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Protective Effect of Glycyrrhiza Glabra Against Toxicity of Carbon Tetrachloride on Some Blood Parameters in Rabbits

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ABSTRACT

The present study was carried out to investigate the protective effects of Glycyrrhiza a glabra roots powder juice one some biochemical parameters in normal rabbits, and ccl4-induced hepatic injury rabbits. A dose of 2.0 g/kg body weight of aqueous extract of roots was orally administered daily to normal and ccl4 – induced hepatic injury rabbits or 7 days. Triglyceride, cholesterol, uric acid and total proteins were decreased in the serum of CCl4—induced hepatic injury rabbits, as compared to normal rabbits. The present study demonstrated that the G. glabra roots extract had a significant effect in liver functions in acute liver disorder when it was given in a single daily dose of 2.0 gm/kg rabbit body weight for 7 days. Therefore, the aqueous extract of G. glabra roots can be used for prevention and treatment of liver disorder.

Key words: *Glycyrrhiza glabra* (Licorice); Carbon tetrachloride; Induced hepatic injury rabbits; Biochemical parameters.

INTRODUCTION

The roots and rhizomes licorice (Glycyrrhiza) species have long been used worldwide as herbal medicine and natural sweetener. licorice root is a traditional medicine used mainly for the treatment of peptic ulcer, hepatitis c, and pulmonary and skin diseases, although clinical and experimental studies suggest that it has several other useful pharmacological properties such as anti-inflammatory, antiviral, antimicrobial, ant oxidative, anti-cancer activities, immunomodulatory, hepatoprotective and cardioprotective effect. A large number of components have been isolated from licorice, including triterpene saponins, flavonoids, isoflavonoids and chalcones, with glycyrrizic acid normally being considered to be the main biologically active component. (1) Carbon tetrachloride (CCl4) induced hepatic injury is very classical model widely used for hepatoprotective drug screening (1,2). The acute hepatotoxicity of CCl4 lies in its biotransformation to trichloromethyl free radical (CCl3) or trichloroperoxyl radical (CCl3O2-) produced by the endoplamic reticulum, which causes oxidative stress and membrane damage (4).

Administration of aqueous extract of *G. glabra* to CCl4–intoxicated animals showed significant hepatoprotective activity by restoring the hepatocellular activity. It has been reported that the high level of flavonoids like luteolin, rutin, and apigenin in *G.glabra* possess antioxidant properties **(13, 14)** The flavonoid compound, rutin, is particularly having free radical scavenging property so inhibits the lipid peroxidation (15). Also, it is found that glycyrrhetinin acid (the active component of licorice) blocks the bioactivity of CCL4 by inhibiting the activity of P4502E1(the enzyme responsible for CCl4 metabolism), thereby preventing the hepatoperoxidation (16).

Glycyrrhiza glabra Linn. of the family Fabaceae is underground stems and roots are used medicinally. Its hypocholesterolaemic and hypoglycemic activities have been reported.(18)http://www.ijp-online.com/article.asp?issn=0253-7613;year=2004;volume=36;issue=5;spage=284;epage=287;aulast=Rajesh - ref4 It is known in the traditional system of medicine for its use in liver diseases. It is a major component of many

antihepatotoxic polyherbal formulations.(19) Isoflavan derivatives glabridin, hisplaglabridin A, hisplaglabridin B and 4' O-methyl glabridin have been isolated from *G. glabra*. These chemicals were reported to provide protection against oxidative stress.(20)http://www.ijp-online.com/article.asp?issn=0253-7613;year=2004;volume=36;issue=5;spage=284;epage=287;aulast=Rajesh - ref6 .

MATERIAL AND METHODES

Carbon tetrachloride (CCl4) was used to induce the hepatic injury of the experimental animal (rabbits)

Plant material and preparation

The dry roots of Glycyrrhiza glabra (Licorice , sweet root) were obtained from local herbal market and was identified and authenticated by department of botany, faculty of Science university of Sirte , Sirte , Libya. The roots were cleaned and grounded into powder. A known weight of this powder, 40 g, were suspended in 200 ml distalled water to prepare the juice for experiment.

Animals

Fifteen rabbits weighing from 0.87- 2.33 kg were used in present study, The animals were grouped and housed in cages (70x 44x 103 cm) at the laboratories of the Zoology department , sirte university , the photoperiod was regulated at 12 hours light / 12 hours dark cycle and temperature was adjusted at 25± 1ºC. the rabbits were fed on commercial standard pellet and offered drink water *ad libitum* , the animals were acclimatized to laboratory conditions for one week before starting of the experiment.

Induction of hepatotoxicity by CCl4

Liver toxicity was induced by an oral single dose of CCl4 1.25 ml / kg rabbits body weight diluted in a 1:1(v/ v) olive oil.

Experimental groups and protocol

Rabbits were randomly distributed into three groups (5.0 rabbits / group)

Group I : control (G1) normal control rabbits were given 2 ml distilled water orally daily for 7 days , and in the 8th day were given 1.0 ml olive oil .

Group II : carbon tetrachloride treated group (G2) rabbits were given 2.0 ml distilled water orally daily for 7 days, and in the 8th day were given a single dose of CCl4 , 1.25 ml / kg body weight (b.w t) in a 1:11 (v/ v) olive oil.

Group III: carbon tetrachloride + G. glabra treated group (G3) –rabbits were given 2.0 g / kg b. wt . G- glabra in 10 ml distilled water orally daily for 7 days , and in the 8th day were given a single dose of 1.25 ml / kg b. wt. CCl4 in a 1:1(V/ V) in olive oil.

Collection of blood

At the end of the experimental period (8 days) , overnight fasting rabbits were deprived of food . but allowed for free access of drinking water . Animals were sacrificed by decapitation and the shed blood was collected in cleaned vials, these vials without anticoagulant for serum separation , these vials were centrifuged at 3000 rpm 20 minutes . The serum was used to measure triglyceride, cholesterol , uric acid and total protein , using spectrophotometer and the available kits.

Statistical analysis

Data were expressed as mean ± SE, and were compared using One way analysis of variance (ANOVA) and student s t test was used to detect the mean differences between groups . The significance level were tested at ($P< 0.05$). (5)

RESULTS AND DISCUSSION

Table (1) showed that administration of CCl4 to the animals resulted in a marked decreased in triglyceride, cholesterol, uric acid and total protein when compared with control group (G1). Group 3 (G3) which was

given the aqueous extract of G. glabra showed a reduction in triglyceride , uric acid , total protein and increased in cholesterol when compared with group 2 (G2) (treated group of rabbits with CCl4)

Table 1: Values of Triglyceride, Cholesterol, Uric acid and Total protein for control and treated groups of rabbits

Groups	Triglycerides mg/ dl	Cholesterol mg/ dl	Uric acid µ mol/ dl	Total protein g / dl
G1 (Control)	97.80±13.16	64.80±7.96	1.85±0.02	3.36±0.50
G2(CCl4 only)	90.20±9.36	49.40±6.26	0.30±0.08	3.26±0.37
G3(G.galabra+CCl4)	26.20±4.29	58.20±6.55	0.26±0.09	2.90±0.46

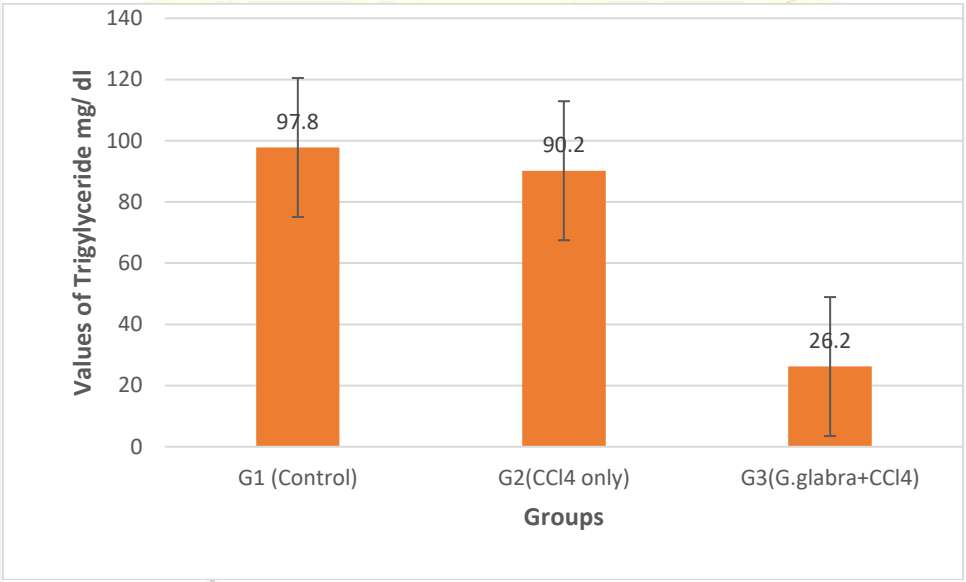

Figure 1 : Values of Triglyderide activity (Means±SE) for control and treated group of rabitts.

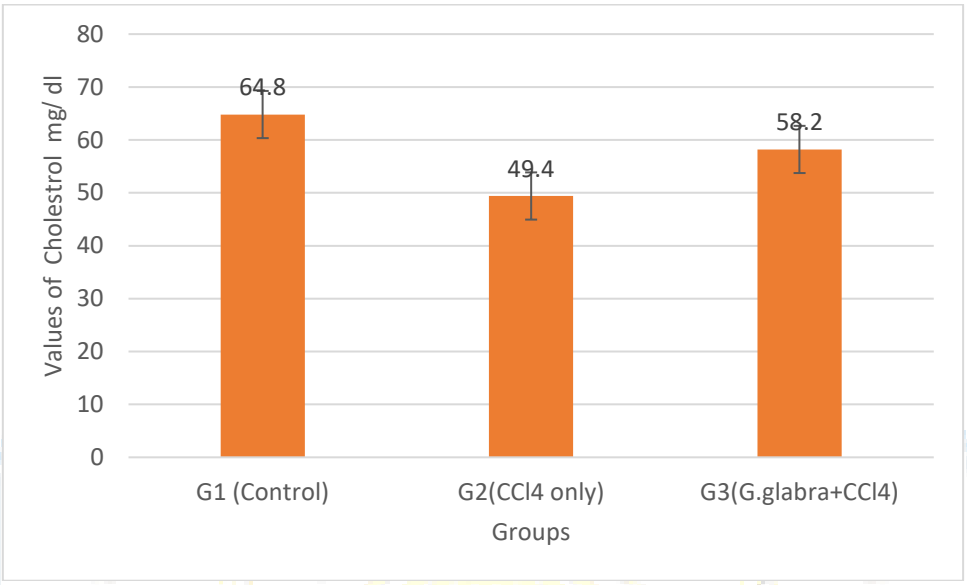

Figure 2 : Values of Cholestrole activity (Means±SE) for control and treated group of rabitts.

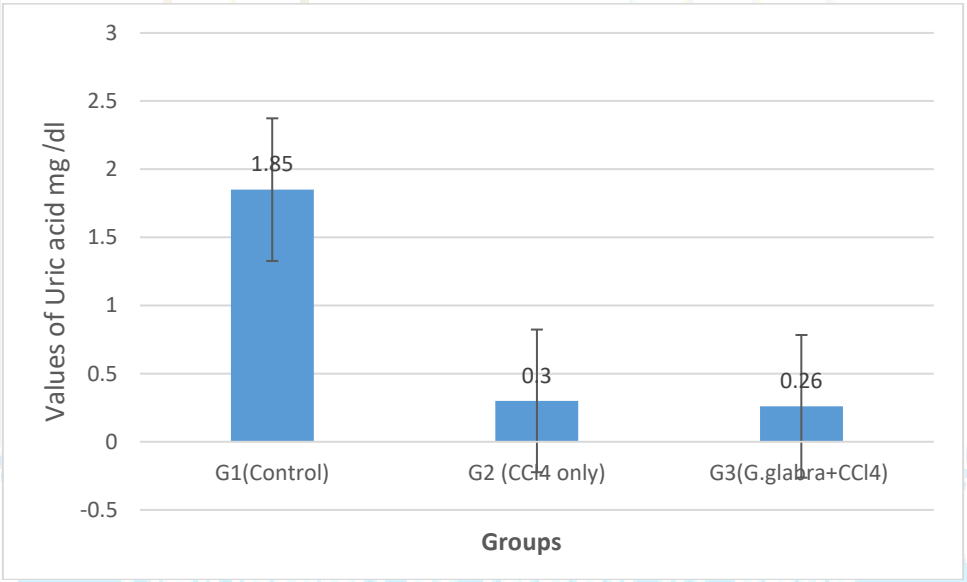

Figure 3 : Values of Uric acid activity (Means±SE) for control and treated group of rabitts.

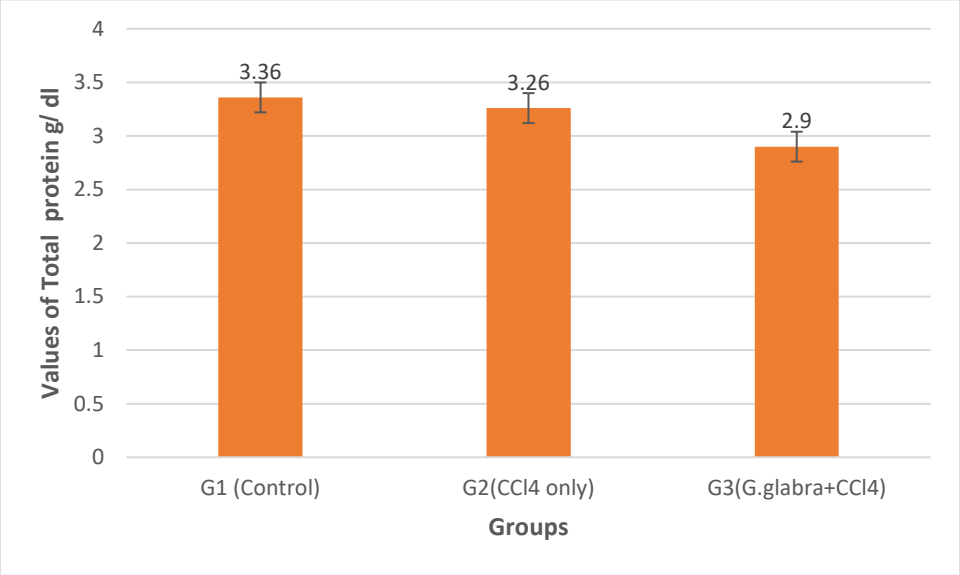

Figure 4 : Values of Total protein activity (Means±SE) for control and treated group of rabitts.

The carbon tetrachloride is one of environmental pollutants that have been studied and developed the conclusion of chronic renal damage. (7)

The rapid increase in hepatic triglyceride was shown to account for entire accumulation of hepatic lipid shortly after carbon tetrachloride ingestion causes rapid liver triglyceride accumulation by impairing the hepatic triglyceride secretory mechanism .these results agreed with other studies (3 ,22)

The inhibition of the synthesis of plasma – lipoprotein after the administration of carbon tetrachloride is of particular interest sine it may explain the subsequent changes in the concentration of lipid in plasma and in liver , it seems reasonable to suggest that reduced synthesis of plasma lipoprotein will result in a fall in the mount of lipid which normally transported from the liver in combination with this protein and that this will lead both to a decrease in the concentration of natural lipids in the plasma and to the accumulation of fat in the liver (8,9)

The phosphatide and cholesterol components of the plasma lipoprotein on the other hand , are synthesized in liver itself . These differences in the origin of the various components of plasma – lipoprotein lipid may explain why only triglyceride accumulates in the liver after the administration of CCl4 since, whereas the rates of synthesis or of destruction of phosphatide and cholesterol may be regulated by the liver itself , the inflow of free fatty acids from the plasma is probably determined by such factors as the rate of mobilization of fat from the depots which are outside the control of the liver.(10,11)

The carbon tetrachloride has a role in the incidence of renal toxicity and poisoning of urethra and the result of the presence of cytochrome P450 in the renal cortex which have a great sensitivity toward the compound CCl4(31). The effects of CCl4 on the structure and function of kidney depends on the status and function of the liver where, it can damage and lead to a breach in the dynamics of the liver (Hemodynamic) and therefore a defect in kidney function (12)

Table (1) show serum uric acid (SUA), it level was significantly decreased in rabbits treated with CCl4 (G2) when compared with the control rabbits (G1) . Uric acid is the final product of purine metabolism in humans. The final two reactions of its production catalyzing the conversion of hypoxanthine to xanthine and the latter to uric acid are catalysed by the enzyme xanthine oxidoreductase, which may attain two inter-convertible forms, namely xanthine dehydrogenase or xanthine oxidase. The serum UA level is associated with the

development of cirrhosis and the presence of elevated serum liver enzymes after adjustments for important causes and risk factors of chronic liver diseases .(21. 22)
The high level of flavonoids like luteolin , rutin, and apigenin in G. glabra possess antioxidant properties (21) . the flavonoid compound , rutin , is particularly having free radical scavenging property so inhibits lipid peroxidation (13)
The G. glabra contains flavonoids , glycosides , glycyrrhizin (the main active component , found in root) and glycyrrhizic acid (10) . the glycyrrhizic acid has a lowering effect of elevated liver transaminase levels.(15)

CONCLUSION

The present study demonstrated that the G, glabra roots extract had a significant effect in liver functions in acute liver disease when it was given in a single daily dose of 2.0 g / kg body weight for 7 days . there the aqueous extract of G. glabra roots can be used for prevention and treatment of liver disorders.

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Denture Base Mechanical Properties Improvement via Incorporation of α-Cordierite as A Filler

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ABSTRACT

Although Poly (Methyl Methacrylate) (PMMA) is the most preferred material to produce denture base, it is still needing further development to address problems such as fatigue failure, impact failure, poor radiopacity, and water absorption. These problems have led to several ways to improve PMMA's properties. The aim of the present study is to investigate the effect of α-cordierite ceramic powder incorporation into PMMA denture base materials. The α-cordierite was treated with a silane coupling agent (γ-MPS). According to the standard dental laboratory application, the samples were prepared by adding α-cordierite powder (0, 5, 10, and 15 wt%, respectively) to the MMA monomer and hand mixed. The blend at the dough stage is packed to fill moulds. The samples were tested for flexural, tensile properties, fracture toughness, and hardness properties. Also, the target of this inclusion is to improve the ability of PMMA to absorb X-rays for achieving a sufficient level of radiopacity. The morphology of the specimens was investigated by scanning electron microscope (SEM). The presence of α-cordierite increased Young's modulus and decreased the tensile strength. The incorporation of α-cordierite could positively influence the flexural modulus and strength as well as the fracture toughness. The results showed an improvement in the surface hardness of the PMMA composite. Moreover, the radiopacity of the PMMA composite was improved when the filler percentage increased. SEM results showed that the filler particle is observed to be partially embedded and semi-bonded to the matrix in the samples which the percentage of filler is 5%. The presence of these particles improves the PMMA composites (α-cordierite 5% filler). This percentage of filler showed higher flexural strength, tensile strength, and fracture toughness if compared to composites with higher filler loadings. The improvement in the radiopacity was also achieved.

Keywords: - Poly (Methyl Methacrylate), A-Cordierite, Tensile Properties, Fracture Properties.

INTRODUCTION

Poly (methyl methacrylate) (PMMA) has replaced prior denture materials such as vulcanite, nitrocellulose, phenol-formaldehyde, vinyl plastics, and porcelain. By 1935, PMMA resin was introduced as a material for removable dentures bases and remained the largely commonly used denture material. PMMA has higher physical, biological, and esthetic properties. Pure PMMA resin is a colorless, transparent solid that may be colored to give any shade and degree of translucency for suitable esthetics for dental applications. Denture base made from PMMA has

good dimensional stability, adequate strength in addition it matches the appearance of normal soft tissues [1- 30].

Although PMMA is basically used as a major material of denture bases and its popularity in satisfying aesthetic, PMMA is still far from ideal denture base materials requirements. It showed poor mechanical requirements of prosthesis [2-37]. This material will from time to time fracture through usage. One of the factors that can lead to fracture is low resistance impact, flexural or fatigue, or poor manufacture procedure. Radiopacity property is one of the several desirable features of dental materials. In addition, dentures constructed from acrylic resin are radiolucent because, C, O, and H atoms are poor X-ray absorbers. This is a serious disadvantage of these materials. If a patient swallows or inhales a denture or fragment of a denture it is difficult to detect using simple radiological techniques[3].

These entire factors raise the necessity to advance the strength of denture base materials and to produce strong dentures, which have increased clinical longevity. There are many approaches, which can be used to improve the strength of PMMA[4]. The first approach is by adding a cross-linking agent of poly-functional monomer such as polyethylene glycol dimethacrylate. The second approach is to create a reinforcement of denture base polymer with rubber phase, metal and metal wire, or fiber [5]. The third approach is using fillers. Fillers are inorganic materials and the word filler is directly linked to solid additives, which are incorporated into the plastic matrix. Also, it can be classified according to their influence on the mechanical properties of the resulting mixture [31]. Harper [6] reported that reinforcing fillers are added in order to advance certain mechanical properties such as modulus or tensile strength also it typically will increase the compressive, tensile, and shear strength; increase the heat deflection temperature, lower shrinkage; and increase the modulus. It improves the properties via several different mechanisms, whereby in some cases a chemical bond is formed between the filler and the polymer.

Many researchers reported that the incorporation of ceramic powder as filler can enhance the properties of denture base material. Elshereksi [7] studied the effects of barium titanate ceramic powder as filler in PMMA denture base and concluded that ceramic filler improved in most of the mechanical properties of denture base material. Another research made by Mohamed [8] studied the effect of ceramic fillers incorporation in the PMMA and which improved the mechanical properties of the composite. Gladwin and Bagby [9] reported that ceramic materials are chosen as fillers for their special properties. The strong hard ceramic materials have low coefficients of thermal expansion (CTE). When they are mixed with polymers, the resulting dental composites have coefficients closer to tooth structure than the polymers on which they are based. Because a composite has a percentage of polymers in the system, there is a reduction of polymerization shrinkage when the material sets. In addition, the material used to make a denture base should have a low specific gravity value as the denture base should be as light as possible [3]. Also, Prajwala et al.[32] stated that the flexural, compressive strengths have improved; thermal conductivity fatigue strength, fracture toughness, and hardness have increased when they incorporate zirconia ceramic filler. Gad et al.[34] reported that adding titanium particles could improve the flexure strength, fracture toughness, hardness of PMMA, as well as thermal conductivity.

The α-cordierite also can be used because of its exclusive properties [10]. The α-cordierite has a very low coefficient of thermal expansion (CTE), specific gravity (~ 2.5 g/cm^3), excellent thermal shock

resistance, and stability at elevated temperature [11-13]. The purpose of this study was to improve the properties of denture base material (PMMA) as a function of incorporation α-cordierite as reinforcement filler.

MATERIALS AND METHODS

The solid elements consisted of PMMA with high molecular weight (966,000 GPC– Aldrich U.S.A) plus 0.5% benzoyl peroxide (BPO) (Merck Chemical, Germany). The liquid component comprised of methyl methacrylate (MMA) (Fluka UK), stabilized with 0.0025% hydroquinone plus the cross-linking agent (10%) ethylene glycol dimethacrylate (EGDMA) (Aldrich USA) and toluene. The α-cordierite powder had selected as a strengthening filler with an average particle size of 1.06 µm. The silane coupling agent 3-(trimethoxysily) propyl methacrylate was supplied by Sigma-Aldrich. Silane as coupling agent (γ-MPS) which has been used in this study has a boiling point of 190 ºC and flashpoint at 92.22 ºC. Silane enhances interfacial bonding by providing covalent bonds between the filler and the matrix of the dental composite [14].

10 g of α-cordierite powder and 10 wt% of silane were added into 200 ml toluene. The solution was refluxed for 15 h before filtering in order to collect the modified powder. The powder was washed with 200 ml of fresh toluene in a Soxhlet apparatus for 24 h. The final product dried at 110 ºC for 3 h under a vacuum. Filler treatment was done according to the method as reported by Abboud et al.[15]. The treated α-cordierite powder was blended with matrix material (PMMA and 0.5% BPO) with different ratios (0, 5, 10, and 15 wt%, respectively) in a plastic ball mill for 20 min.

The blending of powder to liquid (P/L) was done according to standard dental laboratory usage. After reaching the dough stage, the mix was packed into a mould and was pressed under 14 MPa, at room temperature for 30 min. The final polymerization (curing process) was carried out in a water bath at 78 ºC for 90 min before the mold was left to cool slowly at room temperature. After that, the samples were removed.

Each sample was subjected to a tensile test according to ASTM D-638 using an Instron 5582 100 KN. The gauge length was set at 50 mm and the crosshead speed was 5 mm/min. At least five samples were tested for each formula. Tensile strength, tensile strain, and Young's modulus were recorded. The fracture toughness was determined using the single edge notch bending test (SEN-B) according to ISO 13586:2000. The test specimens were prepared in molded plate (thickness, B = 4 mm, width W = 20 mm, span length L = 64 mm, overall length = 80 mm, notch length a = 4 mm). A natural crack was generated by tapping using a new razor blade in the notch. The SEN-B specimens were tested at a crosshead speed of 1.00 mm/min.

The values for fracture toughness (KIc) were calculated using Equation 1:

$$K_{IC} = \frac{3PSa^{1/2}y}{2 \cdot tw^{2}} \qquad (1)$$

The geometry correction factor (Y) is calculated from the formula:

$$Y = \left[1.93 - 3.07\left(\frac{a}{W}\right) + 14.53\left(\frac{a}{W}\right)^2 - 25.1\left(\frac{a}{W}\right)^3 + 25.8\left(\frac{a}{W}\right)^4\right] \quad (2)$$

Where: p = load at peak (N), s = span length (mm), a = notch length (mm), t = specimen thickness (mm) w = specimens' width (mm).

The flexural test was done According to ASTM D790-86. The support span was set at 50 mm whilst the diameter of the loading nose and supports were 20 mm and 10 mm, respectively. Tests were conducted at a crosshead speed of 2 mm/min on the Instron 5582 10 KN.
The flexural strength and flexural modulus were calculated using the following equations:

$$\text{flexural modulus} = \frac{L^3 m}{4bd^3} \quad (3)$$

$$\text{flexural strength} = \frac{3PL}{2bd^2} \quad (4)$$

Whereby L = span length, p = maximum load, b = specimen width, d = specimen thickness, M = tangent gradient of the initial straight line of load versus deflection curve.

The hardness test was done according to the ASTM E 384-89 standard. A calibrated Vickers Hardness Tester FV (Future-Tech) was used to force a 0.3 kgf diamond indenter into the polished surface of the sample and to measure the diagonal length optically. The average of five readings was calculated for each formulation sample. The Vickers hardness number was calculated using the following equation stated in ASTM standard:

$$HV = \frac{P}{As} = \frac{2P\sin\left(\frac{\alpha}{2}\right)}{d^2} = 1.8544\ \frac{P}{d^2} \quad (5)$$

Whereby; P: load, kgf; As: surface area of indentation, mm^2; d: mean two diagonals of indentation d_1 and d_2, mm; and α: face angle of indentation = 136º.

Since grams-force and micrometers units are normally used rather than kilogram-force and millimeters, the Vickers hardness number can be expressed conventionally as:

$$HV = 1854.4\ \frac{P_1}{{d_1}^2} \quad (6)$$

Where P_1: Load, gf, and d_1: mean diagonal of indentation, µm.
The samples' fracture surface was observed using FESEM Leica Cambridge S-360.

The radiopacity test was evaluated according to ISO 4049 – 2000 (E). The experimental procedure was carried out as follows; the tested samples, aluminum plate, and film were irradiated with X-ray at 60 kV using X-ray machine TOSHIBA KXO-15 R, Japan at target film distance of 35 cm, the exposure time was 1 mAs. The film was developed and fixed using Kodak X-OMAT 5000 RA Processor machine.

RESULTS AND DISCUSSION

Mechanical properties

The tensile properties of the PMMA/α-cordierite composite are summarized in Table 1. The PMMA/α-cordierite samples show slightly lower tensile strength compared to that of the PMMA matrix. The particle shape of the filler has an influence on most properties of the composites. For

example, the spherical shape provides a uniform stress distribution on its surface. Polymer composites with a flake or lamellar reinforcements can give a higher modulus than composites with irregularly shaped filler. However, irregularly shaped fillers have sharp edges or points that create a high-stress concentration which can lead to the initiation of premature failure of a polymer matrix composite[16]. Therefore, the reduction of tensile strength might be due to irregularly shaped filler particles, as shown in Figure 1, which might result in stress concentration in the polymer matrix due to the inability of the filler particles to support all stresses transferred from the polymer matrix. A similar observation was recorded by Patnaik[17] who studied the inclusion of alumina as filler in polyester matrix.

Table 1- The effect of filler loading on the tensile properties of PMMA/α-cordierite composite

Specimen	Tensile strength (MPa)	Tensile modulus (GPa)
PMMA matrix	50.6 ± 2.1	1.80 ± 0.02
PMMA+5% T.F	47.5 ± 1.3	1.95 ± 0.1
PMMA+10% T.F	46.4 ± 1.7	1.96 ± 0.1
PMMA+15% T.F	41.9 ± 0.6	2.10 ± 0.1

However, within the filled PMMA itself, tensile strength values decreased as filler content is increased. This is maybe due to the agglomeration of filler particles or simply, as a result of the physical contact between adjacent agglomerates. Agglomerates like a foreign body in the composite. The agglomerates became stress concentrators which build up stresses in composites and finally caused an earlier rupture compared to the pure PMMA samples. And this explanation is agreed with Mohamad et al. [18] when they incorporated alumina nanoparticles into a PMMA matrix. However, a different explanation was given by Ismail & Chia [19] who claimed that low tensile strength could have been attributed to the geometry of the fillers.

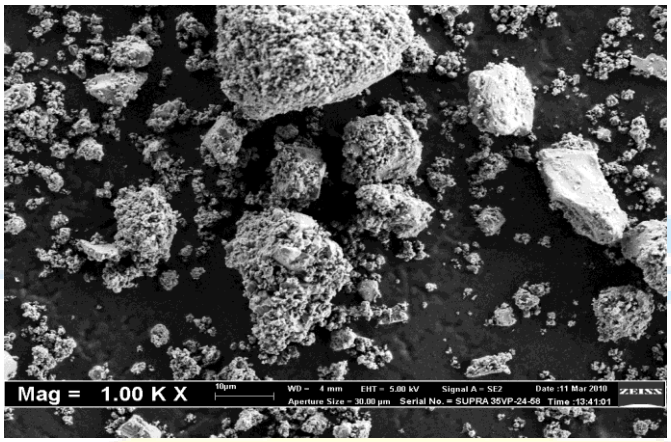

Figure 1. SEM micrograph shows the irregular shapes of α-cordierite particles at 1000x magnifications.

Young's modulus of PMMA/α-cordierite composite increased with increased filler loading. The increase of the modulus with the increase of filler loading indicates the ability of the filler to impart greater rigidity to the composite. As mentioned earlier α-cordierite is a very strong and hard filler thus, an increase in the modulus is expected. This observation is in agreement with the one made by Abudalazez [20] who studied the preparation and characterization of opaque dental porcelain powder as filler in denture base poly (methyl methacrylate). Increasing Young's modulus with increasing the filler content, is the general behavior expected [6, 21].

Figure 2 illustrates the fracture toughness of the PMMA matrix filled with α-cordierite ceramic powder. It is noted that unfilled PMMA exhibits significantly lower fracture toughness than the PMMA composites do. It can be observed that the K_{IC} of PMMA/ α-cordierite composite increased with an increase in filler loading. Further incorporation of α-cordierite reduced the K_{IC} gradually. The increase in the fracture toughness of composites can be attributed to the good distribution of filler particles. This can be led to improve the adhesion between filler and PMMA matrix thus it might transfer stress from the weak polymer matrix to the filler. This is in good agreement with the works made by Chow et al. [22] who stated that the fracture toughness of denture base materials reinforced with HA increased at lower filler loading.

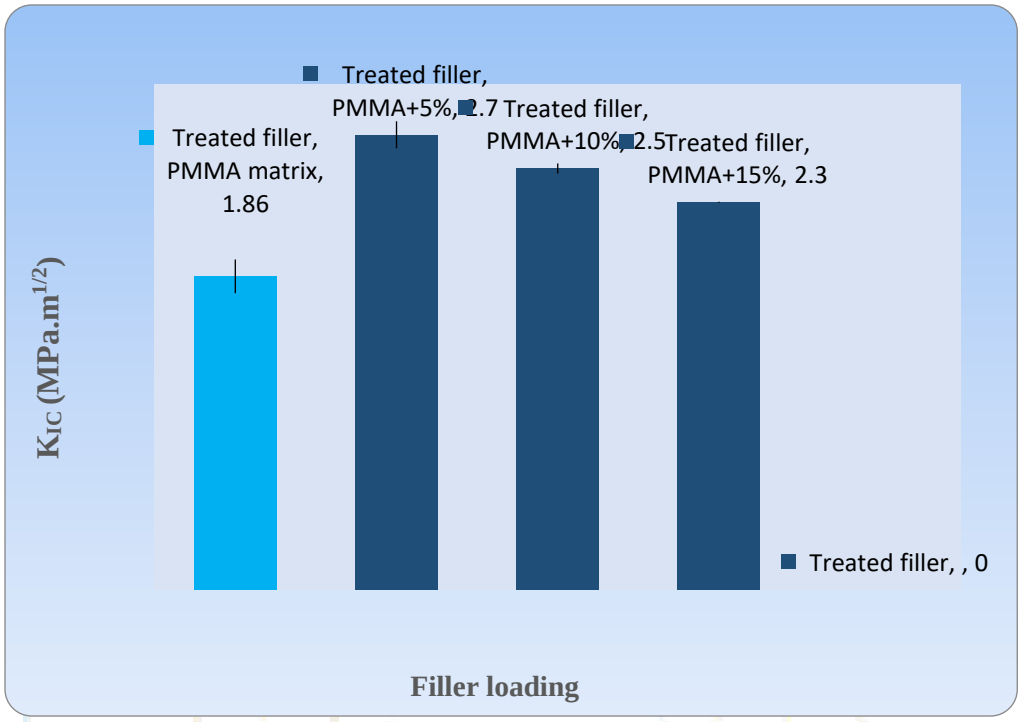

Figure 2. The effect of filler loading on fracture toughness of PMMA filled with α-cordierite ceramic powder

The gradual decrease in fracture toughness with increased filler content is may be due to the offset by particle entanglement and agglomeration. This finding is similar to the studies made by Mohamad [23] and Elshereksi et al.[35] who stated that composites with low filler loading showed fewer agglomerates and better wettability in the composites if compared to composites with higher filler loading.

Figure 3 presents the results of flexural properties of PMMA/α-cordierite composites compared to the PMMA matrix. The graph shows that the slight increase in the flexural strength of PMMA/α-cordierite composite until maximum filler loading (15 wt%) was attained, after which a decrease was recorded. The increased strength of the composite at lower filler content can be attributed to the homogenously dispersed filler particle. Also, these results were the same with Aldabib and Ishak [33] when they study the effect of hydroxyapatite as a filler to reinforce denture base materials. However, the increase in filler loading led to the agglomeration of filler particles in the PMMA matrix. Shyang et al. [24] reported that the filler agglomeration acts the same as stress concentration points and causes inefficiency of stress distribution. Under the influence of external load, more stress will concentrate on the agglomeration area and subsequently initiate deformation at particular locations in the composites [20].

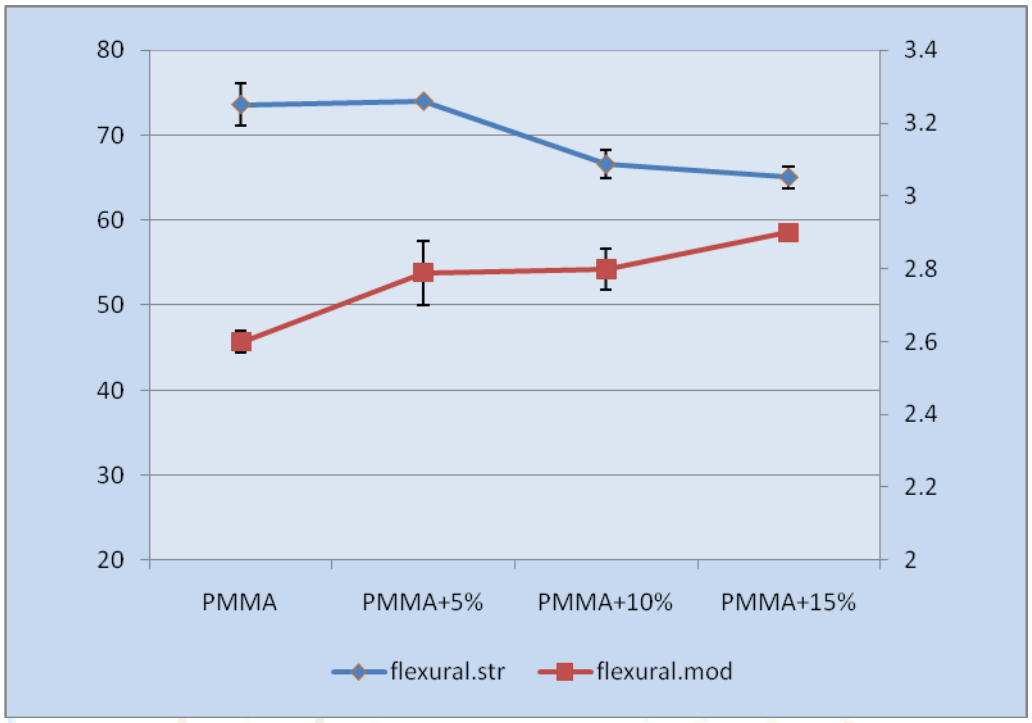

Figure.3. the effect of filler loading on flexural properties of PMMA filled with α-cordierite ceramic powder

Similar to the results of tensile modulus, the PMMA/α-cordierite composite samples showed a slightly higher flexural modulus than the PMMA matrix. This increase in flexural modulus can be attributed to the enhanced brittleness and stiffness of the composite as a result of the improvement in the uniform dispersion of the filler in the PMMA matrix. The uniform dispersion of the filler will give more resistance to flexural force. This uniformity is caused by good interfacial bonding and the wetting of the filler particles by the PMMA matrix. Increments in flexural modulus in PMMA composites with filler content were in agreement with Mohamed [23]. The increase in flexural modulus can be attributed to the restrains movement of the matrix phase in the vicinity of each particle [8]. The stress will transfer across the polymer-composite interface [25]. When the modulus of filler is very high, it is believed that most of the stresses are received by fillers without deformation [26].

The measured hardness values of unfilled PMMA and PMMA / α-cordierite composites are presented in Table 2. It can be seen that the hardness is affected slightly by the addition of α-cordierite. Since the surface hardness of the α-cordierite is higher than that of the PMMA. Thus, the composite surface hardness is expected to be improved as function filler incorporation. According to Harper [6], an increase of filler content in the matrix generally leads to improving the hardness of the composite. This finding is similar to the two studies, one made by Patnaik et al. [14] and another made by Alhareb et al[36]. And Onouha et al.[38] studied the inclusion of alumina as filler in the polyester matrix and stated that the surface hardness of the composite improved by the

addition of the filler. Also, Nejatian et al. [27] stated that the reinforcement of denture base resin and stated that the surface hardness of the composite improved by the addition of the ceramic fillers.

Table 2. Vickers hardness of α-cordierite filler filled PMMA matrix compared to that of the PMMA matrix

Formulation	Vickers hardness (kg/mm^2)
PMMA matrix	18.90 ± 0.8
PMMA matrix + α-cordierite 5%	19.46 ± 0.8
PMMA matrix + α-cordierite10%	23.06 ± 0.4
PMMA matrix + α-cordierite15%	26.10 ± 0.3

Scanning Electron Microscopy (SEM)

Figure 4 shows the fracture surface of the PMMA matrix at 1000x magnification. The crack propagates from the initiation site creating a striped pattern, obviously signifying the occurrence of stable crack propagation. Subsequently, the fracture morphology appeared after fracture smoother, indicating indiscriminate crack propagation through the PMMA matrix.

Figure 5(a) illustrates the fractured surface of α-cordierite filled PMMA matrix (5% filler loading) at 1000x magnification. It can be noted the fracture surface is considerably rougher. The increase in roughness implies the occurrence of a longer crack path and the release of greater fracture energy. At 1000x magnification, Figure 5(b) showed that the filler particle is observed to be partially embedded and semi-bonded to the matrix. It can be inferred that the presence of these particles improves the PMMA composites (α-cordierite 5% filler). This percentage of filler showed higher flexural strength, tensile strength, and fracture toughness if compared to composites with higher filler loading. This finding is similar to one made by Mohamed [18] who stated that lower filler loading shows fewer agglomerates in the composites thus, it can give higher tensile strength.

Figures 6 and 7 show the fractured surface of α-cordierite filled PMMA matrix (10% and 15% filler loading, respectively) at 1000x magnification. It can be clearly noted that the surface roughness decreased with further increasing filler loading. It can be observed that the area of agglomeration increases as the filler content was further loaded. This may be due to the worsening wettability of matrix onto filler surface when the ratio of fillers to PMMA matrix is too high, hence brittle type fracture [28].

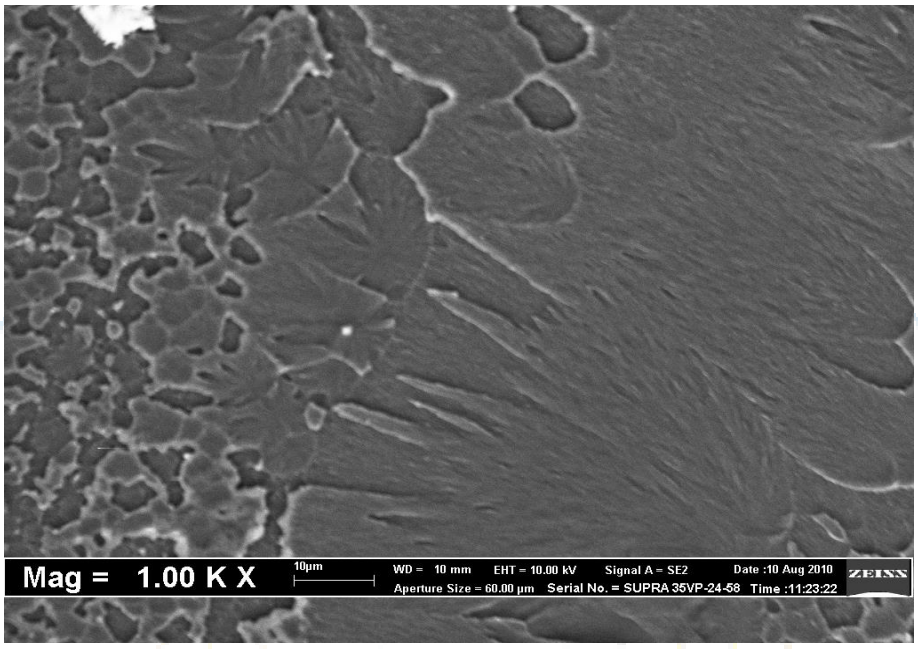

Figure (4): SEM micrograph of the fracture surfaces of the PMMA matrix at1000x magnification.

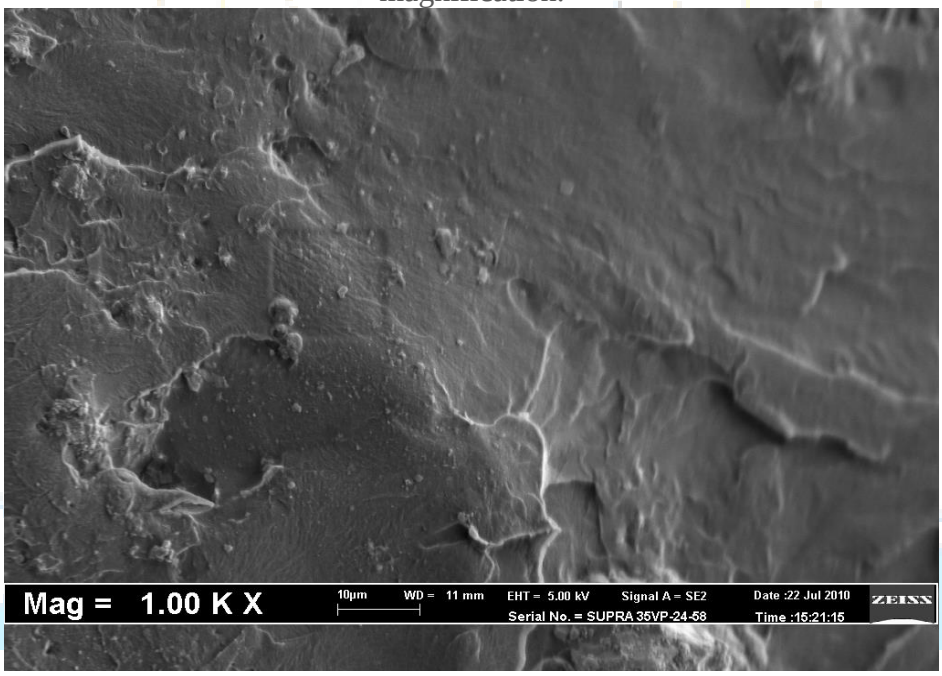

Figure (5-a): SEM micrograph of the fracture surfaces of the 5 wt% (α-cordierite-filled) PMMA matrix at1000x magnification.

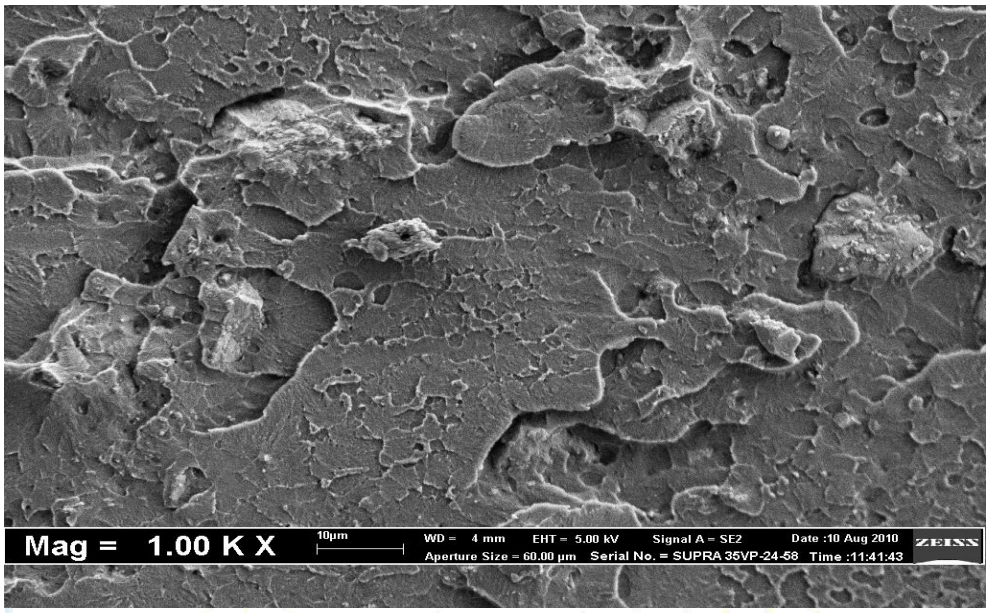

Figure (5-b): SEM micrograph of the fracture surfaces of the 5 wt% (α-cordierite-filled) PMMA matrix at 1000x magnification. The filler particles are embedded and semi-bonded to the matrix.

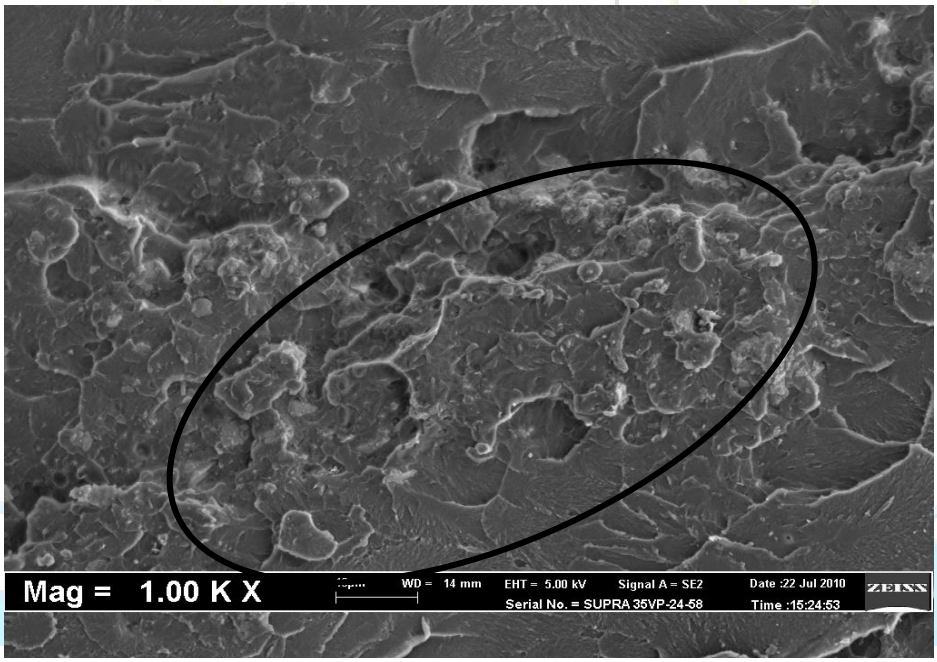

Figure (6): SEM micrograph of the fracture surfaces of the 10 wt% (α-cordierite-filled) PMMA matrix. At 1000x magnification. The agglomeration area is surrounded by black circle.

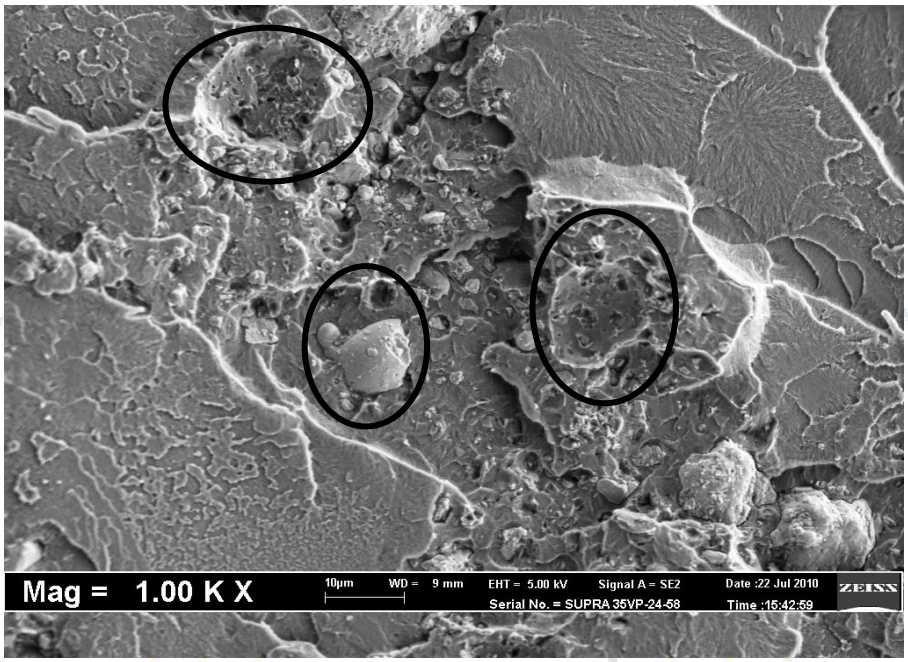

Figure (7): SEM micrograph of the fracture surfaces of the 15 wt% (α-cordierite-filled) PMMA matrix. The worsening wettability of matrix onto filler surface surrounded by the black circle

Figure 8 shows the results of the radiopacity test of the PMMA matrix samples and the composite samples compared with the aluminum plate. It can be seen that the formulations containing α-cordierite are more visible compared to the PMMA matrix sample. Moreover, it can be noted that adding α-cordierite ceramic filler into the denture base material resulted in a significant improvement in radiopacity. Especially, in the sample which contains 15 wt % of filler. Tirapelli et al. [29] stated that the filler contains glass and ceramic particles that give radiopacity to the composite. These particles might differ significantly in their concentration and composition, and therefore the radiopacity of composites varies as well.

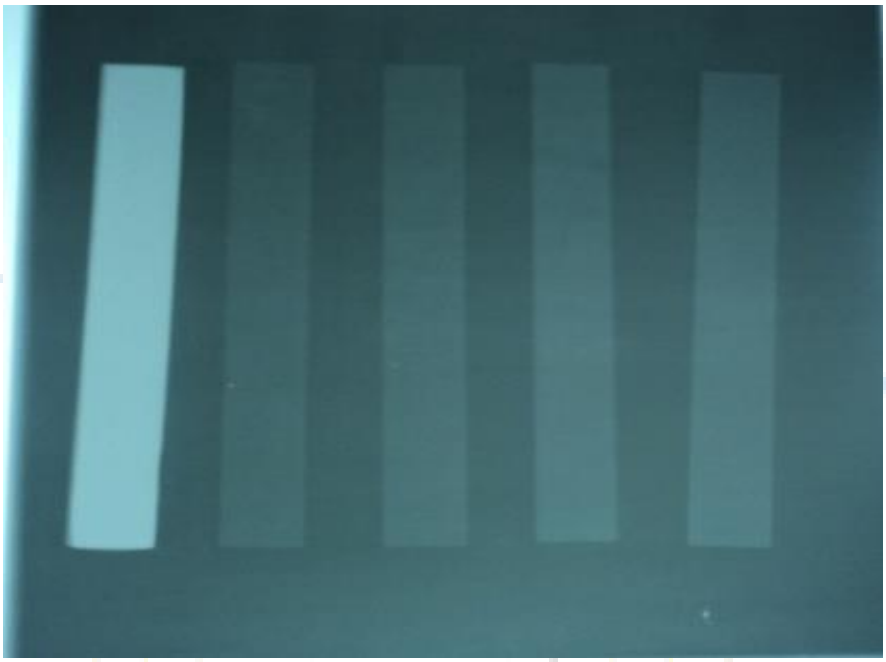

Figure 8: X-ray of the flexural samples compared to the aluminium plate.
(A) Aluminium plate
(B) PMMA matrix
(C) PMMA + α-cordierite 5 wt %
(D) PMMA + α-cordierite 10 wt %
(E) PMMA + α-cordierite 15 wt %

It is possible to increase the radiopacity of the denture base by increasing the filler loading. However, increasing the filler loading can lead to undesirable effects such as a reduction in the mechanical properties [8]. This is in agreement with one made by Elshereksi [7] who concluded that the addition of barium titanate filler into the denture base material resulted in a considerable improvement in radiopacity.

CONCLUSION

The flexural strength and modules as well as fracture toughness of PMMA/α-cordierite composite was increased significantly by addition α-cordierite ceramic powder. However, the tensile strength of the PMMA/α-cordierite composite was reduced by the incorporation of α-cordierite. The optimum loading of α-cordierite was achieved at 5 wt% attributed to the balance of good flexural properties and fracture toughness. Moreover, there is a noticeable enhancement in the radiopacity of PMMA denture base materials.

Acknowledgments

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A Middleware-Based Approach to Monitor Human Emotion in AAL

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Abstract:
In Active and Assisted Living (AAL), the increasing demand of emotion recognition applications require highly flexible and adaptable inference to share services, capture events and monitor emotional state of the elderly. To address this issue, we present a novel middleware-based framework, called HEM that provides a high-level domain specific modeling to abstract common concepts necessary for integrating available recognition applications, as well as information related with situation in various contexts. In this case, the developer will be able to define a wide range of recognition providers, with a framework that reduces the development complexity, takes into account some challenges when applications are integrated within HEM interface in order to optimize emotion -oriented situation.
Keywords: Domain specific modeling, Emotion recognition, AAL, Middleware, language generation, Application integration at runtime.

Introduction

Domain-Specific Modeling (DSM) is an important and efficient way to minimize the intricacies of programming as well as improve the productivity and quality [1,2,3]. DSM aims to grasp the concept of metamodel [4], which makes a model to be create, analyze, and generate code automatically. DSM can raise a higher level of abstraction beyond coding by modeling the problem directly using domain concepts [1]. To exploit the benefits of DSM, we introduce *Human Emotion Modeling (HEM)* as a novel middleware to model human emotion and provide uniform high-level interface to integrate recognition systems in various AAL contexts. HEM is very beneficial to the functioning of systems as it provides the communication between recognition components and hides the heterogeneity of applications. However, the middleware is a term that refers to a set of services that reside between applications and facilitate the development of software applications [5]. HEM permits the developer to represent conceptually a dynamic emotion of elderly that caused by a situation. It helps developers to perform application managerial tasks such as application creation, modification, and monitoring. It designed to streamline the process of detecting and monitoring emotion that reduces duplication of efforts and promotes collaboration between recognition applications. The core concept is to receive contextual information that are stamped with time, then feed them to HEM framework (Fig. 1), which in turn generates beneficial services, such as components visualization, language generation, and resources monitoring.

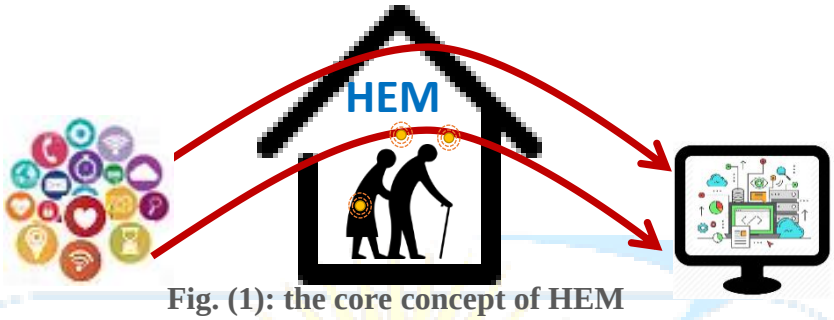


Fig. (1): the core concept of HEM

Our existing work [6] proposed a modeling language to model human emotion-based situation in dynamic AAL. It discussed the phases of designing of HEM, concepts of emotion-oriented situation, and the conceptualization of HEM metamodel.

System Architecture

The general architecture of HEM framework summarized in (Fig. 2); we describe the system as an aggregation of segments, each referring to a different level of abstraction.

Real-world — it shows the abstract environment of the real-world space for the elderly. The *"real-world"* consists of things that the elderly may influence or interact with, such as door, bed, or even another person, a real-world situation is a state of knowledge which stored in human memory and depends on human's context.

Input data — it represents the system's capabilities of sensing or influence the surrounding such as deployed sensors or data that acquired from video recording. The information related with each sensor such as sensor-name, type, location, etc. are stored in HEM database. The location of these sensors (e.g. sensors in each room or wearable sensors) depicted as circles (Fig. 2) which may change over the time.

Semantic annotation — it provides a semantic meaning to the relationships between emotional changes and contextual situation by exploiting data that obtained in the previous segment. It contains "Semantic inference engine" which responsible for detecting current person's emotion and determines the conditions that need to be met if a situation is being occur.

System Services — HEM provides several beneficial services, such as components visualization, language generation, and resources monitoring. HEM permits a modeler to activate/deactivate input resources in the ambient using a graphical interface. This interface allows easily starting or terminating a service, request or saving data, and import or export related contents.

Decision support — upon receiving emotional response, the system checks the relevant elements of current operation. Depending on whether or not the conditions are satisfied, the support can be introduced. In other words, HEM influences the ambient to be more adaptable to the current operation (e.g., the elderly is anger because of the noise => then the system ask him/her to close the window).

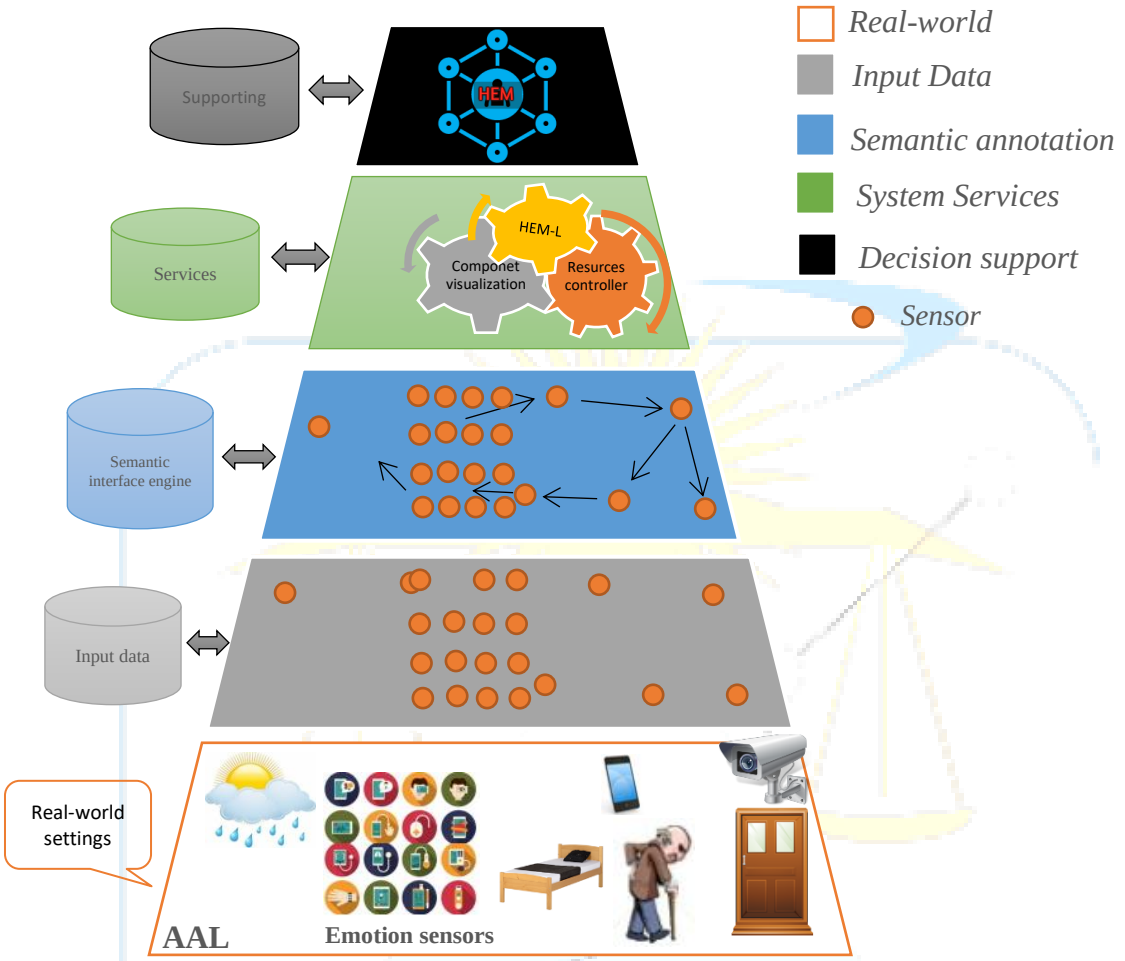


Fig. 2: HEM architecture that depicting how the emotion is achieved in a dynamic AAL environment

However, HEM can be used as a standalone framework or as an add-on for emotion annotation in different contexts. It used to monitor emotion and produce the categories of emotions. Additionally, supporting may introduce through different forms like lighting, sound, heating, or send feedback to the healthcare system.

Visualization of HEM Interface

The construction of HEM comprises two major services: Integration and monitoring services. Integration services of HEM acts as a middleware that allows domain modeler/experts to access available recognition systems. This is very beneficial and timesaving, for instance, instead of working on the details of emotion detection algorithms, an expert can determine the conditions that trigger an emotion (e.g. when a specific lighting might be turned-on at night in response to negative emotion). Monitoring services can be helpful for the expert who analysis emotion-based situation. The values of emotional states can be depicted in an interface to show which emotions are sensed at a given situation and how emotions evolve in time. Domain expert can rely on visualization components to explain overall system responses or to support further inferences regarding to elderly's behavior. Conversely, HEM framework can couple with other

platforms to share its implementation functionality. This may improve the precision and effectiveness of system algorithms and providing timely emotion notifications, independently of the platforms that will use HEM results. In order to demonstrate monitoring capabilities offered by HEM, real-time applications have been implemented. The key functionality of these components is illustrated in the next sections. In what follows, we argue how HEM framework that permits external applications to integrate their result in a seamless manner.

Applications integration at runtime

Usually, building recognition application from scratch is a complicated task, which *requires* special background of knowledge. Instead, HEM permits to combine custom recognition systems as more appropriate solution. This may help experts to focus on a domain problem without worrying about the implementation details. To simplify usability of applications, HEM utilized to hide low-level implementation complexities. It enables available recognition systems to be integrated by encapsulating the complex calculations, algorithms and the like.

Besides, HEM provides the necessary flexibility to represent optionally emotion models such as basic model as well as complex dimensional models as seen on the tabs on the right side in Fig. (3). Additional important part of emotion representation is how to fetch the results when emotion is recognized. Some cases need only to recognize facial expressions, whereas others need to combine more than one modality to analyze emotion. HEM make available for define recognition resources as necessary, for example when a person falling asleep there is no need to acquire emotion from a face, instead, physiological signal can be helpful. If a new recognition technology discover, HEM will provide the infrastructure to add new features without affecting the core framework. In other words, the "*RealTimeSettings*" is a user-defined interface that allows domain expert to insert, edit and delete emotion recognition applications (Fig. 3).

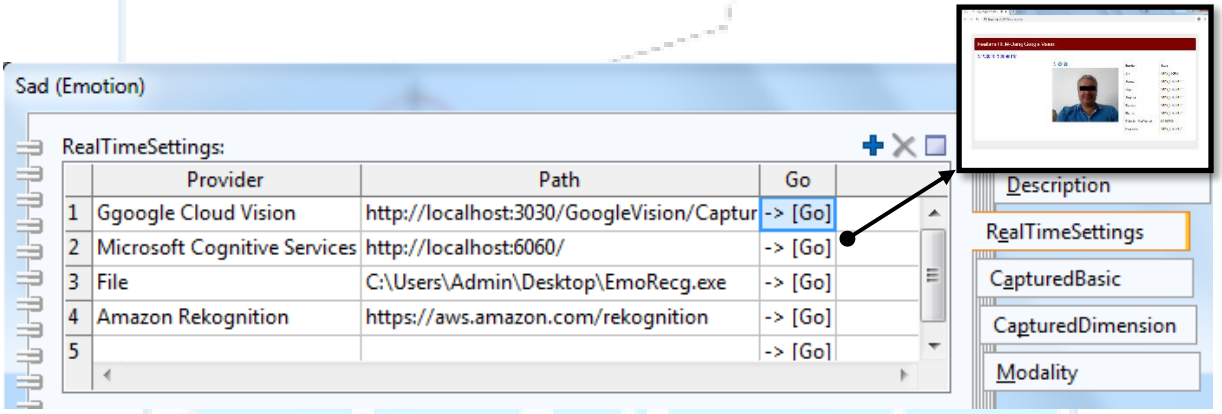


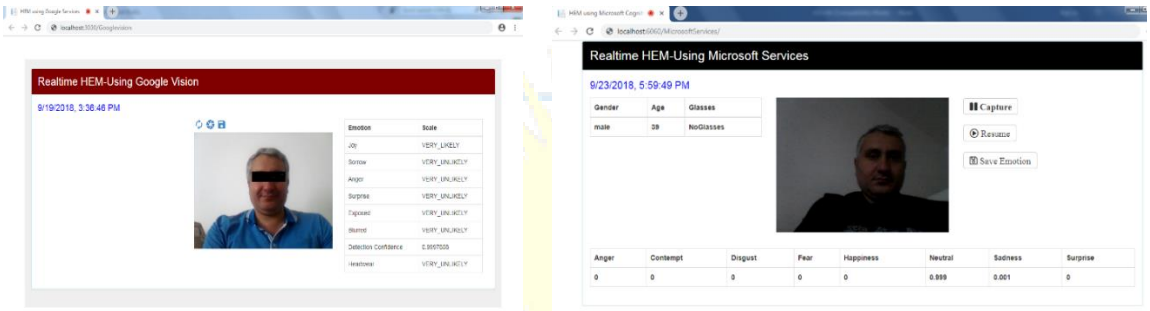
Fig. (3): Interface of Real-Time-Settings to integrate applications

Integration of applications represented as a tuple of three columns that contains (Provider: represents a name of data provider, Path: refers to the path of a service or execution file, whereas GO: pointer used to call a service that relies on a given path). HEM allows to integrate different recognition inputs such as video cameras, microphones, body gestures, physiological signals, etc.

Challenges of Real-time emotion capturing

One issue in this stage that must be addressed, is the heterogeneity of sensed data which recorded from multiple sensors that returning data in their own specific format. This format should convert to a common format in order to use it through HEM framework. For instance,

in our experiment we have accessed the features of emotion application interfaces APIs by processing them to offer low-level emotion information (Fig. 4). Method available for getting emotion results presented in the form of JavaScript Object Notation (JSON). It is worth mentioning that more than 95% of the literature on emotion recognition focuses on facial expressions (i.e. image or video) as an input comparing with other modalities [7], therefore we use camera to capture facial expressions.



(a) (b)

(c)

Fig. (4): Real-time video emotion capturing ((a) Google cloud vision (b) Microsoft cognitive services (c) CLMtrackr)

HEM is capable to accept captured emotions that represented by different emotion models (Fig. 5), for example: Basic model, 2-Dimensional (i.e. Arousal and Valence), 3-Dimensional (i.e. Arousal, Valence, and Dominance), or a custom set of user-defined emotions.

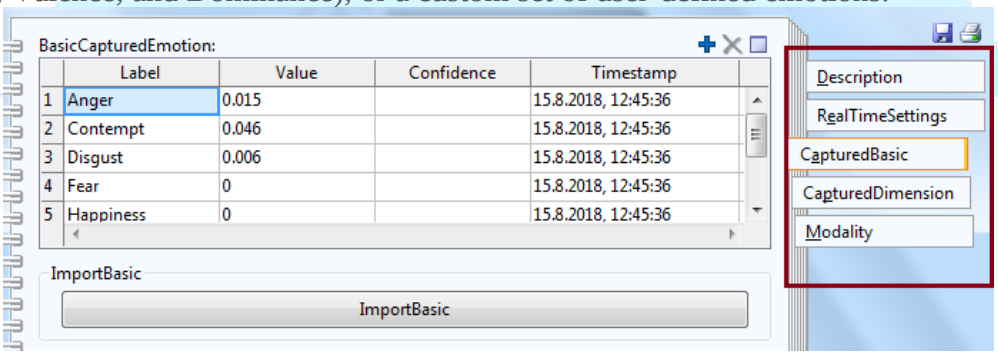


Fig. (5): Tabs showing representation of various emotion models

Multi-sources data collection

This process called sometimes off-line analysis; we gathered various data resulted from available datasets, which represent the most cited ones in the field of emotion recognition. They cover a wide range of potential features to characterize emotion using multi-sensor data type. All collected data stamped with date and time. The used datasets include behavioral and physiological data for a person that watches short videos. Comparison of the content of these datasets depicted in Table 1.

Table (1): Modality comparison of used datasets

	Dataset name			
Modality	MAHNOB [8]	DEAP [9]	DECAF [10]	OMG [11]
Video type	movie	video clip	Movie	video clip
Emotion model	Arousal, valence, dominance, predictability	Arousal, Valence, Dominance, liking, Familiarity	Arousal, Valence, Dominance	Arousal, Valence
EEG	✓	✓	✓	×
GSR	✓	✓	×	×
ECG	✓	×	✓	×
PPG	×	✓	×	×
Respiration	✓	✓	×	×
Temperature	✓	✓	×	×
EMG	×	✓	✓	×
EOG	×	✓	✓	×
MEG	×	×	✓	×
Other	Camera, eye gaze, sounds	×	×	Sounds, utterance

We notice that-- for all datasets-- in the most cases the emotion assessed based on arousal, valence and dominance. The first two indicators (i.e. arousal and valence) are the most widely used to characterize emotion in dimensional scale.

Further, HEM offer ability to import data form benchmark datasets that used in the recognition process. (Fig. 6) is a snapshot showing how our framework receives data acquired from external dataset, for example DEAP dataset [9].

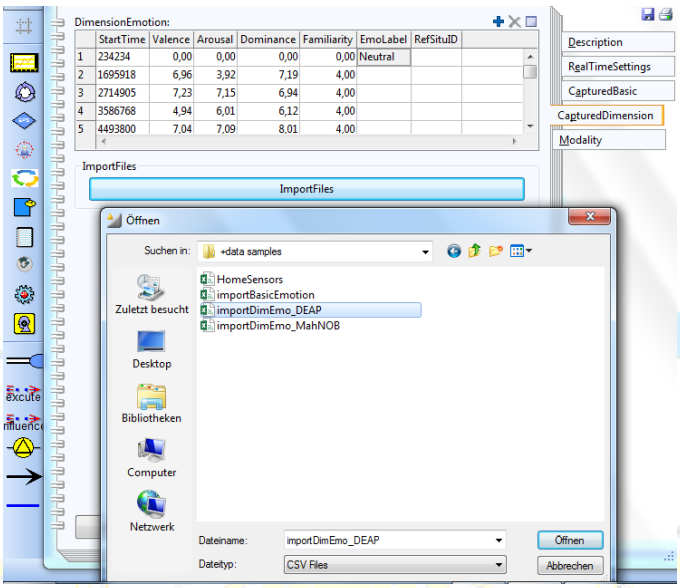


Fig. (6): Import data from DEAP datasets

Environment monitoring and supporting

HEM permits to monitor the environment by representing the real-world space for elderly. This process achieved using suitable sensors or cameras to capture person's activities and emotions; our system provides the opportunity to upload house map so that the system can import information of sensors and video observations. Based on a real spatial information, the system distributes the components simultaneously on the map (Fig. 11).

Fig. (7): positioning of sensors in a home environment

The colored circles (Fig. 7) indicate the placement of various sensors in order to monitor the environment. Our system constraints adding two sensors having the same name and type on the same position. System's modeler is free to change the color of a sensor on the map according

to modality type. Besides, the user can active/de-active specific sensor using HEM framework (de-active ones dyed automatically with black color) (Fig. 8).

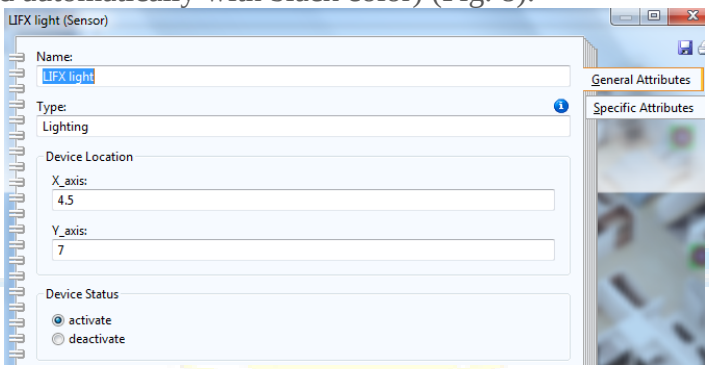


Fig. (8): general attributes of the sensors or services

Additionally, our system influences the environment and offer supporting according to the current emotional state. We notice on the Tabs (Fig. 9) there are two type of attributes (i.e. general and specific): general attributes describe the public attribute for each device or service and specific attributes describe the particular features. HEM regulates the environment by declaring or changing the controllable attributes (e.g., system changes light intensity or light color depending on emotional situation (Fig. 9)).

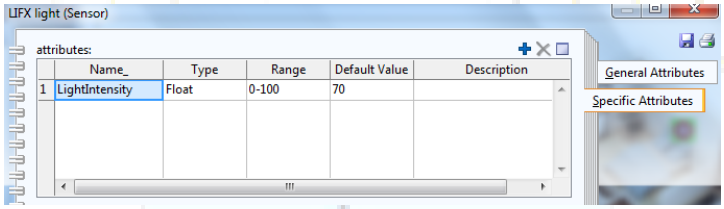


Fig. (9): specific attributes of the sensors or services

Software used for implementing and evaluating HEM framework

This section describes the framework and its usage to solve the issues we discussed earlier. To implement and evaluate the potential of proposed framework, several real-world scenarios are planned in the existing work [6]. We have used several applications that rely on facial cues analysis as well as sensors to monitor physiological signals. Some applications that integrated with HEM through (APIs) need to be compatible with the interface provided by HEM, so as their results are produced in the format required by HEM. We describe in this section, the software utilized for testing purposes. Then, we argue HEM domain specific language and its structure.

In the case of the Google cloud vision [12] and Microsoft cognitive services [13] applications, both required an authorization and payment. They are capable to classify images, detect faces and emotions. Both can communicate with HEM via methods available for acquiring emotions in the form of JavaScript Object Notation (JSON) as an input component, (Fig. 10).

Fig. (10) Resulted emotion in JSON format

We used also Constrained Local Models "CLMtrackr" [14] is an open and free to use JavaScript library for precise tracking of facial features. This library recognizes four emotional states: angry, sad, surprised, and happy. Facial observation has only access to the human's physical expression in order to recognize the emotion. Therefore, we used Biosensors to monitor emotion in Real-time settings via (E4-wristband[1] and BioRadio[2]). Additionally, ADOxx [15] platform used to implement the concepts of HEM modeling language and represent the relationships among those concepts. ADOxx is very flexible to generate language in many forms like XML, RTF, HTML and ADL [16] format. The resulted language can be imported and re-used. We have used also the user-defined query in ADOxx to codify the dynamic inference rules and check syntax of mathematical computations.

HEM-textual representation

HEM is very flexible to represent recognized emotion with related environmental issues visually as well as textually. The generated model can be transformed to the .xml code as a basis for further transformation and exchange. The following example shows snippets of XML representation for emotion and its attributes. A discrete emotional state modeled as a record of rows, each row has attributes (label of emotion, value, timestamp, and confidence). Timestamp is used to represent the date and time relevant with a specific emotion, while a degree of labeling confidence for each emotional state represented by "confidence" attribute, the value of the confidence is a floating-point number in the interval (0-1), as shown below:

```
<RECORD name="BasicCapturedEmotion">
<ROW number="1">
<ATTRIBUTE name="Label" type="STRING">Anger</ATTRIBUTE>
<ATTRIBUTE name="Timestamp" type="STRING">15.8.2018, 12:45:36</ATTRIBUTE>
<ATTRIBUTE name="Value" type="STRING">0.9</ATTRIBUTE>
```

[1] https://www.empatica.com/research/e4
[2] https://glneurotech.com/bioradio

```
<ATTRIBUTE name="Confidence" type="STRING">0.8</ATTRIBUTE>
</ROW>
<ROW number="2">
<ATTRIBUTE name="Label" type="STRING">Contempt</ATTRIBUTE>
…
</RECORD>
```

Alternatively, Emotion can be defined as a record of dimension model in terms of valence, arousal, and dominance.

```
<RECORD name="DimensionEmotion">
<ROW number="1">
<ATTRIBUTE name="Valence" type="DOUBLE">6.96</ATTRIBUTE>
<ATTRIBUTE name="Arousal" type="DOUBLE">3.92</ATTRIBUTE>
<ATTRIBUTE name="Dominance" type="DOUBLE">7.19</ATTRIBUTE>
</ROW>
…
</RECORD>
```

Due to the nature of software providers, software systems can couple with other as SDK or API. HEM designed to be independent of these APIs or SDKs; it can easily integrate different providers without changing its core source-code. HEM provides a domain-specific language to define custom services. A piece of code below shows how to configure input provider so that the user can add, modify, or delete service's with just one line of code. This can also be handled visually through Real-Time-Settings (Fig. 3). We just required to specify provider name and the path. HEM interface is adaptable to integrate and configure an external provider while the system is running. This is useful for the scenario when new additional devices like new wearable component to add simultaneously and provide a certain activity. The resulted code of Real-Time-Settings declared as a record contains three attributes: name, Path, and Go.

```
<RECORD name="RealTimeSettings">
<ROW number="1">
<ATTRIBUTE name="Provider" type="STRING">Google Cloud
Vision</ATTRIBUTE>
<ATTRIBUTE name="Path"
type="STRING">http://localhost:3030/GoogleVision/Capture </ATTRIBUTE>
<ATTRIBUTE name="Go" type="PROGRAMCALL">ITEM &quot;Go&quot;
param:&quot;&quot;</ATTRIBUTE>
</ROW>
<ROW number="2">
<ATTRIBUTE name="Provider" type="STRING"> Microsoft Cognitive
Services</ATTRIBUTE>
<ATTRIBUTE name="Path" type="STRING">http://localhost:6060</ATTRIBUTE>
<ATTRIBUTE name="Go" type="PROGRAMCALL">ITEM &quot;Go&quot;
param:&quot;&quot;</ATTRIBUTE>
</ROW>
<ROW number="3">
```

```
<ATTRIBUTE name="Provider" type="STRING">File</ATTRIBUTE>
<ATTRIBUTE name="Path"
type="STRING">C:\Users\Admin\Desktop\EmoRecg.exe</ATTRIBUTE>
<ATTRIBUTE name="Go" type="PROGRAMCALL">ITEM &quot;Go&quot;
param:&quot;&quot;</ATTRIBUTE>
</ROW>
…
</RECORD>
```

Modality sources represented as a record of attributes, each related with external recognition source and the confidence of that source, for instance, in the following code, the data acquired using physiological sensor called "ECG Monitor Module AD8232" in order to collect biometric data with confidence recognition value 0.9.

```
<ROW number="1">
<ATTRIBUTE name="Name_" type="STRING"> Physiological
</ATTRIBUTE>
<ATTRIBUTE name="Description" type="STRING">Collect biometric
data</ATTRIBUTE>
<ATTRIBUTE name="Confidence" type="DOUBLE">0.9</ATTRIBUTE>
<INTERREF name="Sensor"> ECG Monitor Module AD8232
</INTERREF>
</ROW>
```

Conclusion and future work

Sensing and data gathering from various sources are becoming widely used to recognize human emotion. Therefore, domain expert/observer have to deal with a massive set of input resources. This paper aims at facilitating access to the external recognition providers using domain specific modeling called HEM. The proposed framework designed as a middleware that provide flexible, scalable and concurrent user interfaces to integrate seamlessly recognition applications as well as context variables, whose values are obtained automatically in real life settings. Furthermore, HEM offers considerable gains and simplicity in modeling and execution of complex scenarios in the context of AAL. HEM designed to integrate different providers and custom services without changing its core source-code. HEM interface is very flexible to define and configure an external provider while the system is running. This is useful for the scenario when additional devices like new wearable component to be paired simultaneously in order to provide a certain activity. HEM framework can be used as a standalone or as an add-on for emotion annotation in different contexts. In the near future, we attend to couple HEM framework with other platforms like HCM-L [17] to share its implementation functionality. This may improve the recall, precision, and effectiveness of both system algorithms (i.e., HEM and HCM-L [18]) by providing timely emotion notifications.

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(Formally known: Libyan Conference on Medical and Pharmaceutical Sciences)
تحت شعـار: جـــــــودة التعليـــــم والتعلـــم والبحث العلـمي

Dissolution Profile of Expired Metronidazole Tablet

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Abstract:
In recent years the growing interest in drug stability problem has been observed. However, the studies that reported about the stability of drugs past their expiration dates were limited. If analysis of tablet stability is considered, the most important ones are content determination and dissolution test. The objective of the current study was to examine the Percent of drug release for both expired and valid Metronidazole tablets through dissolution test. According to IP the valid drug has acceptable dissolution rate and excepted good bioavailability. In contrast, the expired Metronidazole tablet listed 71% percent of drug release as the highest rate at 30 min. This study suggested that the expired tablet is not equivalent or similar to valid tablet and recommended to use the valid one to give the therapeutic effect.
Keywords: Metronidazole, Expired, Dissolution, Drug Release

Introduction
Background
Metronidazole (MTZ) is one of the mainstay drugs for the treatment of anaerobic bacterial infections, protozoal infections, and microaerophilic bacterial infections. It is cytotoxic to facultative anaerobic microorganism. This activity will highlight the mechanism of action, adverse event profile, and other key factors pertinent to members of the inter professional team in the care of patients being treated with this medication. [5]

Metronidazole indication
FDA-approved MTZ for the treatment of a broad range of infections such as intestinal amebiases, liver amebiasis, bacterial septicemia, bone and joint infections, central nervous system (CNS) infections (meningitis and brain abscess), endocarditis, gynecologic infections (endometritis, tubo-ovarian abscess, bacterial vaginosis), intra-abdominal infections, lower respiratory tract infections, skin structure infections, and surgical prophylaxis surgeries. [7]

Mechanism of action
Metronidazole diffuses into the organism, inhibits protein synthesis by interacting with DNA and causing a loss of helical DNA structure and strand breakage. Therefore, it causes cell death in susceptible organisms. [1]

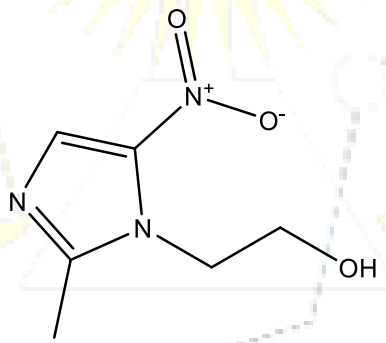
Metronidazole pharmacokinetic

Metronidazole is rapidly absorbed from the small intestine on through oral administration including distribution in all tissues and fluids. In liver metabolism through oxidation and conjugation process with glucuronic acid. It eliminates with urine concluding 7-8 hours of half-life period. [6]

Solubility of metronidazole

Metronidazole's solubility in water was reported as 10 mg/mL at 20◦C and 10.5 mg/mL at 25◦C. Another source reported a solubility of 64.8 mg/mL at room temperature and pH 1.2, decreasing to around 10 mg/mL at pH values between 2.5 and 8.0(Wu Y, Fassini,2005).

Chemically, metronidazole is [2-(2-methyl-5-nitro-1H-imidazol1-yl) ethanol] with molecular weight of 171.15 g/mol and classified according to BCS as Class I drug i.e., highly soluble and highly permeable [2]



metronidazole

Figure 1. Metronidazole chemical structure

Stability of Valid and expired metronidazole tablet:

In recent years the growing interest in drug stability problem has been observed. However, the studies that reported about the stability of drugs past their expiration dates were limited. If analysis of tablet stability is considered, the most important ones are content determination and dissolution test. [11]

Research on the release of medicinal substances is accompanied by a broad range of information concerning the analyzed preparation, i.e. numerous physical and chemical properties of the dosage form, the methods of production. Finally, the changes in dissolution profile might be the result of ageing of the product. [4]

Aim of study:

The objective of the current study was to examine the Percent of drug release for both expired and valid Metronidazole tablets through dissolution test.

Materials and Methods

Apparatus

Metronidazole tablets (250 mg) were kindly provided by Abozriba pharmacy (Benghazi, Libya). The other chemicals and reagents were used of analytical grade.

Study of Metronidazole dissolution was carried out on electronic balance (Kern 870), pH meter, Desicator, dissolution apparatus (ERWEKA DT600) and UV -Vis Spectrophotometer (analytik jena) available in Research Lab of Benghazi University, school of pharmacy.

Preparation of dissolution medium (buffer solution pH 6.8):

Dissolve 28.20gm of disodiumhydrogen phosphate and 11.45gm of potassium dihydrogen phosphate in sufficient water to produce 1oo ml

Standard curve preparation:

50 mg of reference metronidazole is dissolved in 0.1 N HCl to make volume 100 ml. From above solution 1, 2, 3, 4, 5,6 ml is taken respectively and each of them was made 100 ml with 0.1N HCl. All gradual concentrations of solution were conducted for plotting standard curve at 277 nm. The corresponding regression data, indicated reasonable linear relationship R2 = 0.9749. The calibration curve was shown in (Figure 2)

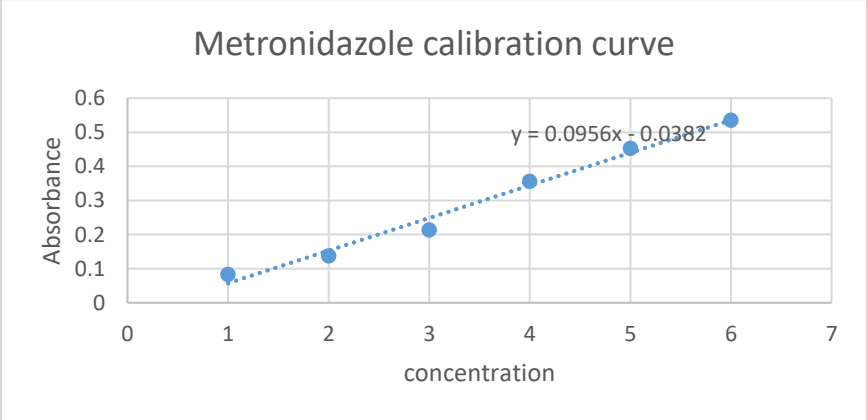


Figure 2. Metronidazole calibration curve

Dissolution test:

Dissolution test was conducted according to International Pharmacopeia. Dissolution rates of metronidazole tablets were determined in 500 mL of buffer solution (pH6.8) at 37 ± 0.5 °C using an Erweka dissolution apparatus at a rotational speed of 75rpm. Samples (5 mL) were removed at 10,15,20 ,30-min intervals over 30 min and replaced immediately with an equal volume of buffer solution to maintain sink conditions. The amount of metronidazole that dissolved over 30 min was determined by measuring absorbance at 277 nm using a UV–vis spectrophotometer.

Using the y =mx + c equation derived from the standard curve of Metronidazole, concentrations of sample at different above-mentioned times were calculated. From these data Cumulative amount release and then % Drug release were calculated using the following equation:
% Drug release= (cumulative amount release(mg))/(strenght in (mg)) x100

Result:

Sample 1:
Metronidazole(250mg) tablet Sanofi- aventis
B. No: 8EG008
Mfg.date:10\2018
Exp.date:09\2021
Table (1): Absorbance of drug sample 1.

No. of tab.	Wt. of tab.	Absorbance at	Absorbance at	Absorbance at	Absorbance at
	Time	10 min	15 min	20 min	30 min
1	0.3538g	1.010	1.442	2.022	**1.984**
2	0.3548g	0.807	1.760	2.155	**2.273**
3	0.3586g	1.246	1.303	2.187	**2.069**
4	0.3420g	1.124	1.800	2.018	**1.943**

Table (2): Percent of drug release sample 1.

Time	Abs.	Conc. Mg	Dilution factor	Conc. \5ml	Cumulative conc.5ml\Mg	Conc(Mg). \500ml	Conc(mg). \500ml	Percent of drug release
10	**1.05**	**12**	**120**	**600**	**600**	**60,000**	**60**	**24**
15	**1,13**	**13**	**130**	**650**	**1250**	**125.000**	**125**	**50**
20	**1,59**	**18**	**180**	**900**	**2150**	**215000**	**215**	**86**
30	**2,07**	**24**	**240**	**1200**	**3350**	**335000**	**335**	**134**

Sample 2:
Metronidazole(250mg) Medopharm industrial
B. No: 5MF77
Mfg.date:06\2015
Exp.date:05\2018

Table (3): Absorbance of drug sample 2.

No. of tab.	Wt. of tab.	Absorbance at	Absorbance at	Absorbance at	Absorbance at	Average of absorbance
	Time	10 min	15 min	20 min	30 min	
1	0.358g	0.2558	0.407	0.695	1.056	**0.603**
2	0.357g	0.464	0.657	0.800	1.112	**0.758**
3	0.356g	0.334	0.997	1.556	2.097	**0.722**
4	0.362g	0.309	0.351	0.496	0.822	**0.494**

Table (4): Percent of drug release sample 2.

Percent of drug release	Conc. (mg)\5ml	Conc.(Mg). \500ml	Cumulative concentration	Conc. (Mg)\5ml	Dilution factor	Conc. (Mg)	Abs.	Time (min)
6.8	17	17000	170	170	34	3.4	0.3	10
20.2	50.5	50500	505	335	67	6.7	0.6	15
41	102.5	102500	1025	520	104	10.4	0.9	20
71	177.5	177500	1775	750	150	15	1.3	30

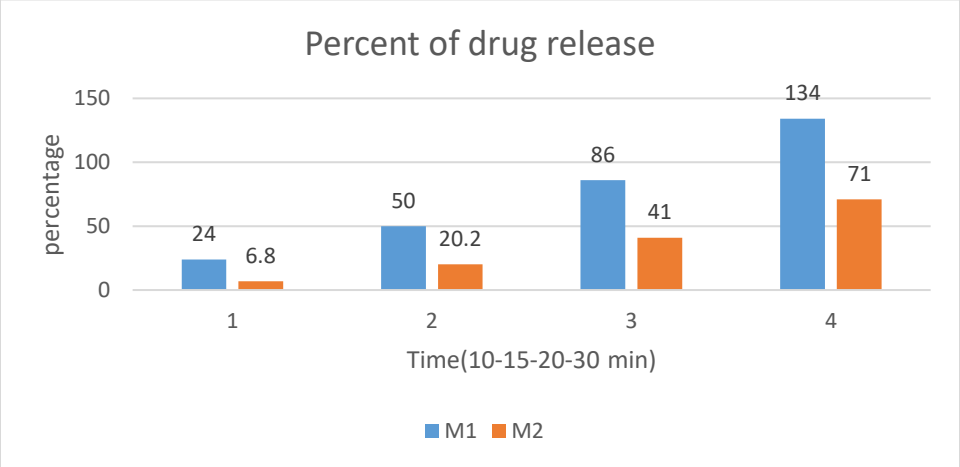


Figure 3: percent of metronidazole release

Discussion

According to IP the acceptable percent of metronidazole release was more than 85% [8]. In this study the vitro dissolution experiment subsequently completed with two different expiration date metronidazole tablets, that have the same strength, the release rate of valid drug was recorded through 30 minutes as 24,50,86,134 respectively (table 1). The highest percentage 134% was listed after 30 min (table 2). According to IP this drug has acceptable dissolution rate and excepted good bioavailability. Our results were compatible with many previous studies.

In contrast, the expired Metronidazole tablet listed 71% percent of drug release as the highest rate at 30 min (table3 and 4).

This percent is less than lower limit of drug release and reflect poor bioavailability. Although many researches explained that drugs stored under optimal conditions, retain 90% of their potency for at least five years after the labeled expiration date, and sometimes longer [3,9,10]. This study showed deterioration in percent of released drug after one year from expiration date. Hence these results may be coming from many factors, such as inappropriate storing conditions.

Conclusion

In conclusion, Dissolution test was applied on both valid and expired metronidazole tablet. This work found that the expired tablet exhibited less than the acceptable limit (71% percent of drug release as the highest rate at 30 min) and was failed. whereas the valid one appeared in the acceptable range and showed more than 85% drug release within 30 minutes. This study suggested that the expired tablet is not equivalent or similar to valid tablet and recommended to use the valid one to give the therapeutic effect.

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Frequency Of Caffeine Consumption in Different Beverages Among Population in Derna City – Libya

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Abstract

A cross-sectional study was carried out in Derna-Libya to study the frequency of caffeine consumption in caffeine beverages among different age groups. **Material & Methods**: The sample included 267 participants with mean age 30.10±13.11 ranged from 18-75 years. Data was collected from participants by questionnaires administered by the researcher then analyzing by using SPSS version 24. **Results:** revealed concerning to frequency of caffeine consumption among study population The most common drink daily was Coffee 207(75) follow by Tea (red and green) 162(58.7%) soft drink 72(26.1) while 28(7.2) of participants consumed energy drink every day. Furthermore, more males consumed coffee and tea than females whereas 108(83.1%), 99(54.1%) respectively in males and females. 83(63.8%), 79(54.1%) Additionally, more males 34 (26.2%) consumed energy drink than females 14(9.6%) while Soft drink consumed by female 87(59.6%) slightly higher than males 78(60.0%).In addition Over half (77.0%) of participants who drink coffee were healthy weight and approximately half of participants (55.8%) who drink soft drink were obese and (78.8%)who drink energy drink were obese. Potential adverse effects of caffeine on human health were investigated effects of soft drinks and energy drinks on body mass index. **Conclusion**: It may be a key contributor to the epidemic of overweight and obesity. Energy drink appear to provide the consumer with a blood glucose increase that may stimulate an insulin response and enhance the glucose pool in body cells Furthermore, Stress and coffee is the extrinsic factor that can cause gastritis. The discussion whether caffeine beverages can be claimed as an actual functional food is ongoing and there is not enough long-term evidence that caffeine beverages can prevent disease. Therefore, caffeine consumption for health reasons requires further scientific evidence before being recommended and promoted.

Keywords: Caffeine beverages, Socio-demographic factor, BMI, Derna.

Introduction

Caffeine is the psychoactive substance most widely consumed in the world, it is found not only in coffee but also in tea, carbonated beverages or soft drinks, chocolate, and a wide variety of medications, including appetite suppressants, diuretics, analgesics, and decongestants (1). Caffeine, a substance that belongs to a group of compounds called methylxanthines, is one of the compounds with known biological activity. According to preparation techniques, the content of caffeine varies widely in different foods and beverages (2).Caffeine is often consumed just after waking up to increase alertness and fight sleep inertia (reduced motor dexterity and a subjective feeling of grogginess immediately following an abrupt awakening) which may interfere with the

ability to perform mental or physical tasks (3). Caffeine has both harmful and favorable health effects on the human body, such as anxiety, insomnia, tachycardia, irritability, and other cardiovascular disease (CVD) (4).The health effects of caffeine depend largely on the dosage used, and it has been established that moderate consumption of coffee is associated with favorable health effects and behaviors (5). In addition to stimulating the central nervous system, caffeine exerts positive effects in the body, often in association with other substances, contributing to prevention of several chronic diseases (6). The recommended portion for favorable and safe health effects of caffeine ranges between 300 and 400 mg/day of caffeine which is equivalent to 3–4 cups/day(7). The consumption of coffee is often associated with unhealthy eating behaviors leading to adverse health effects (8). It has been reported that university students might be at a particularly high risk of negative effects due to the excessive intake of caffeine (9). Children and adolescents should also limit daily caffeine consumption. It results from the influence of caffeine on the central nervous system in the period of rapid growth and the final stage of brain development, calcium balance and sleep duration (10). However, most studies have focused on behavioral effects In general, caffeine doses less than 3.0 mg/kg of body weight have not resulted in any adverse effects on children in controlled clinical trials (11).

Methodology

Study Design:

A cross-sectional and descriptive design was used to conduct the study.

Study Setting:

The random sampling technique was used to choose different places in Dena –Libya

Target Population:

The total sample included 267 participants ranged from 18-75 years in period between 20 /06/2021 up to 20 /08/2021

Sampling Design:

A total of were measured for height and weight

After the measuring, were asked to complete a questionnaire,

Data was collected from participants by questionnaires administered by the researcher. Information on the questionnaire included anthropometric measurements (weight, height) taken at the same time. And socio-demographic characteristics such as age, occupation and educational status and medical factors.

Anthropometric Measurements

Height and weight of each women were measured according to the methods described below .women were weighed on personal Seca scales Portable digital scales (brand: Taurus; model: Level-MS/ 8608, Oliana, Spain). Weight was recorded to the nearest 0.1 kg. Height was measured using a stadiometer attached to scales to the nearest 0.5 cm. Weight and height were measured with the women barefooted and lightly clothed.

Take high and weight

Weight Measuring Procedures

• Scale is set at zero reading.
• Scale is set on firm surface, preferably uncarpeted floor. Student removes shoes and heavy outer clothing such as sweater, jacket, vest and empties pockets.
• women steps on center of the platform, with back toward the scale, both feet on platform, and stands still.
• Read weight value to nearest ¼ pound or 0.1 (1/10) kilogram
• Record weight immediately on data form before women gets off scale
Height Measuring Procedure
• removes shoes.
• removes hair ornaments, buns, braids to extent possible.
• stands on footplate portion with back against stadiometer rule (cut out feet can be placed in position to assist the student).
• Bring legs together, contact at some point (whatever touches first).
• Knees not bent, arms at sides, shoulders relaxed, feet flat on the floor.
• Back of body touches/has contact with stadiometer at some point.
• Body in straight line (mid-axillary line parallel to stadiometer)
• Head in appropriate position – check Frankfort plane
• Lower headpiece snugly to crown of head with sufficient pressure to press hair.
Read value at eye level.
• Measure to nearest 0.1 (1/10) cm or 1/8 inch (repeat measurements should agree within .1 cm or ¼ inch.)
• Record value immediately on data form (11)
BMI was calculated by divided the weight, measured in kilograms, by the square of height, measured in meter (kg/m²). The formula is: BMI (kg/m2) = weight (kg) / [Height (m)]2.

Result

The soic-demographic characteristics of the study participants are shown in Table (2) .The total sample included 276 participants with mean age 30.10±13.11 ranged from 18-75 years. Of these participants 130(47.1%) were male and 146(52.9%) were female. Moreover, According to age group 34 % of participants were in the age group 21-30 years and most of them119 (34.1%) were students. Over half of participants 207(75%) had education was university level and most of them 93 (33.7%) had monthly income between 600- 1000DL.Furthermore, most of participants were single 168(60.9%) and non-smoker 203 (73.6%).

Table 2: Socio-Demographic Characteristics of the Study Participants (N=276)

Variables	Frequency	%
Age		
≤20	87	31.5
21-30	95	34.4
31-40	42	15.2
41-50	23	8.3
51≤	29	10.5

Gender		
Male	130	47.1
Female	146	52.9
level of education		
Preparatory	16	5.8
Secondary	39	14.1
Universal	207	75.0
Postgraduate	14	5.1
marital status		
single	168	60.9
married	88	31.9
divorce	10	3.6
widow	10	3.6
monthly Income		
500 LD	61	22.1
600 -1000 LD	93	33.7
High than 1000 LD	22	8.00
No income	100	36.2
Occupation		
Student	119	34.1
Teacher	45	16.3
physician	17	6.2
Employee	50	18.1
Retired	5	1.8
Business	34	12.3
Not working	6	2.2
Address		
SHAIHA	80	29.0
BABTOUBRAK	89	32.2
LABLAD	69	25.0
ALSAHAL	38	13.8
Smoking		
Sometimes	8	2.9
yes	65	23.6
No	203	73.6
Doing Exercise		
Sometimes	52	18.8
Rarely	30	10.9
Yes	104	37.7
No	90	32.6

Data presented in table 3 shows the mean weight of participants 66.39±15.807. The mean height of participants 162.66±12.835.

The mean cups of red tea drink a day was 2.97±1.640. The mean cups of green tea drink a day was 2.73±1.641. The mean cups of soft drink a day was 2.54±1.243.

The maximum cups of tea and coffee were 5 cups while 4 cups of soft drink and energy drink per day, on the other hand, the minimum for all beverages were 1 cup per day.

Table 3: Descriptive Statistics of socio-demographic characteristics and caffeine intake by cups of the study participants

	Min	Max	Mean	Std.Deviation
Age	18	75	30.10	13.102
Weight	35	125	66.39	15.807
Height	120	197	162.66	12.835
how many cups do you drink a day of red tea	1	5	2.97	1.640
how many cups of Green tea do you drink a day	1	5	2.73	1.641
how many do you drink a day of soft drink	1	4	2.54	1.243
how many do you drink a day of energy drink	1	4	3.62	0.888
how many cups do you drink a day of coffee	1	5	3.20	1.413
BMI	14	125	25.78	9.207

Contributing factors to caffeine consumption varied among the study population. Reported reasons for caffeine consumption are presented in table (4).over half of participants were consume of caffeinated beverages without any specific reason. Furthermore, A large percent of participants claimed that they consume caffeinated beverage because to help focus and drink coffee to get rid of headache.

Table 4: The purpose may you consume caffeinated beverage

	No	%
Stay up late	34	12.3
To help focus and focus	54	19.56
To be more alert	19	6.88
Be more productive	11	3.98
To improve physical performance	5	1.81
Drink coffee to get rid of headache	45	16.30
There is no specific purpose	126	54.6

Concerning to frequency of caffeine consumption among the study population The data presented in table 5 showed The most common daily drink was Coffee 207(75) followed by Tea (red and green) 162(58.7%) soft drink 72(26.1) while 28(7.2) of participants consumed energy drink every day.

Table 5: Frequency of Caffeine consumption

Caffeine consumption pattern Type	Daily No(%)	Monthly No(%)	Weekly No(%)
Soft drink	72(26.1)	89(32.2)	9(3.3)
Energy drink	28(7.2)	16(5.8)	12(4.3)
Red Tea	29(10.5)	0(0.0)	0(0.0)
Green Tea	42(15.2)	0(0.0)	0(0.0)
Tea (red and green)	162(58.7)	0(0.0)	0(0.0)
Coffee	207(75)	0(0.0)	0(0.0)

Data presented in Table 6 showed the distribution of participants consuming caffeine-containing drinks according to their caffeine consumption pattern and their gender .More males consumed coffee and tea than females whereas 108(83.1%), 99(54.1%) respectively in males and 83(63.8%), 79(54.1%)) respectively in females. Additionally, more males 34 (26.2%) consumed energy drink than females 14(9.6%) while Soft drink consumed by female 87(59.6%) slightly higher than males 78(60.0%).A statistically significant difference could be noticed between participants, Coffee, and Energy drink.

Table 6: Distribution of participants consuming caffeine containing drinks according to their caffeine consumption pattern and their gender

Caffeine consumption pattern	No(%)	Gender		X^2	P
Type		Male	Female		
Coffee					
Sometimes	33(12.0)	13(10.0)	20(13.7)		
Rarely	12(4.3)	4(3.1)	8(5.5)	10.48	0.0150
Yes	207(75.0)	108(83.1)	99(67.8)		
No	24(8.7)	5(3.8)	19(13.0)		
Tea					
Red tea	29(10.5)	13(10.0)	16(11.0)		
Green Tea	42(15.2)	20(15.4)	22(15.1)	4.826	0.1850
Both(Green & Red)	162(58.7)	83 (63.8)	79(54.1)		
Nothing	43(15.6)	14(10.8)	29(19.9)		
Soft drink					
Sometimes	46(16.7)	23(17.7)	23(15.8)		
Rarely	27(9.8)	13(10.0)	14(9.6)	0.550	0.9080
Yes	165(59.8)	78(60.0)	87(59.6)		
No	38(13.8)	16(12.3)	22(15.1)		
Energy drink					
Sometimes	25(9.1)	18(13.8)	7(4.8)		
Rarely	22(8.0)	16(12.3)	6(4.1)	34.85	0.0000
Yes	48(17.4)	34(26.2)			

No	181(65.6)	62(47.7)	14(9.6) 119(81.5)		

Data presented in table 7 showed distribution of participants consuming caffeine-containing drinks according to their caffeine consumption pattern and their age. the proportion of consumption coffee, tea , soft drink, energy drink were 84.2%, 56.8% , 66.7% , 21.1% respectively in the Age group of 21-30 years consumed more than other age groups.
However, there is no statistically significant difference could be noticed between age of participants and tea, soft drink and energy drink. Nevertheless, there is statistically significant difference between age of participants and coffee.

Table 7: Distribution of participants consuming caffeine-containing drinks according to their caffeine consumption pattern and their age

Caffeine consumption pattern	**No(%)**	**Age (Years)**					**X^2**	***P***
Type		**≤20**	**21-30**	**31-40**	**41-50**	**51≤**		
Coffee								
Sometimes	33(12.0)	15(17.2)	7(7.4)	6(14.3)	2(8.7)	3(10.3)		
Rarely	12(4.3)	4(4.6)	2(2.1)	1(2.4)	4(17.4)	1(3.4)	21.30	0.0460
Yes	207(75.0)	57(65.5)	80(84.2)	33(78.6)	16(69.6)	21(72.4)		
No	24(8.7)	(12.6)11	6(6.3)	2(4.8)	1(4.3)	4(13.8)		
Tea								
Red tea	29(10.5)	12(13.8)	9(9.5)	4(9.5)	2(8.7)	2(6.9)		
Green Tea	42(15.2)	10(11.5)	17(17.9)	6(14.3)	2(8.7)	7(24.1)	11.07	0.5220
Both(Green & Red)	162(58.7)	49(56.3)	54 (73.9)	23(54.8)	17 (56.8	19(65.5)		
Nothing	43(15.6)	16(18.4)	15(15.8)	9(21.4)	2(8.7)	1(3.4)		
Fuzzy drink								
Sometimes	46(12.6)	11(16.8)	16(19.0)	8(17.4)	4(24.1)	7(16.7)		
Rarely	27(9.8)	9(10.3)	8(8.4)	6(14.3)	1(4.3)	3(10.3)	11.30	0.5030
Yes	165(59.8)	58(66.7)	61(64.2)	20(47.6)	13(56.5)	13(44.8)		
No	38(13.8)	9(10.3)	10(10.5)	8(19.0)	5(21.7)	6(20.7)		
Energy drink								
Sometimes	25(9.1)	9(10.3)	12(12.6)	2(4.8)	1(4.3)	1(3.4)		
Rarely	22(8.0)	11(12.6)	6(6.3)	4(9.5)	0(0.0)	1(3.4)	18.97	0.0890
Yes	48(17.4)	18(20.7)	20(21.1)	6(14.3)	2(8.7)	2(6.9)		
No	181(65.6)	49(56.3)	57(60.0)	30(71.4)	20(87.0)	25(86.2)		

Data established in table 8 showed the relative between caffeine consumption and body weight .Over half (77.0%) of participants who drink coffee were healthy weight. In addition, approximately half of participants (55.8%) who drink soft drink were obese and more than half of participant (78.8%) who drink energy drink were obese

Table 8: Caffeine consumption pattern and BMI

Caffeine consumption pattern	BMI				X^2	P
Type	Underweight No(%)	Healthy weight No(%)	Overweight No(%)	Obesity No(%)		
Coffee						
Sometimes	3(13.6)	14(10.1)	7(11.1)	9(17.3)		
Rarely	2(9.1)	4(2.9)	2(3.2)	4(7.7)	7.74	0.56
Yes	15(68.2)	107(77.0)	3(4.8)	5(9.6)		
No	2(9.1)	14(10.1)	51(81.0)	34(65.4)		
Tea						
Red tea	3(13.6)	17(12.2)	4(6.3)	5(9.6)	17.12	0.05
Green Tea	2(9.1)	19(13.7)	16(25.4)	5(9.6)		
Both(Green & Red)	15(68.2)	75(54.0)	33(52.4)	39(75.0)		
Soft drink						
Sometimes	2(9.1)	24(17.3)	13(20.6)	7(13.5)	8.65	0.47
Rarely	1(4.5)	16(11.5)	5(7.9)	5(9.6)		
Yes	18(8.8)	82(52.0)	36(57.1)	29(55.8)		
No	1(4.5)	17(12.2)	9(14.3)	11(21.2)		
Energy drink						
Sometimes	1(4.5)	17(12.2)	2(3.2)	5 (9.6)		
Rarely	2 (9.1)	12(8.6)	7(11.1)	1(1.9)	14.38	0.11
Yes	7(31.8)	24(17.3)	12(19.0)	41(78.8)		
No	12(54.5)	86(61.9)	42(66.7)	5(9.6)		

As shown in (figure 3) over half 163 (59.1%) of participants suffering from chronic disease.

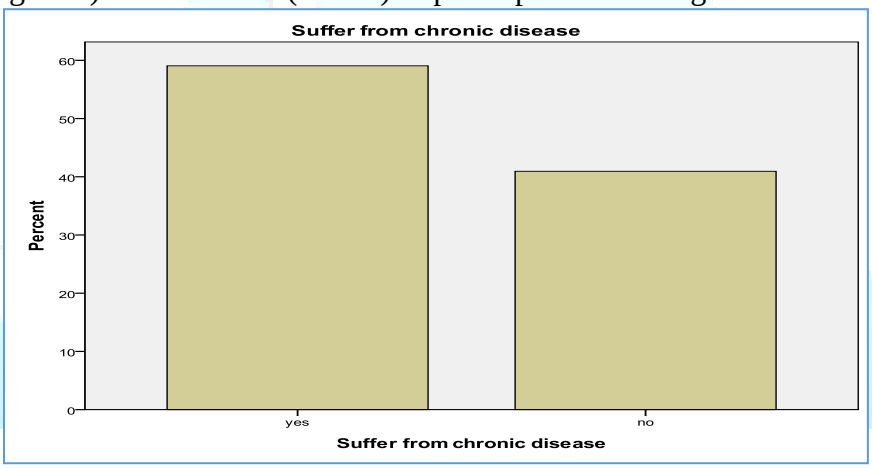

Figure 3: Chronic disease among participants

On the subject of caffeine consumption in different beverages and some disease the most common presented disease was UTI(24.4%). Followed by diabetes (12.3%), hypertension(6.88%), anemia

(5.43%) and gastritis (5.43%), on the other hand, 40.5% of participants didn't have any chronic diseases. as shown in table 9

Table 9: The most common diseases among participants

Common diseases	No	%
Urine tract infection	70	0.425
Diabetes	34	12.3
Hypertension	19	6.88
Anemia	15	5.43
Gastritis	15	5.43
Colitis	13	4.7
Gastric ulcer	11	3.98
Heart disease	9	3.26
Nervous colon	8	2.89
Lower blood pressure	6	2.17
Osteoporosis	5	1.81
Lung disease	5	1.81
Kidney disease	4	1.45
No	112	40.58

Discussion

Over the past decade, caffeine consumption has grown in popularity, especially among adolescents and adults who attend university or work. This study provides an insight on the general behavior towards caffeine intake and the consumption of caffeinated drinks.

This study revealed that the maximum cups of tea and coffee were 5 cups while 4 cups of soft drink and energy drink per day. Study by Higdon, J. V., & Frei, B. (2006) which said there is little evidence of health risks and some evidence of health benefits. However, some groups, including people with hypertension, children, adolescents, and the elderly, may be more vulnerable to the adverse effects of caffeine. For adults consuming moderate amounts of coffee (3-4 cups/d providing 300-400 mg/d of caffeine)(21) .

Based on the data reviewed by Nawrot, P., Jordan, S., Eastwood, J., Rotstein, J., Hugenholtz, A., & Feeley, M. (2003).it is concluded that for the healthy adult population, moderate daily caffeine intake at a dose level up to 400 mg day(-1) (equivalent to 6 mg kg(-1) body weight day(-1) in a 65-kg person) is not associated with adverse effects such as general toxicity, cardiovascular effects, effects on bone status and calcium balance (5). Coffee is one of the most widely consumed beverages and most internationally traded commodities in the world .Data In our study showed the most common caffeinated beverages among participant was Coffee 207(75) follow by Tea (red and green). Coffee and tea are both drunk in most countries. Coffee is the preferred drink in Europe and the Americas, tea elsewhere. Until the early eighteenth century coffee production and consumption was confined to the Islamic world, tea production to East Asia. European traders altered this pattern dramatically (22). In regards to gender difference in caffeine intake, males tend to have higher caffeine consumption than females. In our study coffee, tea and energy drink

consumption was more prevalent in males than females whereas the proportion of coffee consumption specifically was higher among males (83.1%) than females (67.8%) study conducted in Israel by Tifferet, S., Shani, N., & Cohen, H. (2013). Supported this finding (23) .
Another study conducted in Dammam City, Saudi Arabia, by A. O. Musaiger and N. Zagzoog concluded that male adolescents tend to consume energy drinks twice as much as female adolescents do (24). This concurred with the findings from this study population that showed energy drink consumption was more prevalent in males (26.2%) than females (9.1%).
The consumption of caffeine depends on age and, therefore, main dietary caffeine sources may differ as age advances (25) .Data in our study showed The proportion of consumption coffee, tea, soft drink and energy drink were 84.2%, 73.9% , 66.7% , 21.1% respectively in the Age group of 21-30 years more than other age groups this findings agree with the findings Alfawaz, H. A., Khan, N., Yakout, S. M., Khattak, M. N., Alsaikhan, A. A., Almousa, A. A., ... & Al-Daghri, N. M. (2020) Around 70% of United States (US) children and adolescents (aged <22 years) consume some form of caffeine on any given day, and approximately 89% of adults consume caffeinated beverages on a daily basis) May be the metabolic clearance of several substances, including caffeine, in a group of 55- to 70-year-olds found it takes seniors 33% longer to metabolize caffeine compared to younger adults (26). Reasons for caffeine consumption that were pointed out in this study were coherent with other similar studies.
The findings indicated that the main reason for caffeine consumption among participants was for focus which was similar to study by Pasman, W. J., Boessen, R., Donner, Y., Clabbers, N., & Boorsma, A. (2017). which said that caffeine may enhance memory performance particularly when tedious repetitive tasks are involved (27). This might 34 % of participants were in the age group 21-30 years and most of them 119 (34.1%) were students which need to focus on studying for a long period of time. Additionally , Huge percent of participants requested that they drink caffeinated beverage especially coffee can provide relief for a headache Which was similar to study by Derry, C. J., Derry, S., & Moore, R. A. (2014). Which said Caffeine has vasoconstrictive properties, meaning that blood vessels narrow to restrict blood flow, thereby alleviating the pain. In addition, when caffeine is taken in combination with pain medicines, such as aspirin, ibuprofen or acetaminophen, it increases the absorption and strength of the medication to provide faster relief. (28) Regarding to effects of caffeine intake on weight loss Data presented in our study found over half (77.0%) of participants who drink coffee were healthy weight which disagreed with another finding by Greenberg JA, Axen KV, Schnoll R, Boozer CN. (2005) (29) which said High caffeine intake was associated with weight loss through thermogenesis and fat oxidation and with suppressed leptin in women. There is also evidence that coffee consumers have a lower body mass index (BMI) compared with individuals who do not consume coffee and that there is a negative association between coffee consumption and body weight gain in the long term may be consumption of caffeinated beverages might support weight loss maintenance. Even though the difference between-groups was relatively it could over longer periods of time be important for weight loss maintenanc (30).Further studies should investigate possible mechanisms using prospective designs. Furthermore, Our result demonstrated half of the participants (55.8%) who drink soft drink were obese which was similar to study by Malik, V. S., Schulze, M. B., & Hu, F. B (2006) which showed women who increased their consumption of soda from ≤ 1 serving/wk to

≥ 1 serving/d had significantly ($P < 0.001$) larger increases in weight and BMI than did women who maintained a low or a high (≥1/wk) intake or substantially reduced their intake. However, weight change in the women who maintained a high consumption of soda. Consumption of sugar-sweetened beverages (SSBs), particularly soft drinks, may be a key contributor to the epidemic of overweight and obesity, by virtue of these beverages' high added sugar content, low satiety, and incomplete compensation for total energy (31).

In concerning to energy drink our study showed over half of participates (78.8%) who drink energy drink were obese which was agree with finding by M'Touguy, , I. (2016) using a questionnaire exploring the consumption of energy drinks. Which shows 195 of surveyed students consuming energy drinks, of which 22.0% are girls and 78.0% are boys, of which 16.5% were overweight, 5.5% moderate and 2% severe obesity . The calories in sugar-sweetened drinks like energy drinks often have little nutritional value. Additionally, sugar-sweetened drinks often do little to curb your appetite, meaning you may still be hungry after drinking one. This can lead you to consume more calories and ultimately gain weight (32) Another important outcome of the analysis performed in the present study was caffeine intake in different beverages had a relationship to some disease .The most common presented disease in our study among participants was UTI (24.4%). Followed by diabetes (12.3%), hypertension (6.88%), and gastritis (5.43%)

Coffee and caffeine intake were associated with infections of the urinary tract .Study by Maserejian, N. N., Wager, C. G., Giovannucci, E. L., Curto, T. M., McVary, K. T., & McKinlay, J. B. (2013) that included 4,145 adults a found associations between coffee and soda intake and infections of lower urinary tract. Increases in coffee consumption were associated with progression of urgency symptoms. Women, who drank more soda at follow-up particularly caffeinated diet soda or increased their soda intake over time were more likely to report a variety of infections of the lower urinary tract or progression of symptoms. Men who consumed more than 2 cups/day of coffee were more likely to develop progression in lower urinary tract infection (33).

On the topic of diabetes and caffeinated beverages .Energy drink appear to provide the consumer with a blood glucose increase that may stimulate an insulin response and enhance the glucose pool in body cells (34) . Furthermore, some studies have proved that caffeine may play an important role in the regulation of insulin release and related metabolic disorders. González-Domínguez, R., Mateos, R. M., Lechuga-Sancho, A. M., González-Cortés, J. J., Corrales-Cuevas, M., Rojas-Cots, J. A., & Schwarz, M. (2017). showed that healthy young adults who consumed sugar-sweetened drinks with caffeine had a significant increase in blood glucose and insulin levels after 20–30 min. The authors concluded that adverse effects may be the result of synergic effect of caffeine and sugar (35). On the other hand coffee and tea consumption are inversely associated with the development of metabolic syndrome and the High caffeine intake has also been associated with risk of type 2 diabetes (36).

Regarding to relation between caffeine beverages and blood pressure study by Costa, B.M.; Hayley, A.; Miller, P(2014) displayed that excessive caffeine intake induces palpitations, and increases blood pressure, as well as other discomforts (anxiety, insomnia, vomiting, irritability and nervousness (37). Another study by Savoca, M. R., Evans, C. D., Wilson, M. E., Harshfield, G. A., & Ludwig, D. A. (2004). For adolescents, especially African American adolescents presented caffeine intake may increase blood pressure and thereby increase the risk of hypertension.

Alternatively, caffeinated drink consumption may be a marker for dietary and lifestyle practices that together influence blood pressure. Additional research is need owing to rising rates of adolescent hypertension and soft drink consumption (38). Likewise, study by Nowak, D., Gośliński, M., & Nowatkowska, K. (2018) showed Consumption of energy drinks contributed to increased blood pressure in healthy young people (39). Concerning to gastritis and caffeine beverages in a study by Selviana, B. Y. (2015). Showed the incidence of gastritis in some area in Indonesia is quite high.It reach the prevalence of 274,396 cases of 238,452,952 people. Several risk factors of gastritis is the use of aspirin or Helicobacter pilory infection, a habit of drinking coffee smoking and stress. Stress and coffee is the extrinsic factor that can cause gastritis. Caffeine contained in coffee can stimulate the production of stomach acid which could lead to gastritis (40).
In conclusion, the present study showed that Caffeine is widely consumed at different levels by most segments of the population. The most popular caffeine beverage was coffee that was drink by males than females. Potential adverse effects of caffeine on human health were investigated: effects of soft drinks and energy drinks on body mass index. It may be a key contributor to the epidemic of overweight and obesity, by virtue of these beverages' high added sugar content, low satiety, and incomplete compensation for total energy. The calories in sugar-sweetened drinks like energy drinks often have little nutritional value. Additionally, sugar-sweetened drinks often do little to curb your appetite, meaning you may still be hungry after drinking one. This can lead you to consume more calories and ultimately gain weight. Data have also shown that caffeine beverages and coffee were associated with infections of the urinary tract Increases in coffee consumption were associated with progression of urgency symptoms recommended that caffeine intake for people who have urinary tract infection should be decrease.
Energy drink appear to provide the consumer with a blood glucose increase that may stimulate an insulin response and enhance the glucose pool in body cells Furthermore, Stress and coffee is the extrinsic factor that can cause gastritis. Caffeine contained in coffee can stimulate the production of stomach acid that could lead to gastritis. The discussion whether caffeine beverages can be claimed as an actual functional food is ongoing and there is not enough long-term evidence that caffeine beverages can prevent disease. Therefore, caffeine consumption for health reasons requires further scientific evidence before being recommended and promoted. Future research should focus on studying long-term caffeine intake and effect performance prospectively in a longitudinal study and it is possible to relate caffeine consumption to human health.

Recommendations
Coffee, tea and soft drinks are the most important caffeine sources. Across all age groups, energy drinks contribute little to total caffeine intake. The highest potential for reducing daily caffeine intake is by limiting coffee consumption, and in some countries and age groups, by reducing tea and soft drink consumption. Our data support recommendations to limit caffeinated beverage intake for LUTS. Further clinical research is warranted on sodas containing various artificial flavorings, sweeteners, and preservatives, to determine their precise role in bladder sensations and urological function.

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Assessment of Groundwater and Soil Quality in The Vicinity of Benghazi City

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Abstract

The contamination of water and soil by chemicals can have serious repercussions on human and environmental. The present study was conducted at different sites in the vicinity of the city of Benghazi of Libya. Forty (40) ground water samples were collected from different sites in the vicinity of Benghazi city and analyzed for various parameters of physical and chemical quality to assess heavy metal contamination by Cu, Fe, Zn, and Pb. Forty (40) soil samples were collected at a depth of (0-20) cm and their quality assessed. For groundwater samples each parameter was compared with World Health Organization (WHO) and Libyan standards. Results of analysis showed that the groundwater of some samples were within the limits of WHO and Libyan Standards and some do not. For soil samples each parameter was compared with World Food and Agriculture Organization (FAO). Results of analysis showed that the soil of some samples in Abo-atni Benina and Sedi-farag were within the limits of FAO Standards. Some elements showed high concentrations (Ec, Mg^{2+}, Cl^{-}). Sodium adsorption ratio (SAR) and Exchangeable Sodium Percentage (ESP) have been used for measure of the sodicity of soil. The results showed that all regions are very strongly sodic.

Keywords: Groundwater, soil analyses, heavy metals.

1. Introduction

The contamination of water and soil by chemicals can have serious repercussions on human health and safety, where human food and drink is directly affected, and this pollution may be due to the use of pesticides for agricultural purposes or soil pollution with factory waste and car exhausts. Indirectly, when mixed with water contaminated with chemicals [1].

Groundwater pollution by heavy metals is one of the serious environmental problems. Some of the heavy metals considered as micronutrients can cause adverse effects to human health when their contents exceed the permissible limit in drinking water. Heavy metals occurrence in waters from natural or anthropogenic sources. Considering that water pollution has direct implications on the aquatic life and the human health.[2] [3].

For human body, heavy metals are required in small amounts, but can also be toxic in large doses. They constitute one important group of environmentally hazardous substances if present**.**

Heavy metals can find their way to soil due to human activities, by using agriculture chemicals such as herbicides, fungicides and insecticides, or use of fertilizers and

contaminated water. Characteristically, also the anions have its important role in drinking water; results also showed affecting the human health [4].
Soil pollution leads to a decline in crop production, and some harmful chemicals affect the plant and its natural composition, resulting in a decrease in its nutritional value. Where the impact of soil pollution on the plant is not confined to the plant, but also extends to humans and animals. The contamination of food crops with harmful chemicals leads to the infection of human beings due to the consumption of contaminated food, and vegetable or animal.[5] . Ground water quality can be contaminated and become unsafe for drinking and domestic uses as a result of lack of proper amenities in many societies, which can lead to the contamination of ground water with different bacteria including pathogens, especially in the high-density residential areas where sewage disposal practices are not proper. Hydrochemical evaluation of groundwater systems is usually based on the availability of a large amount of information concerning groundwater chemistry [6].
Since water and soil quality data are necessary to protect human health and the environment, in this study the quality of groundwater and soil was assessed in five areas of the city of Benghazi by monitoring the physical and chemical analysis of a number of parameters and heavy elements. This study will also help decision makers to take the necessary measures to maintain on the quality and improvement of groundwater and soil in the region.

2. Experimental

2.1 Study area:

About 40 samples of ground water were collected from pump wells and 40 soil samples of five places in Benghazi plain, The location of sampling points is shown in Figure 1.

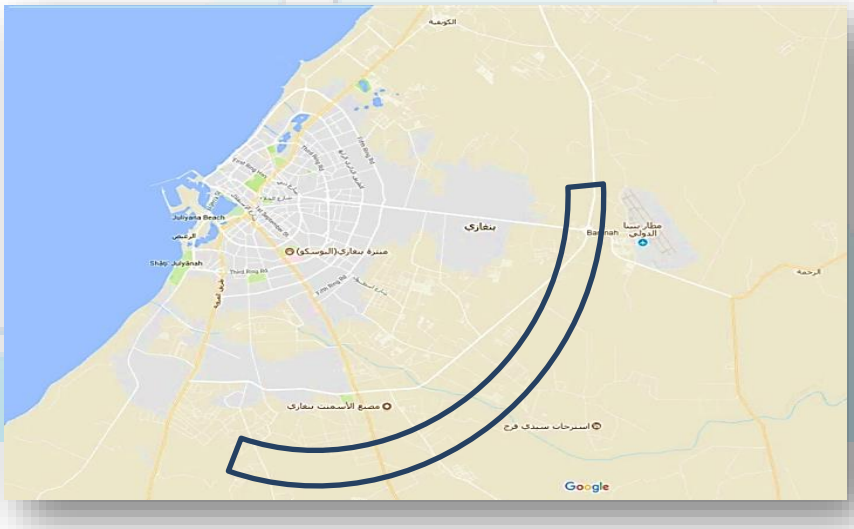

Figure (1): The area of study

2.2 Physical and Chemical Analysis

2.2.1 Water samples

The temperature of the samples was measured in the field itself at the time of sample collection using mercury thermometer. Also, Measurements of physical parameters such as pH and electrical conductivity (EC) were conducted in the field (pH meter Model 3150 JENWAY company) and conductivity meter (Conductivity meter InoLab73). The Chemical Analysis were conducted using standard procedures recommended by American Public Health Association [7]. Total dissolved solid was determined by gravimetric method and hardness was determined by EDTA titrimetric method. Analysis of iron and copper ions were carried out using DR 2800 Spectrophotometer, also lead and zinc were determined using the Atomic Absorption Spectrometer

2.2.2 soil samples

forty soil samples were also collected in the same field campaign from the top soil to a depth of 20 cm in areas with various land uses and salinities (Fig. 1)., ground in a mortar and pestle and then sieved, after which 50 g aliquots of soil were mixed with 100 ml of distilled water and shaken for 10 min to dissolve the salts. The mixtures were then left overnight so that the soil would be fully imbibed in the water and soluble salts would dissolve completely. The EC was then measured in soil saturated paste extracts (1:1 by weight) prepared as described by using the electrical conductivity method [8] and described in USDA (Handbook 60,1954). The soil pH was measured in a 1:1 soil/distilled water suspension by [10] described in [9] and measured by pH meter as described by McLean (1982). Buffer solutions of pH 4, 7, and 10 have been used to perform calibration before measurement.

Total hardness (Ca^{2+} and Mg^{+2}) Total hardness was estimated in soil suspension using the method of titration by EDTA as stated in [11]. From it the calcium and magnesium concentrations were calculated .As for the concentrations of nitrate, sulfate, nitrite, and nitrogen

In the soil it was measured using by spectrophotometer at wavelength of 420 nm [12]. while Potassium and Sodium was measured for 1: 1 (soil: water) using a flame photometer and according to [11].

3. Results and discussion

3.1Water results

Table1 :Table of sample water results for all regions

Parameters / Regions	Tempc°	pH	EC µ/sc	TDS mg/L	Total.H mg/l	Pb ppm	Fe ppm	Cu ppm	Zn ppm
Abo-atni	23.67	7.54	1720.44	895.11	429.27	19.84	0.057	0.268	

									3.374
Benina	21.25	7.87	1746.12	896.25	482.42	28.57	0.09	0.885	4.69
Sedi-faraj	23.56	7.58	1962.66	1030	474.20	29.90	0.314	0.918	5.221
Al-talhaia	23.83	7.64	5786.66	3008.3	876.62	32.76	0.2	1.251	4.073
Al-hawari	25.25	7.72	5346.25	2768.1	827.74	34.10	0.08	2.441	6.047

3.2 Soil results

Table 2: Table of soil sample results for all regions all regions

	PH	Ec	TDS	Salinity	Total.Alk	chloride	Sulfate	sodium	potassium	nitrate	nitrite	nitrogen	magnesium	calcium
Abo-atni	7.56	3.427	2227.69	2.22	14.88	920	195.75	354.87	33.61	182.22	36.07	2.57	316.11	153.02
Benina	7.68	2.4	1560.65	1.55	17.23	502.5	233.92	383.31	49.27	131.80	27.13	1.85	50.81	252.21
Sedi-faraj	7.62	1.118	722.06	0.72	31.08	160	211.2	184.73	13.64	53.95	8.08	0.57	5.64	88.52
Al-talhaia	7.96	3.961	7489.82	7.48	126.08	2784	506.84	1045.38	40.50	5	63.61	4.54	253.40	398.75
Al-hawari	8.09	2.294	1681.30	1.67	90.12	627	134.81	357.61	20.52	38.94	7.48	0.53	305.18	115.35

3.2.1 Physical and Chemical Analysis

The direct measurements of pH and EC, in addition to the total dissolved solids and turbidity for each sample, were conducted. Also the analysis of chloride; nitrates; sulfate; sodium and potassium ions, as well as the total hardness; total alkalinity for each sample. The water quality analyses included all major anions, cations, nitrate, sulphate and ammonia.

The allover groundwater temperature pH and values of the study area are ranging from 21.25°C to 25.25°C , 7.87 to 7.54 and , respectively. The values at all observed regions were within Libyan and WHO standards, while electrical conductivity (EC)range between 1720.4 to 5786.66 µS cm-1.Where the areas of Al-talhaia and Al-hawari were larger than

the limits allowed by the World Health Organization and Libyan standards .Total dissolved solids (TDS) in the study area vary between 895.11 to 3008.33 mg/l Which exceeded their values in the same regions.as shown in (table1)

Iron, copper, lead, and zinc have been determined in water samples. Iron in all samples regions were recorded from 0.0566 to 0.314mg/l. region which was within Libyan and WHO standards except Sedi-faraj

Copper in Al-hawari regions which was more than Libyan and WHO standards limits < 2 as shown in (Fig 3.22). It may be the cause of the high concentration of copper in the Al-hawari because the cement factory

Lead in all samples were more than Libyan and WHO standards limits <0.01 .Zinc was also more than Libyan and WHO standards limits < 3ppm in all smples. The high concentration of zinc ion, especially in Al-hawari region, is often caused by the presence of a cement plant in the region.

3.1.1 Contamination factor (Cf) :

The contamination factor can be calculated from the following relation.

CF= CmSample /Cm Background……

Where Cm sample and Cm background refers the measured concentrations of a pollutant and the average shale respectively. Table presents the Contamination factor (Cf) based on [13].

Table3.3: Contamination factor (Cf) based on Hakonson Classification

Contamination factor (Cf)	Classification
<1	Low Contamination factor
1-3	Moderate Contamination factor
3-6	Considerable Contamination factor
>6	Very high Contamination factor

Contamination factors of various metals in the ground water in sampled zones are presented in Table (3.4).

Table.3.4 Contamination factors for heavy metals ground water for each sampled zone

Metal / Zone	Pb	Fe	Cu	Zn
Abo-atni	0.693	0.625	0.177	0.619
Benina	0.998	0.951	0.173	0.719
Sadi-faraj	1.044	3.413	0.609	0.957
Al-talhaia	1.144	2.173	0.83	0.746
Al-hawari	1.191	0.869	1.619	1.109

Using the contamination factor categories previously described, zone Abo-atni and Benina suffered low contamination by all metals. On the other hand, zone Sedi-faraj displayed low contamination by Cu and Zn, moderate contamination by Pb and considerable contamination by Fe. While Al-talhaia show low contamination by Cu and Zn and, moderate by Pb and Fe. The last Al-hawari zone which showed moderate contamination by all metals except Fe.

3.1.2Pollution Load Index (PLI)

Pollution load index (PLI), for a particular site, has been evaluated following the method proposed by Tomilson [14]. This parameter is expressed as

PLI = (CF1 X CF2 X CF3 X ….X CFn) 1/n……

where, n is the number of metals (five in the present study) and Cf is the contamination factor.

The PLI provides simple but comparative means for assessing a site quality, where a value of PLI < 1 denote perfection; PLI = 1 present that only baseline levels of pollutants are present and PLI > 1 would indicate deterioration of site quality [16].

To effectively compare whether the four stations suffer contamination or not, the pollution load index, PLI, described in Equation 7, was used. The PLI is aimed at providing a measure of the degree of overall contamination at a sampling site. (Figure 2) shows results of the PLI for the four metals studied at these regions .

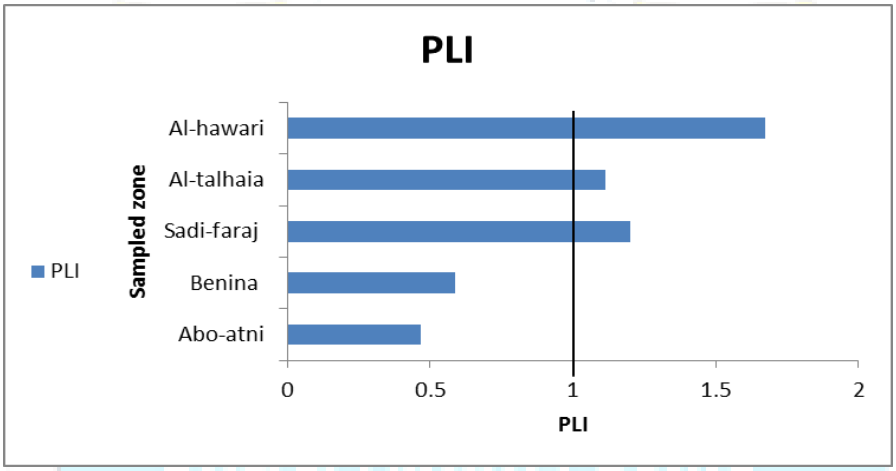

Fig. 2: Pollution load index, PLI for the four metals studied at the sites

Based on results presented in Figure3.25, the overall degree of contamination by the 4 metals is of the order Al-hawari > Sedi-faraj> Al-talhaia > Benina > Abo-atni. The regions Al-hawari, Sadi-faraj, Al-talhaia of show strong signs of contamination or degradation of site quality, while Benina and Abo-atni regions suggests perfection (or no overall pollution).

3.1.3 Geo accumulation index (Igeo)

A common approach to estimate the enrichment of metal concentrations above background or baseline concentrations is to calculate the geo accumulation index (Igeo) [15] .The method assesses the degree of metal pollution in terms of seven enrichment classes based on the increasing numerical values of the index. This index is calculated as follows:

Igeo = log2[Cm Sample / (1.5 X Cm Background)]

Where Cm is the concentration of the element in the enriched samples, and the Cm Background is the background or pristine value of the element. The factor 1.5 is introduced to minimize the effect of possible variations in the background values which may be attributed to lithological variations in the sediments. Therefore, if the concentration of element in a sample be five times greater than the concentration of it in the background the sample is extremely polluted. Muller proposed the descriptive classes as in the appendix C for increasing Igeo values. The results are shown in the following in Table (3.5).

Table (3.5):The result of geo accumulation indices for the sampling sites

Zone/ Metal	Zn	Cu	pb	Fe
Abo-atni	-1.27847	-3.07634	-1.11357	-1.26303
Benina	-1.06037	-3.109	-0.58749	-0.65731
Sedi-faraj	-0.64717	-1.2736	-0.39005	1.186096
Al-talhaia	-1.00619	-0.85356	-0.332	0.535332
Al-hawari	-0.42952	0.110239	-0.5217	-0.7866

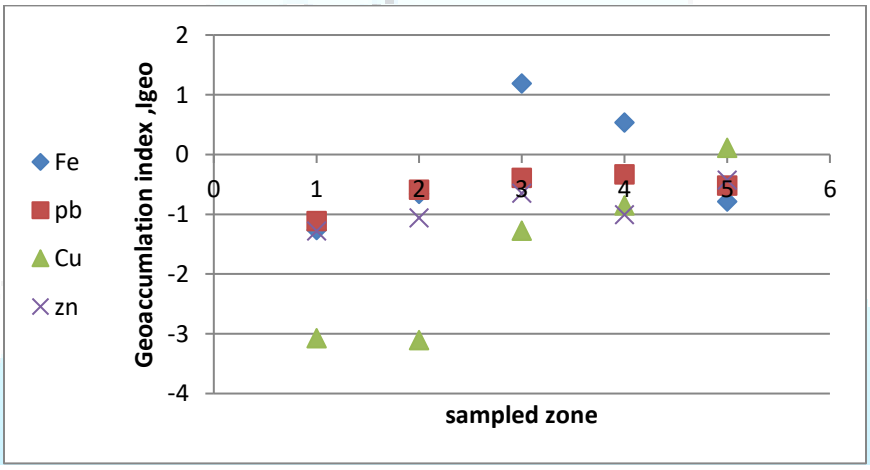

Fig. 3 :Geoaccumulation indices of heavy metals

The calculated geoaccumulation (Igeo) values are presented in (Figure 3). It is evident from Figure3.26 that the uncontaminated to moderately contaminated Igeo value of '1to 2' is observed at sedi-farag and Al-talhaia by Fe, and contaminated at Al-hawari zone by Cu.

3.2.1 Soil samples

Many parameters have been recorded for soil samples collected from the study area. The results are listed in table 2.

The pH averag values of soil range from 7.56 to 8.09. The electrical conductivity (EC) values of soil were from 1.118dS/m to 3.961ds/m. According to the World Food Organization (FAO), in 1985, all regions exceeded the limit <2 ds/m except for Sedi Farag. The total dissolved salts (TDS) values were 722.06ppm to 7489.82ppm. All regions were in the limit except for the Al-talhaia region, according to the World Food and Agriculture Organization's Guide, 1985.

Magnesium. According to the 1985 World Food and Agriculture Organization's guide to irrigation water, all areas exceeded the magnesium limit of 60, except for Benina and Sedi Faraj.

3.2.2 Exchangeable Sodium Percentage (ESP)

The presence of excessive amounts of exchangeable sodium reverses the process of aggregation and causes soil aggregates to disperse into their constituent individual soil particles. This is known as deflocculation and occurs in sodic soil [18].

A sodic soil, by definition, contains a high level of sodium relative to the other exchangeable cations (i.e. calcium, magnesium and potassium). A soil is considered "sodic" when the Exchangeable Sodium Percentage (ESP) is 6% or greater. The exchangeable sodium percentage (ESP) is calculated as follows:

$$\% \text{ ESP} = \text{Exchangeable}\{\frac{(Na^+)}{(Ca^{2+}+Mg^{2+}+Na^+ +K^+)}\} \times 100$$

In Australia, soil with an ESP greater than 6 percent is considered to be sodic. However, soil dispersion problems may occur at a higher or lower ESP depending upon clay type. In this study, ESP % values are classify as very strongly sodic for all regions quality for irrigation in table (3.6).

Table 3.6: classes Exchangeable Sodium Percentage in soil

Percentage	Classification	Samples
<6	Non-sodic	Nil
6-10	sodic	Nil
10-15	Moderately sodic	Nil
15-25	Strongly Sodic	Nil
>25	Very strongly Sodic	All regions

3.2.3 Sodium adsorption ratio (SAR)

A widely accepted index for characterizing soil sodicity, which describes the proportion of sodium to calcium and magnesium in soil solution. The formula to calculate SAR is given below, with concentrations expressed in milliequivalents per liter (meq/L) analyzed from a saturated paste soil extract [17].

$$\mathbf{SAR} = \frac{[\mathbf{Na^{+}}]}{\sqrt{\frac{[\mathbf{Ca^{2+}}] + [\mathbf{Mg^{2+}}]}{\mathbf{2}}}}$$

When SAR is greater than 13, the soil is called a sodic soil. Excess sodium in sodic soils causes soil particles to repel each other, preventing the formation of soil aggregates. This results in a very tight soil structure with poor water infiltration, poor aeration and surface crusting, which makes tillage difficult and restricts seedling emergence and root growth [19] .

In this study, SAR values are classifying al-talhai region as Good while Abo-atni, Benina, Sedi-faraj and Al-hawari regions are classified as Excellent quality for irrigation.

Table3.7: classes Sodium Adsorption Ratio in soil

SAR	Class	Samples
0-10	Excellent	Abo-atni, Benina, Sedi-faraj and Al-hawari region
10- 18	Good	al-talhai
18-26	Doubtful	Nil
>26	Unsuitable	Nil

4. Conclusion :

The study was conducted in the vicinity of the city of Benghazi extending from the area of abo-atni to the al-hawari area to determine the physical, chemical and heavy were determined in water and soil in order to evaluate their quality. By means of different analytical techniques such as electrical conductivity measuring device, pH meter, spectrophotometer, digital optical flame detector, atomic absorption spectrometer which were measured in the laboratory.

All variables were compared with Libyan standards and WHO for drinking water, and FAO for soil samples. The mean values of the variables (temperature, pH, calcium) were in the standard limit for. Water samples.

But the results of the mean values of electrical conductivity of water samples 1720.4 µs/cm to 5786.6µs/cm were greater than the limit, but in the regions of abo-atni, Benina and Sedi Faraj, they were within the Libyan standard limit, While total soluble salts were 895.11mg/l to 3008.3mg/l, which was larger than the limit, but in (Abo-atni, Benina, Sedi Farag) was in the permissible limit .

While in heavy metals the values of the arithmetic average were 0.566mg/l to 0.314mg/l were in the survey boundary except for Sedi Farag. While in copper, the copper average was 0.282mg/l to 2.44mg/l, which was greater than the limit in the Al-hawari area, and the mean values of lead and zinc were 19.84 mg/l to 34.10mg/l and 3.37mg/l to 6.04mg/l respectively which were larger than the surveyed limit in all regions of the two elements.

The contamination of groundwater with heavy metals was assessed using pollution factor calculation, pollution load index and geoaccumulation index. In this study, it was found that the calculation of the pollution factor showed that the areas of Abo-atni and Benina suffered from low pollution by all heavy metals, while the regions of Sedi Faraj and Al-talh

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The Conception of English as a Foreign Language Learning: Use and Challenges from Libyan Students' Perspective

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Abstract

The process of language learning is considered as one of the core processes in a learner's experience. In an English as a foreign language (EFL) context (e.g. Arabic countries), the process of language learning tends to be more challenging for language learners. This is because EFL learning is affected by various factors such as EFL learners' attitudes and their level of motivation to learn it, anxiety, and personality. Therefore, this study aimed to investigate the students' use of English outside the classroom and the most common challenges in learning and using it. As an exploratory study in nature, the study used a quantitative approach to data collection and data analysis. Where the findings of the study exposed that the participants encountered several challenges in all skills in English. In the end, the study concluded by suggesting that an attempt should be made by teachers to improve the EFL Libyan secondary school students' use of English beyond the classroom.

Keywords: English as a Foreign Language; English outside activities; Challenges; Libya.

1. Introduction

Recently, there has been an assumption that knowing learners' attitudes towards language learning, their preferences and their use of that language for communication is very important for teachers so that those learners find that what they learn meets their learning needs. This assumption has been recently reflected in an EFL context including Arab countries through the shift from traditional approaches to teaching English (e.g. behaviourism approach) to the communicative approach and the change in curriculum, syllabus, and materials or textbooks. For instance, as reported by [23], in Libya where English is taught and learned as an EFL, the government introduced a new curriculum for English language teaching at secondary school levels in 2000. This new curriculum is represented by the textbooks that comprise several units. These units have lessons and activities in the four language skills (listening, speaking, reading, and writing) besides grammar and vocabulary. These activities are introduced in a way that reflects the major principles of the communicative approach. Moreover, these activities involve learners in group work where they can use English for communication inside the classroom. Libyan teachers of English are also given guidance on tolerating learners' errors in English and encouraging them to use English [11]. However, like in many other countries in the EFL context, learning English is still challenging for Libyan EFL learners.

In conducting the current study, the problem positioned on the existing practices of learning English in the EFL context in general, and specifically, learning English in the EFL Libyan secondary school context which is reflected on the following issues:

First, like in many EFL Arab countries, passing the exams and obtaining high marks is becoming the concern of Libyan secondary school students in learning English [3]. Moreover, they only receive information from their teachers. Although the exposure of EFL learners including Libyan learners to English instruction at schools is long, EFL learners' poor levels in English skills or using English has been reported by several researchers as a challenge for the majority of them [20]. This can be the case for Libyan EFL secondary school students.

Moreover, in the EFL context, researchers point out the importance of practicing English, developing it, and using what they have learned in classrooms outside [31]. These out-of-classroom activities are assumed to enhance their learning [27]. However, the use of English seems to be challenging for most EFL learners, including Libyan secondary school students. This is because, like many other Arab countries, the social context surrounding the Libyan school students (e.g. family and society) do not provide them with the necessary exposure to English in its four skills (listening, speaking, reading, and writing). Due to this lack of exposure or insufficient contact to English outside the classroom, learners tend to depend only on classroom learning rather than attempting to improve their English outside the classroom.

Finally, another reason that makes using English more challenging for all Arab EFL learners in general and Libyan EFL learners, in particular, is their lack of vocabulary. This frustrates them to use English, especially in speaking and writing [6]. Furthermore, this challenge can underline learners' attitudes and motivation in learning English. However, The study examined the most common challenges of learning English language and using it. Thus, it aimed to achieve this through the following research objectives:

- To explore the types of out-of-classroom activities which are most frequently used by EFL Libyan secondary school learners.
- To identify the major challenges and difficulties encountered by the EFL Libyan secondary school learners in English learning in terms of the four language skills.

1. Literature Review of Language Learning Challenges

Learners' attitude has been one of the most investigated areas for many researchers. Several theories have been developed, and each theory has offered significant contributions to this research area by providing further insights into learners' attitudes. However, language learning is a process of a positive change in the learner's emotional or behavioral aspects, because once he/she has learned a given language, it is expected that will behave differently and will have a distinguished belief [30]. Otherwise, it is important to investigate challenges and difficulties in language learning, since they might lessen learners' interest in engaging in English learning activities. Therefore, a wide review of previous studies has been done on the major challenges encountered by EFL school learners in language learning. Thus, investigating learners' language learning challenges from a comprehensive theoretical framework needs to discuss most of these theories, especially how these theories offer explanations of what attitudes are.

Language Learning Challenges

Based on [29], there are basically four vital skills involved in the language learning task. The techniques of gaining are listening and reading. In addition, [18] revealed that receptive skills are the methods of how people acquire meaning from the dialogue that they observe or hear. In the same vein, [8] states that the productive techniques are those which allow language learners to communicate meaning efficiently to other people. The techniques of production are speaking and writing.

Consistently, [24] found that there are various factors that cause problems in speaking English among EFL students. A few of these factors are related to the students themselves, the teaching processes, the curriculum, and the environment. For instance, most learners lack the essential vocabulary to have their meaning across, and consequently, they are unable to maintain the discussion going. Insufficient strategic competence and communication competence could be one more reason also for not being able to maintain the conversation going.

Moreover [21] reported that listening ability is one of the important skills in EFL learning, and it is used most frequently among the other skills in the language. There are a few studies that have been conducted among EFL learners, especially those school students and investigated the main challenges faced by them in listening skills. For instance, the study by [16] aimed to find the factors influencing English listening comprehension and the strategies that might improve students' listening comprehension. The study has also sought new ways of cultivating listening comprehension competence in the Chinese context. It was found that the most frequent is that of cultural difference and its effect on listening comprehension.

In a wide-ranging study among a group of EFL Saudi students [17], found that the most common problems were the accent, pronunciation, speed of speech, insufficient vocabulary, the different accent of speakers, lack of concentration, anxiety, and bad quality of the recording. The concerns found by the researcher might be of great help in the process of enhancing the students' comprehension and their English listening skills. Unclear pronunciation, for instance, might make it difficult for the listeners to comprehend what they are listening to, as well as the insufficient vocabulary storage they have. Moreover, low-quality records are an obstacle that needs to be overcome. Not to mention, grammar is one of the most important factors in improving EFL learners' listening abilities as without it, they cannot follow the speakers and will probably get lost while trying to understand the intended meaning.

According to [12], listening skill in most of the Arab countries where English is taught as a foreign language is still neglected by many teachers. Instruction in effective listening strategies is often not part of their English. This is because listening skill is integrated in the course books offered to students, rather than being taught as a skill by itself. Moreover, even if it is presented in lessons in each unit, teachers tend to neglect it due to the lack of teaching aids that can help them in effectively teaching this skill to their students. The result is that most EFL Arab learners tend to neglect this skill at school while they attend to other skills, especially reading.

Therefore, researchers [14] suggested that teachers should try to motivate students to listen carefully and guide them to improve their listening understanding. The study suggested some activities for these purposes; these activities varied among pre, while & post-listening activities. And by focusing on the listening process, as the study shows, students can acquire a beneficial tool

to increase their English comprehensive competence. Thus, affects the capacity for improvement in other skills. As a matter of fact, the researcher suggested that it'd be of great importance to combine listening with other skills, which is believed to help the students to improve their language proficiency as a whole.

More the challenges faced by secondary schools in Jordan explored by [4]. Most of them reported the difficulty of the reading passages, the lack of familiarity with the vocabulary items, the ineffectiveness in the reading methods, and the mismatch between the passages and the students' real life. Other challenges were the absence of speed reading, consideration of learners' challenges, the connection between extensive and intensive reading activities, as well as the contradiction between learners' pre-knowledge and the passage's existing ideas. The fourth problem the researcher mentioned was the difficulty to distinguish the main ideas from the secondary ones, and this might be due to the ineffective rereading method and the untrained students. However, and among all, the vocabulary challenge was found as the most serious difficulty in reading. The study did not reveal any statistically significant differences in EFL reading comprehension challenges related to gender, academic level, and achievement level.

The author [1] investigated EFL school learners' cohesion and coherence problems in EFL essay writing. Writing is an important skill in the English language and is so related to reading, yet needs much training on how to express one's ideas briefly and sufficiently. One thing that should be taken into account is the different abilities among students, and there should be different kinds of essays coping with their varying proficiency. Trained teachers are believed to have the ability of their students, especially those who are acquainted with using classroom interaction techniques and methods such as pair work, peer-review, or any other similar useful techniques.

Based on this study by [10] among Iraqi EFL learners, it was found that EFL learners' errors in English spelling can be traced back to the following potential temporary causes. This includes the complexity of the English spelling system, the influence of the mother tongue (first language), and student neglect in English spelling. Finally, there is a lack of adequate practice in English spelling.

All these previous studies provided useful information about the major challenges faced by EFL learners in oral skills, especially in listening and pronunciation and written skills. However, these studies have not investigated these challenges faced by learners in all four language skills. There is only one study by [13] which examined the challenges of Tunisian secondary school students in language learning in general. As reported by this study, based on the students' perceptions of the difficulties they encounter in learning English as a foreign language, the results showed that the difficulties were mostly linguistics. The students lacked the needed linguistic knowledge, but they could get used to some useful strategies. It was found that these strategies used to overcome such difficulties varied based on some factors, like the learners' course level, gender, and socio-economic background. Level affected the classification of strategies, gender affected the type of strategies (boys: social, girls: translation), and low socio-economic groups were distinguished for their various and most frequent use of strategies.

2. Methodology

The current study used a survey approach to data collection and analysis. The present study was exploratory in nature since it had features that characterized the quantitative research paradigm. Whereas, [9] identifies quantitative research as a technique of testing objective theories by evaluating the relationship among factors. These factors consequently can be measured. Generally, on the instruments, the digitized data can be evaluated using statistical processes.

However, the researcher exercised control by enhancing the external validity of the study by developing a structured questionnaire from previous studies that covered all the aspects aimed to be investigated. This, in turn, enabled quantifying the responses and to conduct statistical analysis. This implies that it was possible for the researcher to maintain objectivity through structured data collection. Whereas, a questionnaire was an effective tool for gathering the necessary data [7] about EFL Libyan secondary school students learning challenges. The researcher could gain and illustrate the views of the participants regarding this aspect of EFL learning.

Population and Sampling

The target population for this present study was only the second class of secondary school students (grade 2) in Libya. They were selected as sample participants in this study because of the convenient location of the schools. Secondly, the entire population in the present study was of a manageable size, and that data was collected in a localized setting. Therefore, the participants could be easily accessed by the researcher and so, distribution of the survey among them was easier.

The questionnaire aimed to identify the major challenges faced by the EFL Libyan secondary school students in EFL learning. This questionnaire was adapted from [5, 2, 19,25, 28] Table 1. It comprised 44 items. These items covered all possible challenges that the students might have faced in their EFL learning process at school. They were distributed in 6 sections. The first section included 6 items requesting the participants to self-evaluate the major difficulties in EFL learning through a four-point scale. The second section comprising only 3 items requested the participants to provide self-evaluation of the most challenging skills in English namely; reading (Rd=1); writing (writ=2); listening (lsn=3); speaking (spk=4). The third section having 7 items was about the learners' major challenges in speaking skill in English. The fourth section about the learners' major challenges in listening skill in English, it consisted of 11 statements. The fifth section regarding the learners' major challenges in writing skill in English had only 5 statements. The last section was about the learners' major challenges in reading skill in English, and it consisted of 12 items. Table 3.3 below shows the number of items used in this questionnaire along with their three sections and the researchers from whom these items were adopted.

Table 1: EFL Learning Challenges

Author	Aspects	No. Items
Huang, J. (2005)	Self-Evaluation of Major Difficulties in EFL Learning	6
Shen et al. (2005)	Self-Evaluation of Most Challenging Skills in English	3
Akbari, Z. (2015)	Major Challenges in Speaking Skill in English	7
Yahya (2007)	Major Challenges in Listening Skill in English	11
Altamimi & Shuib (2009)	Major Challenges in Writing Skill in nglish	5
	Major Challenges in Reading Skill in English	12
Total		44

3. Data Analysis and Discussion

The use of such structured questionnaires enhances objectivity and supports statistical analysis. Therefore, the current study used Statistical Package for Social Sciences (SPSS) for analysis of the collected data. In analysing the data, descriptive statistics, including the frequencies (n) and percentages (%) were used to organize and summarize the participants' Likert scale responses. Moreover, this quantitative analysis included the standard deviation (SD) and the mean (M) to find out the learners' overall language learning attitudes and to find out the differences in the participant's responses to the various sections of research questions.

Based on the M values obtained from the analysis of their responses as in Figure 1 to these items regarding their evaluation of their general proficiency, their abilities to read, write, speak, their listening comprehension, and vocabulary in English, the results revealed that the mean (M) values were low (M=1.67, 1.61, 1.35, 1.26, 1.40 and 1.59) respectively. These results of the low M values of the participants' self-evaluation of their English based on the major general skills in the language were further interrelated by analyzing the percentages of the participants' responses to these items. As shown in Figure 1 below, it is obvious that none of the participants evaluated himself/herself as excellent in the stated language skills, and even those who evaluated these skills as good represented only (4%: 2% in proficiency in English and 2% in writing skill). However, the majority of them evaluated their skills in English as fair and poor, as these two points of self-evaluation were highest.

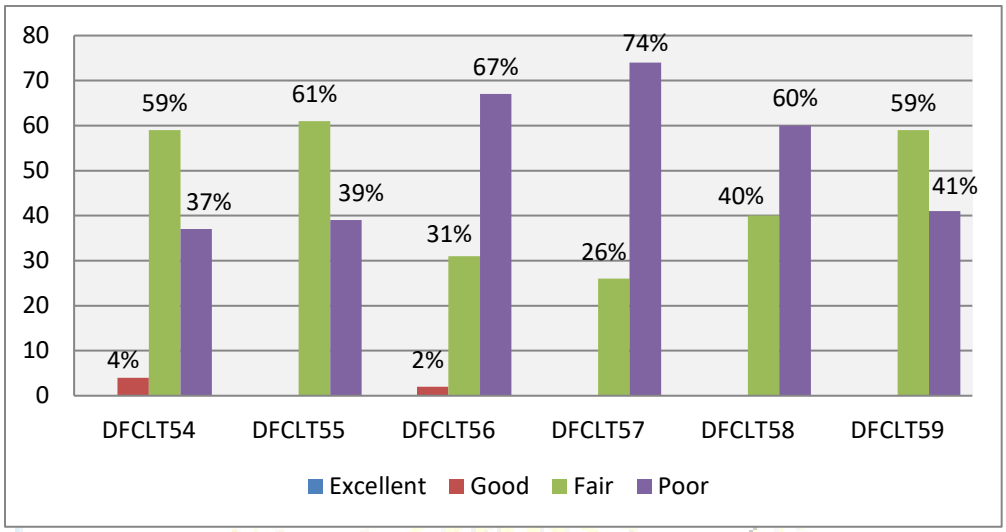

Figure 1: *Descriptive Statistics of the EFL Libyan Learners' Self-Evaluation of their skills in English (1)*

The second subsection included three items that aimed to obtain information about the participants' perception of the four language skills (speaking, listening, writing, and reading) in terms of the most difficult skill, the best skill, and the most important skill. These items need to be responded to by the participants by selecting one skill in each item. Based on the descriptive statistics of the participants' responses to these three items (percentages) as shown in Table 2, the most difficult skill in English was writing (53%) and it was followed by reading (12%), speaking (14%) and listening (11%). Despite these results of the most difficult skills for the participants, it was found that the participants viewed reading skill in English as their best and most important skill, as the results revealed that this skill recorded 41% in terms of being

Table 2: *Descriptive Statistics of the EFL Libyan Learners' Self-Evaluation of their skills in English (2).*

St. N	Speaking %	Listening %	Writing %	Reading %
DFCLT60	14	11	53	12
DFCLT61	3	12	14	41
DFCLT62	35	11	10	44

their best skill and 44% in terms of being their most important skill. This was followed by writing (14%), listening (12%) and speaking (3%) in terms of their best skills and in relation to the importance, speaking skill was the second (35%) followed by listening (11%) and writing (10%).

The third subsection consisting of seven items aimed to obtain data regarding the participants' challenges in speaking skill in English. Based on the participants' responses as displayed in Table 3, it was revealed that most of the participants agreed that worrying about making grammatical mistakes (90%), finding it difficult to communicate with others in English

(89%), and feeling embarrassed and confused (79%) were the most major challenges in speaking in English. Moreover, none of the participants agreed that communicating in English with teachers and students is easy as (80%) of them stated their disagreement about this challenge.

Table 3: Descriptive Statistics of the EFL Libyan Learners' Major Challenges in Speaking Skill in English

St. N	Agree %	Neutral %	Disagree %
IDE63	79	21	0
IDE64	89	11	0
IDE65	90	10	0
IDE66	0	12	88
IDE67	100	0	0
IDE68	100	0	0

When they asked about how to overcome such challenges in speaking skill in English, all the participants (100%) highly agreed that chatting with others more often, registering for a conversation class and practicing the language, and improving their other language skills in order to be a good English speaker is important to overcome these challenges in speaking in English.

As for the fourth subsection of this questionnaire, it consisted of 11 items that aimed to evaluate the learners' major challenges in listening skill in English. From the results presented in Table 4, it was found that the most frequent challenges encountered by the learners in listening in English are the speed of speaking on TV in English (94%), feeling lost with the information and expressions (94%), difficulty understanding what they listen to in English (93%), feeling confused and losing concentration by slang and informal expressions (93%), difficulty in listening to a recorded tape (92%) and difficulty recalling the meaning of words (92%).

Table 4: *Descriptive Statistics of the EFL Libyan Learners' Major Challenges in Listening Skill in English*

St. N	Always %	Often %	Sometimes %	Never %
LISN70	92	8	0	0
LISN71	94	6	0	0
LISN72	92	8	0	0
LISN73	94	6	0	0
LISN74	93	7	0	0
LISN75	0	89	11	0
LISN76	0	0	90	10
LISN77	0	0	91	9
LISN78	92	8	0	0
LISN79	93	7	0	0
LISN80	0	0	88	12

Other challenges that are faced by the participants are related to their grammatical background and vocabulary (91% sometimes), difficulty in getting the main point (90% sometimes), having to translate every single word into their native language (89% often faced) and their prior information and background knowledge (88% sometimes).

The fifth subsection included four items about the major challenges faced by the participants in writing skill. The finding revealed that the majority of the participants stated that finding the right words and vocabulary (80%) and using the appropriate structures to fit the meaning (75%) were the most agreed-upon challenges in writing. These were followed by other two challenges, namely; expressing your ideas easily (72%) and knowing the right spelling of words (66%) (Table 5).

The last subsection of the questionnaire comprised 12 items that were concerned with the major challenges faced by the learners in reading skill in English. As shown in Figure 2, the results revealed that the majority of the learners sometimes encounter challenges in reading including

Table 5: *Descriptive Statistics of the EFL Libyan Learners' Major Challenges in Writing Skill in English*

St. N	Yes %	No %
WRIT81	80	20
WRIT82	66	34
WRIT83	75	25
WRIT84	72	28

their inability to find the appropriate kind of texts which match their proficiency level (81% sometimes and 19% often), feeling lost and not able to differentiate between important and less important points in the texts (67% sometimes and 32% often), looking up all the new words

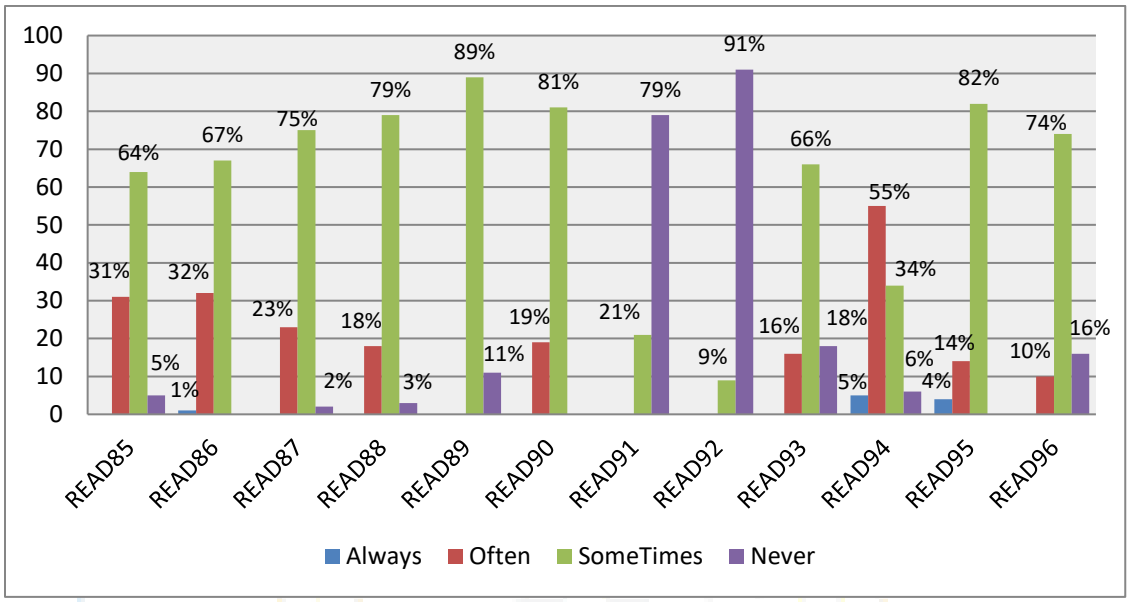

Figure 2: *Descriptive Statistics of the EFL Libyan Learners' Major Challenges in Reading Skill in English*

before I read (75% sometimes and 23% often), feeling of confusion of informal expressions are used (79% sometimes and 18% often) and getting the main idea of the text (64% sometimes and 31% often). These were followed by another challenge related to the participants' inability to read for a long time with full concentration (89% sometimes).

However, as for what best strategies used by the participants in overcoming such main challenges in reading in English, the participants stated that they ask the teachers or friends for help (55% often and 34% sometimes) and reading the entire text and not pay attention to every new word till the end (74% sometimes and 10% often). Other strategies include trying to find the difficult words and expressions (82% sometimes, 62 14% often and 4% always) and guessing the meaning of strange words (66% sometimes and 16 % often). Only a small percentage of them stated that they sometimes stay in touch with up-to-date words and expressions (21%) and reading news and articles on the Internet (9%). These two strategies as being supported by high percentages of the participants' "never" state are evident of these several challenges faced by them in reading as previously discussed.

4. Conclusion and Recommendation

The results obtained from the participants' responses to self-evaluation of their English showed their low and poor levels in their English proficiency and all the four skills as well as vocabulary in English. This was evidenced by the low M values and their fair and poor percentages of self-evaluation obtained through the quantitative analysis of their responses to the first section of this questionnaire. Moreover, these results were supported by the results obtained from the participants' responses to the second section of the questionnaire. It was revealed that the most difficult skill in English was writing, which was followed by reading, speaking, and listening.

Regarding the results of the students' challenges in speaking skill in English, the current study showed several challenges faced by the participants in this particular skill. These include worrying about making grammatical mistakes, difficulty in communicating with others in English and feeling embarrassed and confused, and difficulty in communicating with teachers and their friends.

In addition, learners faced challenges in listening skill in English. According to findings, the speed of speaking on TV in English, feeling lost with the information and expressions used by speakers, difficulty understanding what they listen to in English, feeling confused and losing concentration, difficulty in listening to a recorded tape, and difficulty recalling the meaning of words were the most frequent challenges encountered by the participants. Moreover, other less frequently encountered challenges were the participants' grammatical background and vocabulary, difficulty in getting the main points, having to translate every single word into their native language, and their prior information and background knowledge. These results are somehow consistent with results obtained [17] among a group of EFL Saudi students as the researcher found that the most common problems were the accent, pronunciation, speed of speech, insufficient vocabulary, the different accent of speakers, lack of concentration, anxiety, and bad quality of the recording.

As for the major challenges faced by the EFL secondary school students in writing skills, the results indicated that the participants face challenges in finding the right words and vocabulary to express their ideas, using the appropriate structures to fit the meaning, expressing your ideas easily, and knowing the right spelling of words. As reported by [26], EFL learners' major writing difficulties and topping the list: word choice, verb form, missing subject, and verb tense. Reasons are limited vocabulary size, poor grammar knowledge, and interference from the first language, and the suggested solutions are growth in vocabulary size and vocabulary knowledge.

The last types of challenges faced by the participants as identified in the present study were several challenges in reading skill in English. Based on these results, the most frequently encountered challenges in reading in English were the difficult words and expressions, finding the appropriate kind of texts that suit their levels in English, feeling lost, and not being able to differentiate between important and less important points in the texts, looking up all the new words before reading, feeling confused by the new informal expressions and getting the main idea of the text. These were followed by other less frequently encountered challenges, including being unable to understand the text on their own, being unable to continue reading for a long time. Similar results were found by [4] especially in terms of the lack of familiarity of the vocabulary items. Similarly, the fact that limited vocabulary poses challenges for learners in the four language skills and, especially, in reading support what was reported by other previous researchers [15,22,25]. Therefore, how to improve students' word power becomes a critical issue for EFL teachers. For other challenges in reading, they were found to be the participants' inability to find the appropriate kind of texts that suit their levels, feeling lost and not able to differentiate between important and less important points in the texts, looking up all the new words before reading, feeling confused by the new informal expressions and getting the main idea of the text. These were followed by another challenge related to the participants' inability to read for a long time with full concentration.

However, the interesting aspect of these results is the participants' awareness of good strategies in overcoming some of these challenges. These are asking the teachers or friends for help and reading the entire text and not pay attention to every new word till the end. Other strategies include trying to find the difficult words and expressions and guessing the meaning of strange words (66% sometimes and 16 % often). Thus, this indicates that those students did not do enough to learn English, and this is the other important issue. It is significant that the EFL Libyan school teachers should motivate and encourage their students to do more out-of-class English learning activities. These days, due to the increasing advances of technologies and their increasing applications in education in general and in English learning and teaching in particular, teachers should encourage their learners to make good use of these technologies especially the Internet which can be accessed by them easily these days. They should be motivated to use the Internet even in the net cafés where they can listen to songs, movies, stories, and other English learning video and audio clips. They can also use chats to enhance their speaking and writing by communicating with their friends and others outside their country orally and in writing. Moreover, they can be provided with useful links for simple shirt stories and articles for further reading in English. By encouraging the learners to be involved in such out-of-classroom activities, the students can develop various effective self-learning strategies to overcome the various challenges faced by them in the four EFL skills as well as vocabulary and grammar.

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المؤتمر الدولي الليبي السادس للعلوم الطبية, التطبيقية, والانسانية
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Evaluation Knowledge and Attitudes of Radiology Technicians Regarding Radiation Protection in Alafya and Waddan Hospitals

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Abstract:

Background: Ionizing radiations have several side effects on human beings**.** Since all ionizing radiation forms produced different types of hazards. Therefore, it is necessary for technicians to have good knowledge about protection their self and patients from ionizing radiation. **Aim:** To evaluate the knowledge of radiology technicians towards radiation protection. **Methods:** The study design is questionnaire based cross-sectional study performed in Alafya and Waddan hospitals-Aljufrah zone, Libya between March and June 2021. 20 out of 24 radiation technicians were randomly selected. Data were collected using questionnaire and analyzed by using microsoft Excel softwere surveyed. **Results:** The results appeared that the majority age of the radiation technicians are between 23 – 33 years 12 (60%), and Bachelor holders 14 (70%). All radiation technicians (100%) have done primary examination before [start] work. However, the periodical examination never done after started work for all radiology technicians (100%). It is imperative for x-ray technicians during work to wear personal radiation dosimeter device, acording to international commission of radiation protection. Unfortunatily, all radiation technicians have not supplied with radiation dosmeter device. The study showed that majority of technicians stayed in work between 39 and 42 hours per week. Radiation survey and x -rays machine colibration have not ever been done. All radiation technicians have poor knowledge and awarness about the ionizing radiation. **Conclusions:** The study showed that insufficient knowledge level of radiology technicians in Alafya and Waddan hospitals about radiation risk and protection.

Keywords: Ionizing radiation, radiation protection, radiation technicians, dosimeter and training course.

Introduction

One of the important methods used in medical practice are ionizing radiations. Ionizing Radiation is energy in the form of particles as alpha and beta or waves as gamma and x-rays. These ionizing radiations are had negative effects, it can be couse cancers. Therefore, some protection applications should be applied against these ionizing radiations [1]. Since the beginning of creation, ionizing radiation has been found [2]. Therapeutic radiology, nuclear medicine and x-ray diagnostic all

examples of ionizing radiations. Radiation technicians might be at risk due to their exposures and contact to ionizing radiations. The radiation technicians need rules for safety and methods to prevent ionizing radiations dangers and radiation measurement [3-4-5]. Nowadays, radiographic imaging is necessary in treatment and diagnosis [6-7]. Different studies have done in various countries to measure annual equivalent doses of radiation workers in Kenya 2011 [8], in that annual exposure levels ranged from 0.32 - 6.98 mSv, in Saudi Arabia 2017 [9]. Annual average effective dose for radiotherapy workers, were found 0.28 mSv. It might be the reason of this decreased due to international regulations application for the radiation protection.
The aim of this study is evaluated the level knowledge of radiology technicians towards radiation risk and protection by using multiple choice questionnaire.

Materials and Methods
In Alafya and Waddan hospitals were 20 samples selected randomly out of 22 radiation radiology technicians. Through differnt several multi choice questionnaires figure (1), data was collected and by using Excial softwere surveyed data was analyzed.
Fig. 1: questionnaire on radiation risk and protection knowledge.

Resuls
The study is covered two general hospitals and specifications of every hospital. Such as, gender and technician's number were following shown in figure (2).

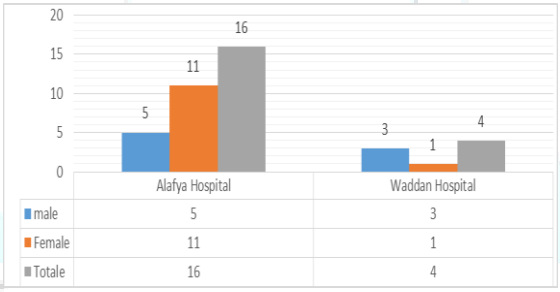

Fig. 2: Specifications of Alafya and Waddan hospitals

Sample profile
The result appeared the number 8 male (40%) 4 and 12 female (60%) of radiation technicians working in Alafya and Waddan hospitals, as shown in figure (3).

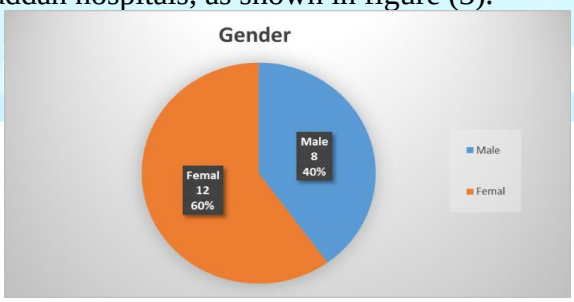

Fig. 3: Technicians distributions

Majority of radiation technicians ages between 23 – 33 years, 12 (60%) and Bachelor holders 16 (80%), (4 male, 12 female) shown in Table (1).

Table–1: Sample profile age and gender qualification

Qualifications									
Gender	Age	Institute (Diploma)		University		Total			
		No	%	No	%	No	%		
Male	20-30	0	0.0	4	100.0	4	50.0		
	31 -40	4	100.0	0	0.0	4	50.0		
	41- 50	0	0.0	0	0.0	0	0.0		
	Total	4	100.0	0	0.0	8	100.0		
Female	20- 30	0	0.0	7	70	7	58.3		
	31- 40	2	100.0	1	10	3	25		
	41- 50	0	0.0	2	20	2	16.5		
	Total	2	100.0	10	100.0	12	100.0		

Respondenting technicianes working years were ranging between 1-10 years found that 11(4 male, 7 female) (55%) and 9 (4 male, 5 female) (45%) were worked ranging between 11 -20 years as showen in tabe (2).

Table. 2: Gender and working years

	working years					
Gender	1-10 years		11-20 years		Total	
	No	%	No	%	No	%
Male	4	36.5	4	44.4	8	40.0
Female	7	63.5	5	55.6	12	60.0
Total	11	100.0	9	100.0	20	100.0

Radiation Protection

Before starting work 20 (100%) radiation technician has completed primitive medical examinations. However, until now no radiation technicians have done periodic medical examinations, an addition, there is no radiation protection responsible and supplied radiology technicians by personal radiation dosimeter to measuring radiation exposure level. As well as, since started their work calibration and periodic radiation survey never done shown in table (3).

Table-3: Periodic, primitive, Radiation Protection Responsible, Supply Radiation Dosimeter, x-ray machine calibration and periodic radiation survey.

Primitive Medical examination	No	%
Yes	20	100
No	0.0	0.0
Total	20	100
Periodic Medical examination		Never done
Radiation Protection Responsible		NO
Supply Radiation Dosimeter		NO
Done x-ray machine calibration		Never done
Done periodic radiation survey		Never done

Discussion:

International commission on Radiation Protection (ICRP) recommended that [10]. Survey of medical radiology technicians exposed to ionizing radiation should be under rules of general principles of occupational medicine. These rules helped in ensuring initial and continuing compatibility between radiation work conditions and radiology technician's health. As result, it

gives good information's in the case of occupational disease. Health conditions and job nature require medical surveillance programmed for radiation workers [11].
The study survey of radiation exposure measurements of radiology technicians in Alafya and Waddan hospitals never done. No radiation technicians did periodic medical examinations and there is no radiation warning sign in work place. Radiation survey and x -rays machine colibration have not ever been done. All radiation technicians have poor knowledge and awarness about the ionizing radiation. Increasing ionizing radiation exposure at low dose rate, as result increase cancer mortality relative rate [12-13]. Estimating of leukaemia hazard may affect medical radiology technicians exposed to x-ray and gamma ray law doses, it should be used historical accurate dosimeter [14]. Clinical indication advised people should be known for reduce radiation dose CT scans uses in limited cases and lowest possible radiation dose of diagnostic image [15].

Conclusion:

The study was analysis data of ionizing radiation technician's protection. Healthy program for radiology technicians should be including personal dosimeter monitoring and medical surveillance. This requires candidate of healthy physics, safety professional and radiology technicians themselves. To follow international commission on radiation protection (ICRP) all radiation technicians should be urgently supplied by dosimeter device and preparing plan for ionizing radiation risk and radiation protection training courses.

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المؤتمر الدولي الليبي السادس للعلوم الطبية, التطبيقية, والانسانية
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Family violence and its Impact on the Mental Health of Adolescents in the city of Mosul / a survey study

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Abstract

Bacgkround: Family violence is one of the most common social phenomena and problems that have forced researchers to conduct several researches for the purpose of understanding this phenomenon through study, analysis and deduction to search for appropriate solutions, as the method of raising children is a global problem that is not limited to one society, but suffers from all societies. Studies confirm that appropriate methods of education come at the forefront of the factors affecting the formation of the personality of children and their psychological security, as the person lives from the beginning of his life in a number of different contexts such as the family, school, friends, the environment and others. But the family has the greatest impact on the child and his upbringing since his birth. **Method:** The current study attempts to verify the effect of violence by one or both parents in the family on the degree of aggression of the children as a product. Not through normal methods. The study was conducted on a sample of 300 male middle school students in some schools in the city of Mosul. Measures of domestic violence, aggression, and self-affirmation were applied to them, prepared by the researcher. **Results:** The results show that there is a statistical significance for the two axes with regard to psychological and physical violence with a degree of 0.01 and it is statistically significant at the probability coefficient of 0.05. **Conclusion:** The study recommends conducting more research and standardizing the recommendations and conveying them to the competent authorities in Iraq, due to the emergence of violent incidents in the last security forces against children and adolescents, such as sexual assault and sometimes murder.

Keywords. Family, Violence, Mental Health, Adolescents.

1.Introduction:

Family violence is one of the social phenomena and issues which receives the attention of most researchers who try to deeply analyze and understand its dimensions. Physical violence, means the actual harm that may be inflicted on the child, or it is any type of intentional behavior that results in harm and harm to the child's body, and is practiced by one or both parents, or others surrounding the child, or by strangers to the child, and directed to one or all of the children in the family[5].
psychological violence, the concept describes all forms of emotional abuse and abuse against a person, such as verbal psychological abuse such as threats and threats, slander, insults, intimidation and imposing control over the other. ...of this type of violence is often accompanied by excessive jealousy and behavior that manifests itself in controlling and dominating the other [6].

In this regard, studies have confirmed the importance of the parental role in shaping psychological safety, or mental illness for children, according to their awareness of psychological safety, concern, and respect on the part of parents [7].

Therefore, Maslow points out that the satisfaction of human needs, such as psychological security needs, follows in importance the satisfaction of basic physiological needs and that deprivation of them, or failure to satisfy them makes the individual feel threatened, fear, and inability to achieve himself [8].

Preventing violence against children is possible. Preventing and responding to violence against children requires efforts to systematically address risk and protection factors at all four interrelated levels of risk (individual, relationships, communities, and society). Strategies to end violence against children. The group aims to help countries and communities achieve target 16.2 of the Sustainable Development Goals on ending violence against children [1].

Each letter of the word INSPIRE stands for one of the strategies, and most of them have been shown to have preventive effects that include many different types of violence, as well as benefits in areas such as mental health, education and crime reduction, in May 2016, the World Health Assembly passed a resolution endorsing the launch of the first-ever WHO Global Action Plan on Health System Strengthening as a multi-sectoral national response to address personal violence, particularly against women and girls, and against children [1].

2. Methodology: The study aims to find out a domestic violence to determine the level of domestic violence as perceived by the children.

Study design: descriptive study, cross-sectional type

Study sample: Data were collected through an electronic questionnaire distributed to secondary schools on both sides of the city of Mosul, for the age group from 13 to 17 years, and the total number is **300** students**.**

Study tools: The researcher formulated the terms of the domestic violence scale consisting of (20) phrases divided equally into four dimensions: physical violence, psychological violence, social violence, economic violence. The student chooses to answer them through three alternatives: (applicable, sometimes, no Apply), the scores are given in order (3-2-1), so that the score theoretically ranges between (1.5-2.6), and the high score indicates the level of perceived domestic violence by the student**.**

3.Finding: The results of the study

Table (1) shows that the physical violence that children are exposed to is large with a rate of 2.8, the highest rate among the calculated axes. At a rate of 38.8%, this indicates a high rate of physical violence among the specified age group.

Table (1) The arithmetic means of the physical violence axis N=300

N	Paragraph	Calculated average	overall average
1	I am physically abused by beating and others in my family.	0.6	2.8
6	My property in my family is being destroyed and destroyed.	0.4	
11	My family treats me harshly and violently.	0.7	
16	I miss the support, love, tenderness and kindness within my family.	0.8	
21	Take my possessions within the family by force and violence.	0.3	

Table (2) shows the high percentage of psychological violence and is considered the highest percentage among the five axes at a rate of (2.5) It is more than the calculated percentage and a percentage of (41.1%), which included 123 students.

Table (2) psychological violence axis

N	Paragraph	Calculated average	overall average
2	I am subjected to ridicule and ridicule from my family, even in front of others.	0.4	2.5
7	I am being harassed by my family for no known reason.	0.6	
12	I feel oppressed and humiliated by the mistreatment of my family.	0.5	
17	I miss the support, love, tenderness and kindness within my family.	0.3	
22	My family distorts my image in front of people.	0.7	

Table (3) shows the weighted relative average for each axis within the axes of the study, on which the percentages of the extent of the impact will be measured, and this is according to an international scale

Table (3) The total score for each dimension of the scale

domestic violence scale	Scale axis dimensions			
	Physical axis	Psychological axis	Social axis	Economic axis
	2.6	**2.3**	**1.5**	**1.8**

Total average

Table (4) shows the four axes that most affect the health of children by percentage, and they are arranged from most to least and the most influential is psychological violence, then physical violence, then social and economic violence.

Table (4) Frequency and percentage of responses to participating students N=300

Axis	Frequency	Percentage
Physical axis	115	38.3%
Psychological axis	123	41.1%
Social axis	17	5.6%
Economic axis	45	15%

4.Discussion

A study aimed at determining the relationship between student violence and some psychological variables (anxiety, self-esteem), and social (economic and cultural level) among a sample of secondary school students in the city of Mecca. The study sample consisted of 300 high school students, on whom the violence scale was applied. Among the results of the study, there is no relationship between violence and the economic and cultural level. There are also statistically significant differences between the averages of high degrees of physical and psychological domestic violence.

It is clear from the tables that the arithmetic mean of each of the scale expressions and the total degree of the dimension to which it belongs is a function at the level (0.01), which indicates the correlation of these expressions with the total degree of the dimension to which it belongs, and this indicates the effect of violence on this axis, which is the physical axis. These results are in agreement with the study [2].

The relationship between the mother and father is disturbed and family conflicts erupt within the same family, this family turns into a fertile breeding ground for problems and an environment prepared for disturbances, especially if it is accompanied by violent behavior or some types of aggressive behavior [3].

The aggression may be direct or indirect, physical, verbal, monetary, threatening or disobedient. Psychological studies also confirm that aggression and violent behavior in most cases are accompanied by an angry emotional charge and arise as a result of actual frustration or an expectation of it that threatens the security of the individual. And the individual may transgress and be extravagant in his aggression out of a feeling of inferiority, whether it is real or illusory, or he may transgress in order to assert himself, announcing his existence, or to ward off an expected aggression against him. The frustrated individual transgresses, but the aggression itself may frustrate him, here the aggression is joking, and it is shifted to another, which is the weakest [4].

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Surface Construction and Analysis using CAD Application

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ABSTRACT

The surface of material and tension of overall shape is defining shape identity. As science and technology progress, the need for better understating of the physical and mechanical properties of materials and surface structure. Surface tension and curvature are key for understanding the fabric of the surface design. The relationship between surface and curvature, we can define it as tension affect the surface. Materials also playing an important role by knowing the physical and mechanical quality of material, we can understand the design modeling process. Application used is CAD application environment, from modeling to analysis tools. The discussion is about the difference between polydurface and mesh modeling, and how they differ from each other. We can see the difference in surface analysis. Finally the approach used in modeling is important for suitable design and structure product.

Keywords: surface construction; surface curvature, structural analysis; surface analysis

1. Introduction

The objective of this research is to bridge the gap between the science of topology and architectural design in general. There's always the problem of understanding surface and membrane fabric. In some cases in the engineering design community, we can see that there's a high impact of computer-generated morphologies, using scripting culture. The scripting design approach is taking over the design process; this really has great Implications on architectural engineering and civic communities. The problem of using this type of generated design is not really reflecting the reality of our needs. Scripting is helpful for generating and understanding design in scientific and natural ways. There's always the idea of topology and curved surface design approach that a large major of architects and designers reject. This paper will use surface construction, curvature structural analysis tools, and methods design. Curved surface as I view it is the dynamic of space. There will be some impact that this paper will make on part of the research and academic design community in general. This research will focus on the basis of surface construction and topology analysis structure, by understanding the surface structure, curvature, and optimization options. Curvature is always effected by the surface and its angle degree *(curve curvature)*. [1] Step by step different types of topology analysis will be used, which we can generate to understand the bases and science of topology and surface structure. The result may influence the science of surface construction and

surface analysis approach. in how we design surface in CAD envirnoment. What we design is influenced by the progressing of our knowledge and understanding of the surface structure.

2. Materials and Methods

The platform used is the CAD environment, with a different type of design and optimization analysis tools. The main focus of the paper will be analyzing the structure of polysurface and polygon mesh, generated in CAD applications. We going to understand the main principle of generating clear and clean surface structure, by using different types of design methods and surface analysis tools. As known in the Euclidean coordinate system, the structure of a surface start with points, knots, vertex and control points. we going to lay down some important equations the govern how we analysis surface and curves in 3D applications.**Error! Reference source not found.**

3. Theory and Calculation

There are two types of curvatures, positive and negative curvature. Positive curvature is the surface structure will be more stable and load distribution will be uniform. Negative curvature the structure will be less stable and more vertical supports needed. The theory is as long as there's positive curvature there's high compression area along the curvature area.

3.1 Mathematical Expressions and Symbols

- **Curve Curvature:**

$$K= \quad 1/R>0,\ K= -1/R<0$$

- **Mean Curvature equation:**

$$H(T) = ½ [K1(T) + K2(T)]$$

4 Results and Discussion

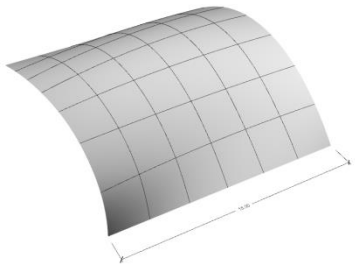
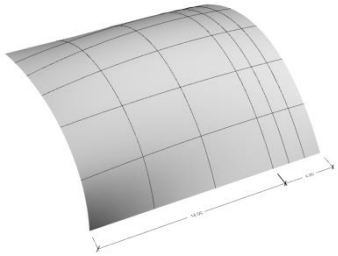
4.1 Surface Construction

We going to see the effect of choosing non-uniform or uniform structure curves for selected surface polysurface (figure 1,2) and polygon mesh (figure 3,4). There's a different surface design approach depends on the CAD application, for this analysis we going to use the Network surface design method. Equal and non-equal construction curve dimension.

Abbreviations:

- PSED (Polysurface equal dimension)
- PMED (Polygon mesh equal dimension)
- PMNED (Polygon mesh not equal dimension)
- CC (Construction Curves)

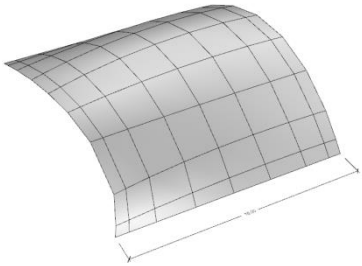
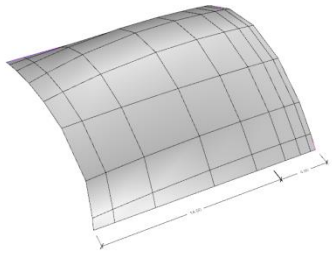
Table 4.1.1: Comparison between PSED and PSNED, using network surface design.

PSED	PSNED
 Figure 1. Polysurface type 1	 Figure 2. Polysurface type 2
Properties: ▪ Network Surface ▪ CC dimension are equal ▪ Two construction curves	Properties: ▪ Network Surface ▪ CC dimension are not equal ▪ Three construction curves

4.1.2

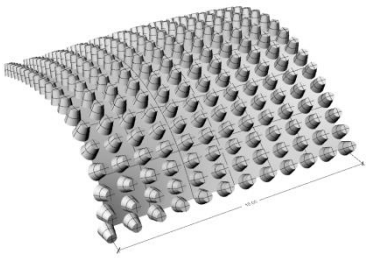
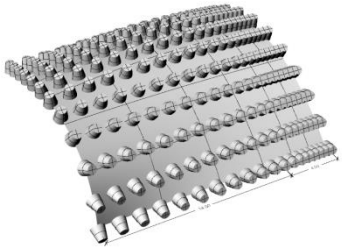
Polygons Mesh

Table 4.1.2: Comparison between PMED and PMNED, converted from polysurface.

PMED	PMNED
 Figure 3. Polygon mesh type 1	 Figure 4. Polygon mesh type 2
Properties: ▪ Network Surface ▪ Two construction curves	Properties: ▪ Network Surface ▪ Three construction curves

4.1 Surface Interaction

Table 4.2.1: Comparison between PSED and PSNED array along the surface.

PSED	PSNED
 Figure 7. Array long PSED	 Figure 8. Array long PSNED
Properties: ▪ The shape is properly aligned	Properties: ▪ Shape not properly aligned

The interaction inside a CAD environment between objects is very important for designers, architects, and engineers. Here we going to see the reaction of two type of surface by applied shape along the surface (figure 7,8).

4.2 Surface Curvature

Table 4.3.1: Comparison between PSED and PSNED, mean curvature analysis.

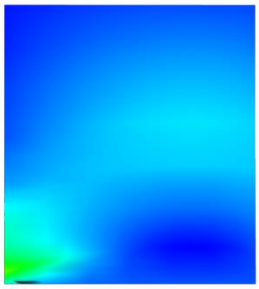
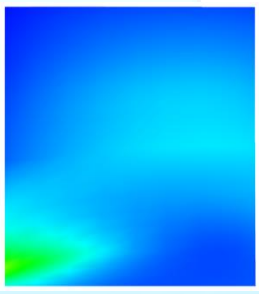
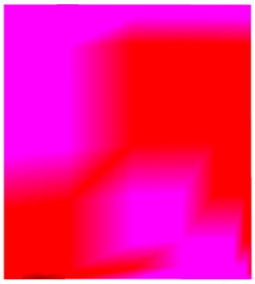
PSED	PSNED
 Figure 9. Top view for PSED curvature analysis	 Figure 10. Top view for PSNED curvature analysis
Properties: ▪ Medium distribution region	Properties: ▪ Large distribution region

Table 4.3.2: Comparison between PMED and PMNED, mean curvature analysis

PMED	PMNED
 Figure 11. PMED curvature analysis	 Figure 12. PMNED curvature analysis
Properties: ▪ Medium distribution region	Properties: ▪ Large distribution region

Curvature analysis is considered as basic steps for analyzing surface and it's structural potential, there's a different type of curvature analysis. For this paper, we going to use Mean curvature analysis (figure 9,10). The degree of curvature is between green and blue, Green considered as max bending and blue considered as minimum bending.**Error! Reference source not found.**

4.3 Surface and Continuity

Continuity of surface is regarded as an important aspect of surface analysis. Black and white lines show how the pattern adapts along the surface, show as a compressed and decompressed zebra pattern (figure 13,14). We can use this analysis to predicate which area of surface needs structural optimization. **Error! Reference source not found.**

Table 4.4.1: Comparison between PSED and PSNED, continuity analysis

PMED	PMNED
 Figure 13. PSED continuity analysis	 Figure 14. PSNED continuity analysis
Properties: There's not much difference between PSED and PSNED.	

4.4 Principal Stress

Table 4.5.1: Comparison between PSED and PSNED, principal stress analysis

PSED	PSNED
 Figure 15. PSED principal stress	 Figure 16. PNSED principal stress
Properties: ▪ Range: -1.078e+7 To 9.853e+6	Properties: ▪ Range: -1.259e+7 To 1.362e+7

Structural stability is considered an important part of analyzing the fabric of any surface. The material used is steel thickness is 560mm. The type of analysis used is principal stress and deflection, the support fixed at the four corners. The light blue shows the compression area and the light red shows the tension areas. [5]

4.5 Curvature and Continuity Comparison

By overlaying figure 9 and figure 13 also overlaying figure 10 and figure 14.

Table 4.4.1: Comparison between PSED and PSNED, continuity and curvature.

PSED	PSNED
 Figure 17. PSED curvature and continuity analysis comparison	 Figure 18. PSNED curvature and continuity analysis comparison
Properties: ▪ High - dense continues line pattern in the light blue and green area ▪ In the middle and the far left down these areas is a high compact curved area ▪ The low dense area in the dark blue. These areas show minimum curved surface	Properties: ▪ High + dense continues line pattern in the light blue area ▪ In the middle and the far left down this area is a high compact curved area ▪ The low dense area in the dark blue. These areas show minimum curved surface

4.6 Conclusion

- Important to consider a different type of surface evaluation and analysis tools and approaches for better surface understanding
- Use equal construction curves methods for more uniform load and stress distribution along with the structure
- Material tests and analysis is very important for design surface evaluation
- Consider the surface construction type to fit your needs
- Tension and surface continuity is important when designing and understanding surface structure
- Uniform tension effect and controlled effect on the surface

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Antibiotic sensitivity patterns of bacterial isolates from semen of male patients attending Al Saleem Medical Laboratory, Benghazi, Libya

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Abstract

Bacteriospermia is progressively difficult and may lead to fertilization. With the increasing global problem of antibiotic resistance of pathogens, proper diagnosis and therapy of the patient are important. Semen specimens were cultured within one hour of specimen collection on blood agar, MacConkey agar plate. They then incubated aerobically at 37 ^{o}C for 24-48 h, whereas chocolate agar cultures were incubated at 5% CO2 candle jar. Isolates were recognized using the growth morphology on the different culture media, motility test, gram staining and biochemical identification tests. The bacterial concentration of greater than 10^3 CFU/ml for certain pathogens and greater than 10^4 for other bacteria species was considered significant. Antibiotic susceptibility testing was done according to the standard Kirby-Bauer disk diffusion method on Mueller Hinton agar and interpreted according to the guidelines of the Clinical and Laboratory Standards Institute. In this study, a total of 249 semen cultures were analyzed, and the positive specimens for bacterial growth after 48 h were 74 (29.7%). Of the 74 isolates, 49 (66.2%) isolates are gram-positive bacteria, and 25 (33.7%) are gram-negative bacteria. *Strep pyogen* (33.8%) constituted the highest bacterial isolate, followed by *E. coli* 28.4%. Males aged between 31 and 41 years old had somewhat high prevalence (24/74:32.4%) of seminal infection. The isolates were most sensitive to Ceftriaxone and ciprofloxacin. The activity of the Clindamycin and Septrin against the isolates was found to be very poor**.** 37.8% of the cases were recorded during the fall seasons, while 23% were in winter. The most isolated age group from which *Strep pyogen* was 31-41. Male genital tract infections often remain asymptomatic; this examination should also include appropriate bacteriological testing of the semen including antibiotic resistance. Ceftriaxone, a 'traditional' antibiotic, continues to have an important place in treating many infectious diseases.

Keywords. Antibiotic, Sensitivity Patterns, Bacterial Isolates, Libya

Introduction

Bacterial infections of the genital tracts or semen are the main causes of male infertility.4 The development of bacterial antimicrobial resistance has made the selection of empirical treatment more difficult and expensive. [1] For this reason, there is a necessity for regular identifying of organisms causing various infections and to describe their antimicrobial susceptibility pattern to commonly used antibiotics at the regional, to guide the clinicians to choose an appropriate antimicrobial for empirical treatment of infections. Microbial infections of the genital tracts or semen are major causes of male infertility. The normal stream of urine maintains [2-3] Sterility of the internal urethra. The male urethra is exposed to a large number of organisms during intercourse, but the physiological conditions have a significant influence on which organisms will be selected out to colonize the area. [4] Not all bacterial organisms cultured from semen should be considered pathogenic. Most gram-positive isolates are considered commensals or normal flora of the distal urethra, while most gram-negative organisms are considered pathogenic when recovered from these specimens. [15] In evaluating a genitourinary tract infection, semen culture is considered a significant diagnostic method as genitourinary tract infections and inflammations are potential causes for male infertility. Therefore, the culturing of semen specimens usually yields growth of organisms, many of which are considered to be normal flora of the genitourinary tract. [2] Aim of this study was to determine the antibiotic sensitivity pattern of bacteria isolated from semen of male patients attending Al saleem Medial Laboratory, Benghazi, Libya.

Material and Methods

2.1 Study area

The study was conducted at the Microbiology Department of Al saleem Medical Laboratory, Benghazi

2.2 Sample collection

Semen specimens were collected from males attending the al saleem Medical Laboratory**.** Semen was collected from patients into a sterile clean wide-mouth container. Upon collection, immediately semen was conveyed to the Microbiology Department**.**

2.3 Culture

Semen specimens were cultured within one hour of specimen collection on blood agar, MacConkey agar plate. They then incubated aerobically at 37ºC for 24-48 h, whereas chocolate agar cultures were incubated at 5% CO2 candle jar. 8-9 The bacterial concentration of more than 10^3 CFU/ml for certain pathogens and more than 10^4 for occasional pathogens was considered significant.

2.4 Identification of bacterial isolates

After obtaining the pure strains, isolated bacteria were recognized using the growth morphology on the different culture media, motility test, gram staining and biochemical identification tests: coagulase, catalase, oxidase, indole production, urease production, Triple sugar iron, citrate utilization, mannitol Salt agar, hydrogen sulphide production, nitrate/nitrite production, methyl red and voges Proskeur.5-6-7

2.4.1 Gram's Stain

The smear was made from the isolate on a clean grease free slide and allowed to air dried and fixed. The smear was flooded with crystal violet as a primary stain and was allowed to stain for 2 minutes and rinsed with water. A mordant (lugol's iodine) was then flooded, allowed to stay for 1 minute, and rinsed with water. A smear was then flooded with secondary stain (neutral red) and was allowed to stain for 2 minutes and then rinsed in water and allowed to air dry. 11

2.4.2 Coagulase test

Staphylococcus spp were further tested for the production of free coagulase enzyme using tube coagulase test. Coagulase test, a drop of plasma was placed on a clean dried slide. A drop of saline was placed next to the drop of plasma as a control. With a loop a portion of the isolated colonies was mixed in each drop starting with the saline until a smooth suspension was obtained. Then, the suspension was mixed well and rocked gently for 5-10 seconds. 10

2.4.3 Oxidase test

A piece of filter paper was moisture with a substrate (1% tetramethyle–p-phenylene-diamine dihydrochloride). A wooden stick was used to remove a small portion of bacterial colony and streak across the wetted filter paper Streaked area on wetted filter paper was observed for the color change to deep blue. 11

2.4.4 Dnase test

Using a sterile loop, test and control organisms (ATCC 2923) were spot-inoculated and incubated at 35-37 overnight. The surface of the plate was covered with 1mol/ml hydrochloric acid solution and excess was tipped off. Clearing around each colony was observed within 5 minutes of adding the acid.11

2.4.5 Analytical profile index (api) 20e test

5ml ample of API Na cl, 0.85% medium, was opened. A single well- isolated colony from an isolation plate was removed using a pipette. To obtain homogeneous bacterial suspension, it was carefully emulsified in 5ml ample of API Na cl 0.85%. Using the same pipette, both tube and cupule of the test CIT, VP and GEL were full with the bacterial suspension. Anaerobiosis was created in ADH, LDC, ODC, H2S, and URE tests by overlaying with mineral oil. The incubation box was closed and incubated at 36° C for 24 hours. 10

2.4.6 Urease test

The surface of the urea slant agar was streaked with a portion of well isolated colonies. The cap of the slant was left on the loose and incubated at 35°C for 18-24 hours.11

2.4.7 Carbohydrate utilization test

0.1ml of a heavy saline suspension of the test organism was added to each of the four tubes containing glucose, lactose, maltose and sucrose carbohydrate disk and no to the fifth tube and was incubated at 37°C for 5 hours. It was examined at 30 minute intervals for up to 5 hours from red to yellow indicating carbohydrate utilization. 12

2.4.8 Citrate utilization test

The surface of the Simmons citrate agar slant was streaked with a portion of a well isolated colony. The cap of the slant was left on loosely and was incubated at 35°C for 18-24 hours.

2.5 Antibiotic susceptibility

Antibiotic susceptibility testing was done according to the standard Kirby-Bauer disk diffusion method on Mueller Hinton agar and interpreted according to the guidelines of the Clinical and

Laboratory Standards Institute. McFarland Standards are used in the antimicrobial susceptibility testing procedure where the bacterial suspension is compared to Standard McFarland, prior to swab on Muller Hinton agar. It is a part of quality control to check and adjust the densities of bacterial suspension that can be used for identification and susceptibility proceeds. However, the used concentration for the antimicrobial susceptibility testing and the culture media performance testing is done by 0.5 McFarland standards in the microbiological laboratory. Using a sterile loop, well isolated colonies of similar morphology was mixed in 3-4ml of sterile normal saline. The turbidity of the standard was matched with the turbidity of the standard, which was viewed against a printed card. Using a sterile swab, a plate of Mueller Hinton agar was inoculated. The swab was streak over the surface of the M-H agar in three directions. And then, the surfaces of the plates were allowed to dry by allowing staying for 3-4 minutes. An appropriate antimicrobial disk was evenly distributed on the inoculated plates. Within 30 minutes of applying the disks. The plates were inverted and incubated appropriately, depending on the organism. After 24h incubation, the control and test plates were examined to certify the growth was confluent or near confluent. Using a ruler a zone of inhibition was measured in mm. 13 Using interpretative tables, the zone sizes of each antimicrobial was measured, reporting the organism as either Sensitive (S) or Resistance (R). 13
The antibiotics tested were ceftriaxone-CRO (30mcg); Levofloxacin- LEV (30 µg); Augmentin AMC (20/10 mcg); imipenem- IMI (10mcg); ciprofloxacin- CIP (5mcg); Gentamycin- CN (10µg); Septrin- SXT (25 µg); Azithromycin- AZI (15mcg); cefotaxime-CTX (30mcg); Tetracycline- TE (30µg); Amikacin- AMK (30 mcg); Clindamycin- DA (2 µg); ceftazidime- CAZ (30mcg); meropenem- MERA (10 mcg); Doxycycline- DO (30mcg).
The data was analyzed by SPSS programs version 20.

Results

In this study, a total of 249 semen cultures were analyzed, and the positive specimens for bacterial growth after 48 hrs were 29.7% (74 / 249).

3.1 Distribution of growth positive cases

The study showed that out of the 249 semen samples cultured in the solid media, 74 yielded bacterial growths, looking at the year distribution 39(52.7%), and 35(47.3%) for year 2020 and 2021 respectively. (Table 1)

Table (1) Distribution of bacteria growth sample n=249

Type of Bacteria growth		Distribution of growth sample	
		No.	%
Growth positive 74 (29.7%)	+	49	66.2
	-	25	33.8
No Growth		175	70.2
Growth by years	2020	39	52.7
	2021	35	47.3

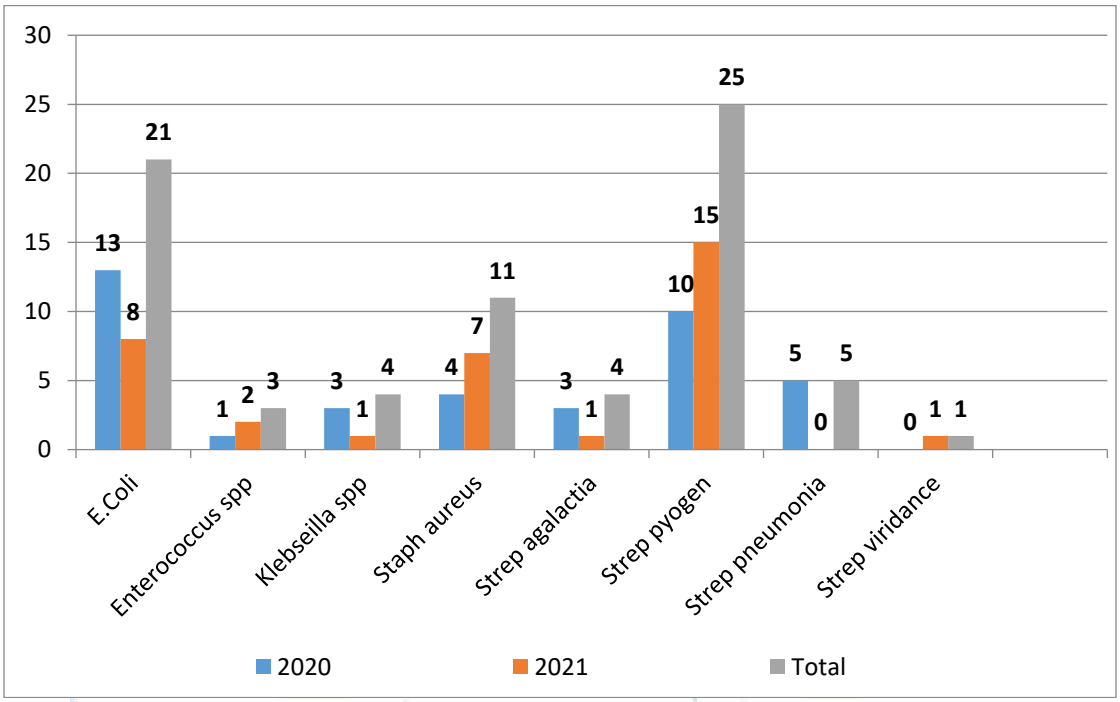

Fig. (1) distribution of Bacteria in this study with variation of two years.

3.2 Various organisms isolated and their frequencies of occurrence

From 74 isolates, 49 (66.2%) isolates are gram-positive bacteria and 25 (33.7%) isolates are gram negative bacteria. *Strep pyogen* (33.8%) constituted the highest bacterial isolate, followed by *E. coli* 28.4%. While *Enterococcus* spp. (4.1%) and *Strep viridance* (1.4%) were the least. (Table 1, and Fig.2)

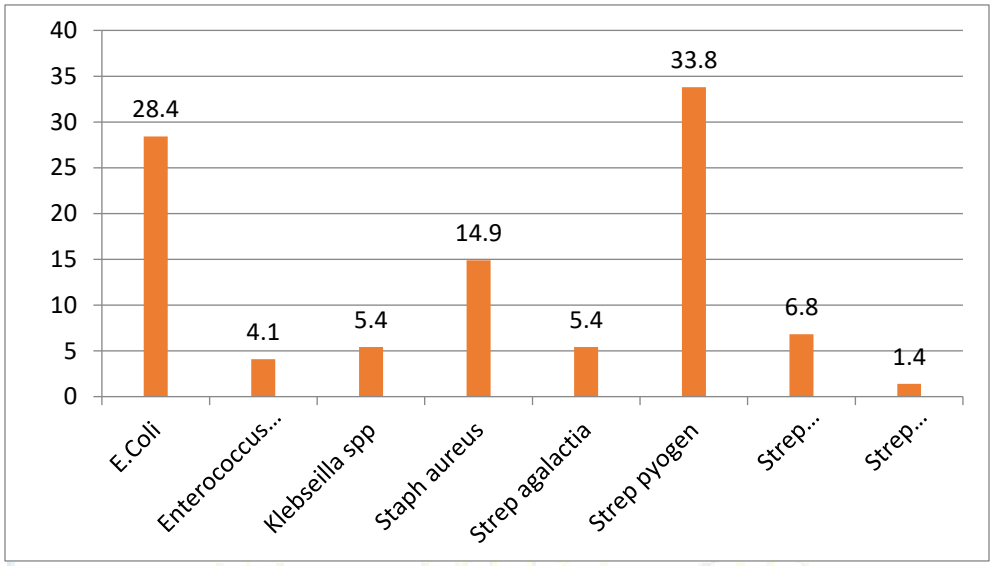

Fig.(2) Various organisms isolated and their frequencies of occurrence**. no=74**

3.3 Distribution of the growth of positive cases by age group

Seminal tract infection and its association with age are presented in figure below, males aged between 31 and 41 years old, had a somewhat high prevalence (24/74:32.4%) of seminal infection. In the age group 64-74 years, the seminal infection is somewhat reduced to (5.4%). (Fig. 3)

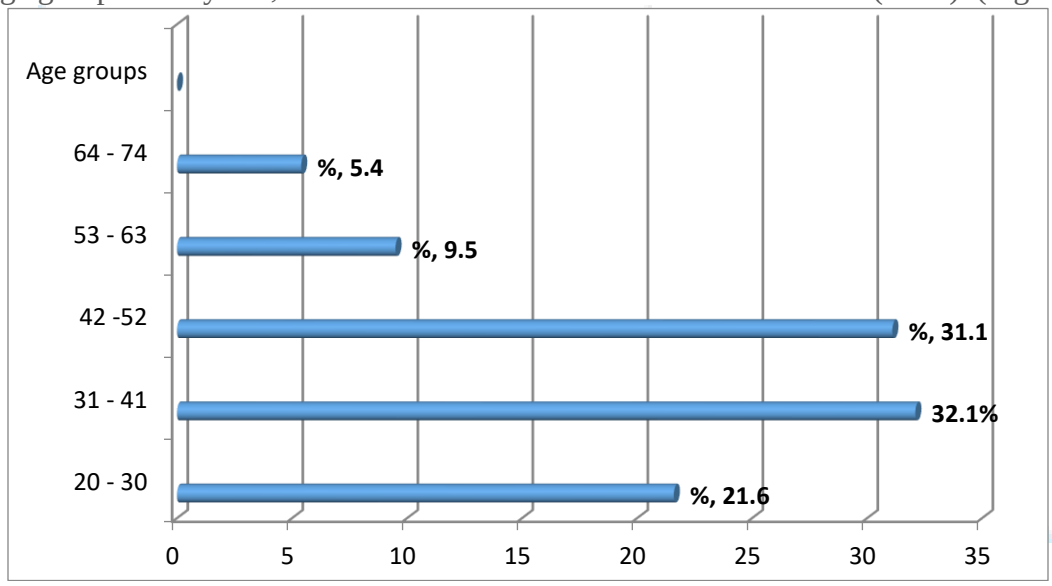

Fig. (3) Distribution of the growth of positive cases by age groups. n=74 %

3.4 Antibiotic sensitivity, resistance and intermediate sensitivity of bacteria isolated from blood culture.

The susceptibility patterns of the bacterial isolates to various antibiotics are presented in Table 2. From the results, the isolates were most sensitive to Ceftriaxone and ciprofloxacin. The activity of the Clindamycin and Septrin against the isolates was very poor. Percentage resistance of isolates to antibiotics Clindamycin and Septrin was 37.8% and 36.5% respectively.

Table. 2 Antibiotic sensitivity, resistance and intermediate sensitivity ofbacteria isolated from semen culture.

Antibiotic type	Susceptibility patterns							
	I		R		S		Missing	
Ceftriaxone	2	2.7	10	13.5	59	79.7	3	4.1
Levofloxacin	0	0.0	12	16.2	45	60.8	17	23.0
Augmentin	3	4.1	16	21.6	49	66.2	6	8.1
Imipenem	1	1.4	5	6.8	41	55.4	27	36.5
Ciprofloxacin	3	4.1	13	17.6	50	67.6	8	10.8
Gentamycin	6	8.1	26	35.1	27	36.5	15	20.3
Septrin	2	2.7	27	36.5	12	16.2	33	44.6
Azithromycin	1	1.4	22	29.7	2	2.7	49	66.2
Cefotaxime	0	0.0	1	1.4	2	2.7	71	95.9
Tetracycline	1	1.4	13	17.6	7	9.5	53	711.6
Amikacin	4	5.4	16	21.6	14	18.9	40	54.1
Clindamycin	1	1.4	28	37.8	11	14.9	34	45.9
Ceftazidime	0	0.0	3	4.1	6	8.1	65	87.8
Merapenem	0	0.0	5	6.8	13	17.6	56	75.7
Doxycycline	4	5.4	13	17.6	8	10.8	49	66.2

Note: I: Intermediate; R: Resistant; S: Sensitive.

3.5 Antibiotic susceptibility profile of bacterial isolates.

In the present study, *Strep pyogen* was found to be susceptible to Augmentin with, followed by Ceftriaxone, Imipenem and Ciprofloxacin. *E. coli* are highly sensitive to Ciprofloxacin with percent, followed by Ceftriaxone and Levofloxacin. Whereas, *Klebseilla* spp. was sensitive to Levofloxacin and Ceftriaxone. (Table 3).

Table. 3 Antibiotic susceptibility profile of bacterial isolates.

Antibiotic susceptibility		Type of Bacteria							
		E. coli	Enterococcus spp	Klebseilla spp	Staph aureus	Strep agalactia	Strep pyogen	Strep pneumonia	Strep viridance
Ceftriaxone	I	0	0	1	0	0	1	0	0
	R	2	0	0	5	0	3	0	0
	S	18	2	2	6	4	20	5	1
Levofloxacin	I	0	0	0	0	0	0	0	0
	R	1	1	0	1	1	6	1	1
	S	17	2	4	3	2	14	3	0
Augmentin	I	1	1	0	0	0	1	0	0
	R	10	0	4	0	0	1	1	0
	S	8	2	0	8	4	22	4	1
Imipenem	I	1	0	0	0	0	0	0	0
	R	5	0	0	0	0	0	0	0
	S	11	3	1	4	4	16	2	0
Ciproflox acin	I	0	0	0	0	0	2	1	0
	R	1	1	0	1	2	6	2	0
	S	20	2	2	8	1	16	1	0
Centamycine	I	3	0	2	0	0	0	1	0
	R	1	3	0	2	3	14	3	0
	S	11	0	2	6	0	7	1	0
Septrine	I	1	1	0	0	0	0	0	0
	R	5	0	2	3	1	13	2	1
	S	5	0	1	5	0	1	0	0
Azithromycine	I	0	0	0	0	0	0	1	0
	R	1	1	0	9	2	8	0	1
	S	0	0	0	0	1	1	0	0
Cefotaxime	I	0	0	0	0	0	0	0	0
	R	0	0	1	0	0	0	0	0
	S	1	0	0	0	1	0	0	0
Tetracycline	I	0	0	0	0	0	1	0	0
	R	3	0	1	4	0	4	0	1
	S	1	0	0	2	1	3	0	0
Amikacin	I	4	0	0	0	0	0	0	0
	R	0	1	0	0	1	11	3	0
	S	6	1	1	3	0	3	0	0
	I	0	0	1	0	0	0	0	0

Clindamycin	**R**	12	1	0	1	1	13	0	0
	S	0	2	0	0	2	2	4	1
Ceftazidime	**I**	0	0	0	0	0	0	0	0
	R	0	0	0	1	1	1	0	0
	S	2	0	0	1	0	2	1	0
Merapenem	**I**	0	0	0	0	0	0	0	0
	R	0	0	1	1	0	3	0	0
	S	3	0	1	5	0	4	0	0
Doxacyline	**I**	3	0	0	0	0	1	0	0
	R	5	0	2	0	1	2	3	0
	S	2	1	1	1	0	1	1	1

3.6 Distribution of the growth of positive cases by seasons

37.8% of the **positive** cases were recorded during the fall season (9-11 month), followed by 23% in months of December up to February, winter months.

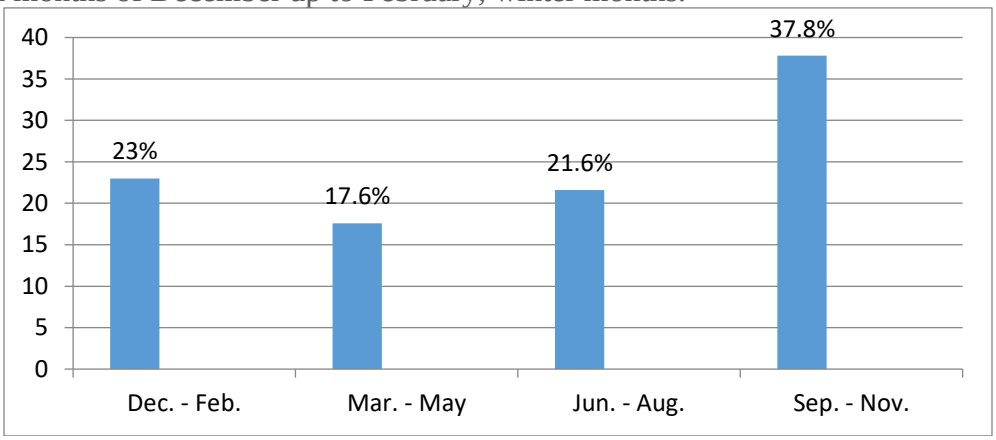

Fig. (4) Distribution of the growth of positive cases by seasons. n =74.

3.8 Distribution of isolates type of bacteria by ages

The most isolated bacteria age group from which *Strep pyogen* was among 31-41, followed by 42-52 age groups as the sample used for this study. However, the result show that the age groups more effected is 31-52 years old presenting 31.1 and 32.4% respectively.

Table. 4 Distribution of isolates by ages.

Bacteria	Age										Total	
	20-30		31-41		42-52		53-63		64-74			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
E. coli	5	23.8	6	28.6	8	38.1	2	9.5	0	0.0	21	28.4
Enterococcus spp.	1	33.3	0	0.0	1	33.3	0	0.0	1	33.3	3	4.1
Klebseilla spp.	0	0.0	0	0.0	3	75.0	1	25.0	0	0.0	4	5.4
Staph aureus	1	9.1	4	36.4	3	27.3	1	9.1	2	18.2	11	14.9
Strep agalactia	2	50.0	2	50.0	0	0.0	0	0.0	0	0.0	4	5.4
Strep pyogen	6	24.0	10	40.0	6	24.0	2	8.0	1	4.0	25	33.8
Strep pneumonia	0	0.0	1	20.0	3	60.0	1	20.0	0	0.0	5	6.8
Strept viridance	1	100	0	0.0	0	0.0	0	0.0	0	0.0	1	1.3
Total	**16**	**21.6**	**23**	**31.1**	**24**	**32.4**	**7**	**9.5**	**4**	**5.4**	**74**	**100.0**

4.9 Distribution of bacteria's isolate variation of months of the year.

The highest of isolation of *Strep pyogen* was between months of 6-8, followed by months of 3-5, while *E.coli* was higher in the months of 9 – 11, and for *staph aureus* was more during months of December up to February, as shown in table 5.

Table. 5 Distribution of isolates by months

Type of Bacteria	Month									
	12-2		3-5		6-8		9-11		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
E. coli	5	23.8	4	19.0	2	9.5	10	47.6	21	28.4
Enterococcus. Spp.	2	66.7	0	0.0	0	0.0	1	33.3	3	4.1
Klebseilla. Spp.	0	0.0	0	0.0	1	25.0	3	75.0	4	5.4
Staph aureus	4	36.4	2	18.2	2	18.2	3	27.3	11	14.9
Strep agalactia	1	25.0	0	0.0	0	0.0	3	75.0	4	5.4
Strep pyogen	3	12.0	7	28.0	9	36.0	6	24.0	25	33.8
Strep pneumonia	2	40.0	0	0.0	1	20.0	2	40.0	5	6.8
Strep viridance	0	0.0	0	0.0	1	100	0	0.0	1	1.4
Total	17	23.0	13	17.6	16	21.6	28	37.8	74	100.0%

3.10 Distribution of isolates by years.

The most frequent of bacteria types occurrence of *strep pyogen* was in 2021 as 42.8%, while the highest frequency of *E. coli* was observed in 2020 as 33.3%, while in overall the occurrence in year was almost equal, as shown in table 6.

Table. 6 Distribution of isolates by years.

Bacteria	Years					
	2020		2021		Total	
	No.	%	No.	%	No.	%
E. coli	13	33.3	8	22.9	21	28.4
***Enterococcus* spp.**	1	2.6	2	5.7	3	4.1
***Klebseilla* spp.**	3	7.7	1	2.9	4	5.4
Staph aureus	4	10.2	7	20.0	11	14.9
Strep agalactia	3	7.7	1	2.9	4	5.4
Strep pyogen	10	25.6	15	42.8	25	33.8
Strep pneumonia	5	12.8	0	0.0	5	6.8
Strep viridance	0	0.0	1	2.9	1	1.4
Total	39	52.7	35	47.1	74	100.0

Discussion

The microbial isolates obtained from seminal fluids analyzed in the laboratory are presented in Table 2. The result shows a total of seventy-four (74) isolates were obtained. This agrees with the works of Nasiru *et al*. 14 who reported similar findings in their researches.

The present study reported the prevalence of infection was highest amongst men aged 31 - 40 years. This result is similar to these reported by Nwofor *et al*. The isolates were classified into eight different isolates. *Strep pyogen* was found to have the highest occurrence 25 (33.8%). Other microorganisms encountered include; *E. coli* 21(28.4%), *Staph aureus* (14.9%), *Strep pneumonia* 6 (6.8%), *Strep agalactia, Klebseilla* spp 4 (5.4%) equally, *Enterococcus* spp 3 (4.1%) and *Strep viridance* 1 (1.4%).

In our study, from 74 isolates, 72 (66.2%) isolates are gram-positive bacteria and 25 (33.7%) isolates are gram negative bacteria. Yasser ***et al.*** also reported, 108 isolates, 72 (66.6%) isolates are gram-positive bacteria and 36 (33.3%) isolates are gram negative bacteria.

Gram positive bacteria, specifically *Strep pyogen* was commonly isolated in this study. This result is similar to those reported by Uneke and Ugwuoru and Yasser *et al.*, 30Nwho stated that *Strep pyogen* was the commonest bacteria isolated.

Staph aureus was the second gram positive isolated in the present study as earlier reported from other studies. 26-30 The detection of *Staph aureus* from seminal fluid specimens was recognized. They were identified in the main colonies adherent to the prostatic duct walls. 32 Bergman

demonstrated that gram positive Staphylococci species were found in significant numbers in 43% of patients with symptoms of prostatitis.

As previously reported from other studies, S Gram negative bacterial isolates compiled 16/74(21.6%) were *E. coli* 21/74(28.4%) and *Klebseilla pneumonia*.27-28 This is contrary to a study, which reported that *Klebseilla pneumonia* was the most frequently isolated bacteria followed by *E. coli.*

Another frequently recognized bacterial species were *Escherichia coli*, *E. coli* are considered the most common non-sexually transmitted urogenital tract microbes. These pathogens cause epididymitis, epididymo-orchitis, or prostatitis and increase seminal leukocyte concentrations.

In the current study, the susceptibility patterns of the isolates to various antibiotics showed that the isolates were most sensitive to Ceftriaxone and Ciprofloxacin. These two antibacterial agents are fluoroquinolones that have been used regularly since 1980. The application of FQs is in the treatment of sexually transmitted diseases.

The antibacterial mechanism of CPFX is based on the inhibition of the bacterial type II topoisomerase/DNA gyrase enzyme.5 The cross-reactivity of fluoroquinolones, including CPFX with mammalian topoisomerase II has been reported previously. 18 Whereas ciprofloxacin has been used extensively because of its improved stability against traditional β-lactamases.

Studies related to the cytotoxic effects of CPFX revealed that this antibacterial agent inhibits the growth of various cultured mammalian cells. 21 Cellular DNA damage and chondrotoxicity were reported to be induced by the CPFX.

Impairment in testicular function and structure have been approved to be caused by CPFX .

Ceftriaxone is used to treat various community-acquired infections; it has the advantages of only requiring a once-daily administration and can be used as an intravenous or intramuscular injection for outpatients in an appropriate pharmacological manner. Ceftriaxone is also thought to play a role in activating bacterial cell autolysins which may contribute to bacterial cell lysis. Resistance to ceftriaxone is primarily through hydrolysis by beta-lactamase, alteration of penicillin-binding proteins (PBPs), and decreased permeability.

Sulphamethoxazole unaccompanied significantly decreases progressive motility of human spermatozoa in vitro only at extremely high concentrations (5 mg/ml). 25 The activity of the Clindamycin and Septrin against the isolates was found to be very poor. Moreover, the poor activity of Clindamycin and Septrin may be partly influenced by the widespread abuse of these agents in Benghazi city.

E. coli isolated in this study were moderately sensitive to Amikacin, Gentamycin and Doxycycline (4%) equally. But *E. coli* was resistance to many antibiotics Clindamycin (16.2%) and Augmentin (13.5%). This resistance could be interpreted depending on the fact that many strains of *E. coli* have acquired plasmids conferring resistance to one or more than one type of antibiotics. Therefore antimicrobial therapy should be guided by laboratory result test of sensitivity.

K.pneumoniae carry resistance genes to other antibiotics including septrin and clindamycin. 35 In addition, these plasmids are movable genetic elements and can be transmitted between gram negative bacilli of different species in vivo. 36 The plasmid from *K. oxytoca* spread to *K. pneumonia* and *E. coli.*

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper

Conclusion

The present study's sensitivity and resistance patterns in all isolates revealed that Clindamycin and Septrin were slightly effective while Ceftriaxone and ciprofloxacin showed higher efficacy. There was a common increase in the resistance pattern of isolates to all the antibiotics used in this study. The recent results clarify that bacterial resistance was a high and alarming problem in our area.

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Bacterial pathogens in semen culture and their in vitro antibiotic susceptibility pattern

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Abstract

Background: Bacterial infections, which can agglutinate and thus immobilize spermatozoa, play a role in the etiology of male infertility. The purpose of this study was to identify the bacterial species that cause semen infection and their antimicrobial susceptibility in infertile AL-ZAWIA men. **Methods**: This study enlisted the participation of 50 infertile men. Each participant's sperm was collected in a sterile container via masturbation or coitus interruptus. The sperm samples were collected and processed using standard microbiology techniques for routine culture and antibiotic susceptibility testing. Gentamicin, Nitrofuradantion, Ciprofloxacin, Ceftriaxone, Trimethoprim, Norfloxacine, Tobramycin, Amikacin, Amoxicillin, Ceftazidime, Cefoxitine, Augmentin, Imipenem, and Nalidixic acid were the antibiotics used in the sensitivity test. **Results**. Among gram-negative bacterial isolates, E. coli was found highly susceptible to imipenem (73%), followed by Gentamicin. P. aeruginosa showed sensitivity to ciprofloxacin, Tobramycin, Gentamicin, Augmentin, and norfloxacin. **Conclusion**: Imipenem was found to be the best antibiotic for both gram-positive and gram-negative bacteria and can be used empirically to treat men with semen bacterial infection.

Keywords: Antibiotic sensitivity, infertility, semen culture.

Introduction

The human Semen has been defined as a mixture of spermatozoa and fluids. During ejaculation, spermatozoa are mixed with and diluted by fluid secretions from accessory sex organs like the bulbourethral, urethral, and prostate glands, which are formed from a concentrated suspension stored in the paired epididymis (1). Each of the glands and organs that contribute to the semen sample is treated as a separate sterile area. Although the internal urethra's sterility is mostly maintained by normal urine flow, the distal urethra is not regarded as a sterile location, therefore culture semen samples frequently result in the development of organisms, many of which are considered normal genitourinary tract flora. (2)

In societies where having children is highly valued, infertility is a serious emotional and social problem. Primary and secondary infertility affects approximately 20.0 to 30.0 percent of African couples. The most affected areas are in central Africa, which is known as Africa's infertility belt. [8] Human infertility is becoming an increasingly serious issue. According to World Health Organization (WHO) surveys, nearly 15–20 percent of couples are unable to conceive, with men accounting for 45.0 percent of the problem. [9] About 25.0 percent of couples do not become pregnant within a year, 15.0 percent seek medical treatment for infertility, and less than 5.0 percent remain childless unwillingly. Malefactors contribute to infertility in 50.0 percent of involuntarily childless couples. [10]

Male fertility can be reduced as a result of the following factors: 1. Congenital or acquired urogenital abnormalities. 2. Infections of the urogenital tract. 3. Rise in scrotal temperature (Consequence of varicocele). 4. Endocrine problems. 5. Genetic abnormalities. 6. Immunological factors. [11]

Bacterial infection of the reproductive tract organs can impair sperm production or cause scarring and blockage of the sperm transport tubules, resulting in infertility. Orchitis can prevent sperm production by clogging the tiny testicular tubules where sperm is produced (seminiferous tubules). Epididymitis interferes with sperm maturation and can obstruct sperm transport. Because the prostate produces approximately 40.0 percent of the fluid in the ejaculate, prostatitis may prevent the release of fluid from the prostate, resulting in a decrease in ejaculate volume. The vesiculitis often occurs secondary to prostatitis and is mostly caused by Staphylococcus aureus, Streptococcus species, and Escherichia coli.[12]

Semen culture is a significant investigative process used as a probable reason for infertility to exclude infection. It is in addition used to exclude bacterial prostatitis and accessory gland infections. For in vitro fertilization or intrauterine fertilization, sperm culture is particularly useful. (3)

These infections can account for as much as 15 percent of male infertility. It is important to note that acute and chronic infections and inflammation in the male reproductive systems can interfere with the spermatogenic process and sperm cell function. It has been shown that bacteria in semen can come from the urinary tract of patients or be transmitted to a partner through sexual contact.

Prostatitis and epididymitis are most commonly caused by E. coli, the most common microorganism. It has been reported that E. coli agglutinates and immobilizes sperm. "E. coli inhibits male sperm motility through direct adhesion to and aggregation of the male sperm, as Diemer and colleagues (1996) reported. (4)

Materials and Methods

This cross-sectional analytical study was conducted during the period from March 2021 to October 2021 to determine the bacterial causes of seminal infection and their antimicrobials susceptibility pattern among infertile males from patients attending the fertility and urology clinics of IBN AL-NAFFES medical laboratory in AL-ZAWIA, 50 samples of semen were collected.

The age was between 20-and 60 years (average 40Y). All men were deprived of any medication in the past 3 months. After three days of no ejaculation, the patients return to the lab for a sample collection. They were then given oral and written instructions that included, the must to pass urine, wash their hands and penis with soap, and rinse the soap off before collecting samples. They ejaculated into sterile wide-mouth universal containers (1).

For routine culture and antibiotic susceptibility testing, semen samples from infertile men were collected and processed according to standard laboratory methods.

In addition to its acceptability, the sample was evaluated in terms of its labeling and proper labeling (full name, age, serial number of the patient, date, and time of collection) (5). On blood agar and MacConkey agar, semen samples were cultured. Inoculation was performed within 1 hour of specimen collection and cultures were incubated aerobically at 37°C for 24-48 h, while chocolate agar cultures were incubated at 5% percent CO2 via a candle jar. Colony morphology, Gram staining, and biochemical tests were used to recognize pathogens with a concentration

greater than 10^3CFU/ml for certain pathogens and greater than 104 for occasional pathogens (6).

Kirby-Bauer disk diffusion method on Mueller Hinton agar was used to test antibiotic susceptibility. The results were interpreted according to the guidelines of the Clinical and Laboratory Standards Institute (CLSI).

Gram-positive bacteria and Gram-negative bacteria treated with Gentamicin, Nitrofuradantion, Ciprofloxacin, Ceftriaxone, Trimethoprim, Norfloxacine, Tobramycin, Amikacin, Amoxicillin, Ceftazidime, Cefoxitine, Augmentin, Imipenem and Nalidixic acid were the antibiotics used in the sensitivity test. (7)

Results

A total of 29 (58%) of the 50 semen samples tested were found to have significant levels of bacterial growth. 16 isolates were gram-negative and 13 isolates were gram-positive. 68.96 percent of culture-positive cases were found in the 20- to-30-year-old age group, followed by the 31-40-year-old (24.13) and 41-60-year-old age groups (6.8 percent). The most common bacterial species isolated were Escherichia coli (52%).

Among gram-positive organisms, S. aureus was found 92% sensitive to Augmentin followed by Imipeneme and Nitrofuradantion.

Among gram-negative bacterial isolates, E. coli was found highly susceptible to imipenem (73%), followed by Gentamicin. P. aeruginosa showed sensitivity to ciprofloxacin, Tobramycin, Gentamicin, Augmentin, and norfloxacin.

Table 1: Shows the Bacteria Isolated From Semen And Their Frequent

Samples	frequency	%
No growth	21	42
Positive	29	58
Total	50	100

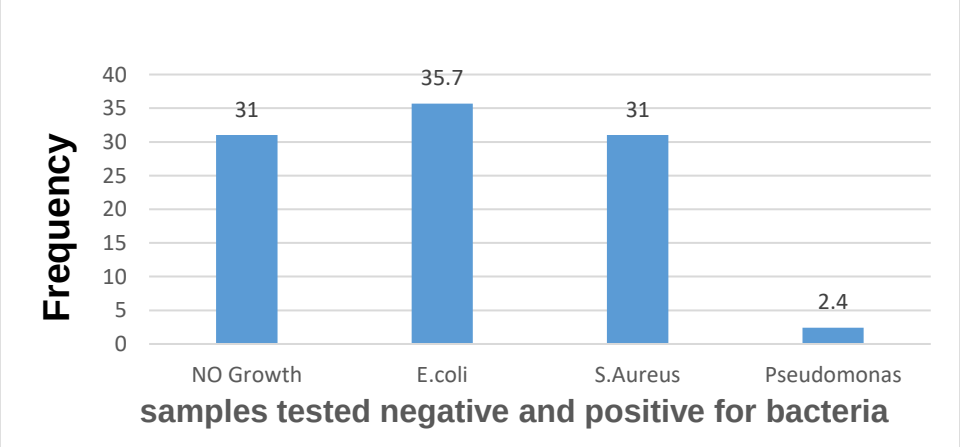

Figure 1. In 50 semen samples tested, 58% were found bacteria, and 42% did not find bacteria

Table 2: Distribution of bacteria isolated from the participant's semen according to age

Age group	Total of isolates	*Escherichia coli*		*Staphylococcus aureus*		*Pseudomonas aeruginosa*	
		F	%	F	%	F	%
20-30	20(68.96%)	10	50	9	45	1	5
31-40	7(24.13%)	3	43	4	57	0.00	0.00
41-50	1(3.44%)	1	100	0.00	0.00	0.00	0.00
51-60	1(3.44%)	1	100	0.00	0.00	0.00	0.00
Total	29	15	52	13	44.6	1	3.4

*** F= Frequency. % = Percent**

Table 3: Antibiotic sensitivity pattern of Gram-negative and Gram-positive bacterial isolated from seminal fluid

Antibiotic	*Escherichia coli* (n =15)			*Staphylococcus aureus* (n =13)			*Pseudomonas aeruginosa* (n =1)		
	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)
Nitrofurantoin(F)	46,7	13,3	40	69,2	23,1	7,7	0	100	0
Gentamicin(CN)	66,7	33,3	0	61,5	30,8	7,7	100	0	0
Trimethoprim(SXT)	13,3	46,7	40	30,8	30,8	38,4	0	100	0
Norfloxacin (NOR)	20	33,3	46,7	23,1	53,8	23,1	100	0	0
Tobramycin(TOB)	40	60	0	46,2	53,8	0	100	0	0
Ciprofloxacin(CIP)	26,7	66,7	6,6	46,1	38,5	15,4	100	0	0
Ceftriaxone (CRO)	33,3	46,7	20	38,5	23	38,5	0	100	0
Amikacin (AK)	60	40	0	61,5	38,5	0	100	0	0
Amoxicillin (AX)	6,7	6,7	86,6	0	0	100	0	0	100
Ceftazidime(CAZ)	13,3	40	46,7	7,7	7,7	84,6	0	100	0.00
Cefoxitin (CTX)	40	46,7	13,3	61,5	23,1	15,4	0	100	0.00
Augmentin (AMC)	40	46,7	13,3	92,3	7,7	0	100	0.00	0.00
Imipenem	73,3	20	6,6	84,6	15,4	0	0	0	100
Nalidixic acid (NA)	0	40	60	0	61,5	38,5	0	100	0

* n= Number, S = Sensitive, I = Intermediate, R = Resistant.

Discussion

In this study, 58% of semen culture was found with significant bacterial growth. Gram-negative bacteria (55,2%) include E. coli and Pseudomonas. These bacteria are associated with epididymitis, orchitis, and prostatitis, suggesting that they may have a role in infertility (13). Gram-positive cocci (44,8%) including Staphylococci are associated with Prostatitis and epididymitis has been associated with this bacterium, suggesting that they may have a role in infertility too (13).

The bacterial isolated E. coli (52%) followed by Staphylococcus aureus (44,6%) and Pseudomonas aeruginosa (3,4%). Similar studies conducted by other researchers found that E. coli (41,9) was the highest prevalent bacteria isolated (5). Other studies found Staphylococcus aureus (77.8%) was the most predominant isolate (12).

In our study, *E Coli* was found susceptible to Imipenem (73,3%), followed by gentamycin (66,7%), Amikacin (60%), and Nitrofurantoin (46,7), *S. aureus* was found susceptible to Augmentin (92,3%), Imipenem (84,6%), and Nitrofurantoin (69,2%), *Pseudomonas aeruginosa* was found susceptible to gentamycin (100%), Augmentin (100%). Our results principally are consistent with the previous studies on the effect of bacterial infection on sperm (5).

Conclusion

In our study, we examined the effect of treating with an empiric antibiotic scheme for both partners in a sample of infertile. showed that 66,7 % of semen culture in the age group between 20 and 30 years was found to be bacterial pathogens. *E. coli* followed by *S. aureus* 69,2%, *Pseudomonas aeruginosa* 100%. Imipenem was found to be the best antibiotic for both gram-positive and gram-negative bacteria and can be used empirically to treat men with semen bacterial infection.

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Prevalence of Thyroid disorders in chronic kidney disease patients under regular Hemodialysis at Brack ALshati General hospital

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Abstract

Thyroid hormones (TH) play an important role for growth and development of kidneys and glomerular filtration rate (GFR). On the other side; Kidney has critical role in the metabolism and degradation of thyroid hormones. Endocrine disorders are highly common complications of chronic kidney disease, including CKD patients on dialysis. The main purpose of this study was to evaluate the prevalence of thyroid disorders in patients undergo haemodialysis in dialysis centre at Brack-Alshati General hospital. They were 50 patients (27 males and 23females) attended the dialysis centre, blood samples were collected from all of them before dialysis for estimation of thyroid hormone levels (including serum thyroxin (T4), triiodothyronine (T3) and thyroid-stimulating hormone (TSH)) and kidney function tests (urea, creatinine and uric acid). The results show that; the mean age of the participants were 45.08 ± 16.7 years, the mean concentrations of T3, T4 and TSH were 0.959 ± 0.23 ng/ml, 55.39 ± 16.05 ng/ml and 2.99 ± 2.00 µU/l respectively. The prevalence of hypothyroidism among them was 38%. We concluded that there is a high prevalence of hypothyroidism among chronic kidney patients undergoing dialysis in Brak -Al Shati general hospital.

Keywords: Thyroid disorders, chronic kidney disease, hypothyroidism, dialysis

INTRODUCTION

Chronic kidney disease (CKD) is a major public health concern, that affects approximately 16 %of the population worldwide. CKD is characterized by a progressive decline in the GFR of less than 60 mL/min/1.73 m, albuminuria of at least 30 mg per 24 hours, or signs of kidney damage (eg, haematuria or structural abnormalities such as polycystic or dysplastic kidneys) persisting for more than 3 months[1, 2].

Thyroid hormones (TH) are important for growth and development of kidney, glomerular filtration rate (GFR), renal transport systems, and sodium and water homeostasis[3]. On the other hand; kidneys have an important role in the metabolism and degradation of thyroid hormones[4].

Endocrine disorders are common complications among patients with chronic kidney disease, including those on dialysis, on the other side; chronic kidney disease shows multiple endocrine and metabolic effects, one of the most common ones is hypothyroidism and nodular goitre[5].

CKD affects both hypothalamus–pituitary–thyroid axis and TH peripheral metabolism. Uraemia influences the function and size of the thyroid, and uremic patients have an increased thyroid volume and a higher prevalence of goitre compared with subjects with normal renal function, also, thyroid nodules and thyroid carcinoma are more common in uraemic patients than in the general population[3]. CKD affects thyroid function in multiple ways including low circulating thyroid hormone concentration, altered peripheral hormone metabolism, decreased plasma protein levels and increased iodine store in thyroid glands[6]. The previous study suggested that increased serum levels of toxic compounds in hemodialysis patients leads to decreased serum levels of thyroid hormones and thus thyroid damage[7]. Study in Cairo, Egypt demonstrated that, thyroid gland volume was significantly larger in haemodialysis patients than controls, and the prevalence of thyroid lesions was 35% among patients, especially in female patients[4]. Other study in India found the prevalence of subclinical hypothyroidism among the hemodialysis patients was 24% and subclinical hyperthyroidism was 6%[6].Our study was designed to evaluate the prevalence of Thyroid disorders in hemodialysis patients attending dialysis centre in BrackAlshati general hospital, Libya, and to investigate the relation between thyroid hormones and other parameters.

Material and Methods

This study was carried out in Dialysis centre at BrackAlshati general hospital, from September 2021 to October 2021. Questionnaire were collected from all the patients at the centre, whose were 50 patients (27 males and 23 females), their ages were arranged from 15 to 85 years and undergo haemodialysis treatment. Demographic information (name, age, gender, thyroid history duration of CKD and dialysis) were recorded for them. Blood samples were collected, serum samples were separated from blood cells by centrifugation at 3000 RPM for 10 minutes, and divided into two parts, one used for measurement of Thyroid hormones (T4, T3, TSH) using iFlash Immunoassay Analyzer kit, the second one used for assessment of serum Urea, Creatinine and uric acid using Selectra pro M chemistry system.

Statistical Analysis: Data analysis was conducted in statistical package for social sciences (SPSS) version 19.0, Means and standard Deviations were calculated for variables (age, duration of CKD, Thyroid hormones levels, Urea, Creatinine and Uric acid levels). Person correlation used to show the relation between variables.

Results

The mean age of the study group was 45.08 ±16.7years (mean ± SD), their mean body mass index (BMI) was 23.95 ± 6.18 kg/m2, and mean duration of CKD was 3.3 ± 1.42 years. The mean concentrations of thyroid hormones and kidney function tests are shown in table (1).

Table 1: Characteristic parameters of the study group.

Characteristics	Study Group (Mean ± SD)
Gender(M/F)	27/23
Age (years)	45.08 ±16.7
Body Mass Index(kg/m²)	23.95 ± 6.18
Duration of CKD (years)	3.3 ± 1.42
T4(ng/ml)	55.39 ± 16.05
T3(ng/ml)	0.959 ± 0.226
TSH(µU/ml.)	2.99 ± 2.00
Urea(mg/dl)	97.47 ± 26.32
Creatinine (mg/dl)	8.39 ± 2.18
Uric acid (mg/dl)	5.9 ± 1.27

Study group were divided based on sex to 27 males (54%) and 23 females (46%). both genders exhibited similar pattern of T4, TSH concentrations and biochemical parameters, as the results demonstrated no difference between them using two sample t-test (P- value was more than 0.05), except for T3, where it was significantly lower in males than in females (p=0.002), as shown in table (2).

Table 2: Parameters of the study group according to gender.

Variables	Female (23)	Male (27)	p- value
	Mean ± SD		
Age (years)	42.7 ± 19.52	47.0 ± 13.9	0.38
BMI (kg/m^2)	23.41 ± 6.19	24.0 ± 6.20	0.91
T4 (ng/ml)	59.98 ± 18.1	51.48 ± 13.16	0.06
T3 (ng/ml)	1.06 ± 0.25	0.865 ± 0.15	0.002*
TSH (µU/ml.)	2.86 ± 1.74	3.26 ± 2.21	0.31
Urea (mg/dl)	94.26 ± 21.2	100.2 ± 30.13	0.41
Creatinine (mg/dl)	8.19 ± 2.19	8.55 ± 2.19	0.65
Uric acid (mg/dl)	6.04 ± 0.86	5.77 ± 154	0.48

*significant difference (p value lees than 0.05)

Therefore, the whole study group divided based on the level of TSH hormone, as the master for diagnosis of thyroid disorders, into three groups, high TSH (TSH ≥ 5.1 µU/ml) group1, normal TSH (TSH 0.3 - 5.0 µU/ml) group 2, low TSH (TSH ≤ 0.3 µU/ml) group 3. Data analysis demonstrated that, 8 (16%) patients had high TSH level, 42 (84%) had normal TSH concentration and none of them had low TSH level. Out of 8 patients with high TSH concentration, 4 had low T4 level, and 4 had normal T3 & T4 level. On the normal TSH level, 11 patients had low T3 and T4 levels with normal TSH level, as a result; the prevalence of hypothyroidism among study group was 38% as shown in table (3).

Table (3): Absolute and relative frequencies of thyroid functional disorders among study group.

Thyroid disorder	(N)	(%)
Euthyroid	31	62%
Clinical hypothyroidism	4	8%
Subclinical hypothyroidism	4	8%
Low T4& T3	11	22%

Pearson correlation analysis was done to demonstrate the relation between urea, Creatinine, uric acid, duration of CKD and thyroid hormones, a significant negative correlation was found between T4 level and creatinine (r = -0.388; p = 0.005), and between T3 level and age (r = -0.369; p = 0.008) as shown in table (4) and figures (1 &2).

Table (4): Correlation between Thyroid hormones and other parameters.

	T4	T3	TSH
Age(years)	r=0.191, P=0.184	r =-0.369, P=0.008*	r =0.222, P=0.121
BMI(kg/m²)	r=-0.030, P=0.843	r=-0.223, P=0.132	r =0.030, P=0.840
Duration of haemodialysis(years)	r=-0.245, P=0.087	r =0.038, P=0.796	r =-0.068, P=0.636
Urea(mg/dl)	r=0.750, P=0.046	r =-0.055, P=0.706	r=0.253, P=0.076
Creatinine(mg/dl)	r=-0.388, P=0.005*	r =-0.001, P=0.995	r=-0.20, P=0.163
Uric acid(mg/dl)	r=0.107, P=0.461	r =0.029, P=0.841	r=-0.04, P=0.784

* significant correlations.

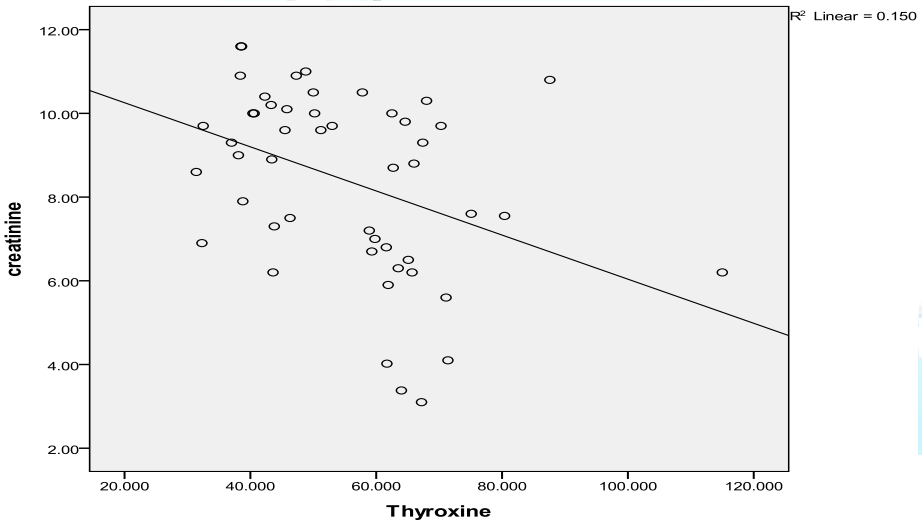

Fig. 1: Pearson's correlation between T4 and Creatinine.

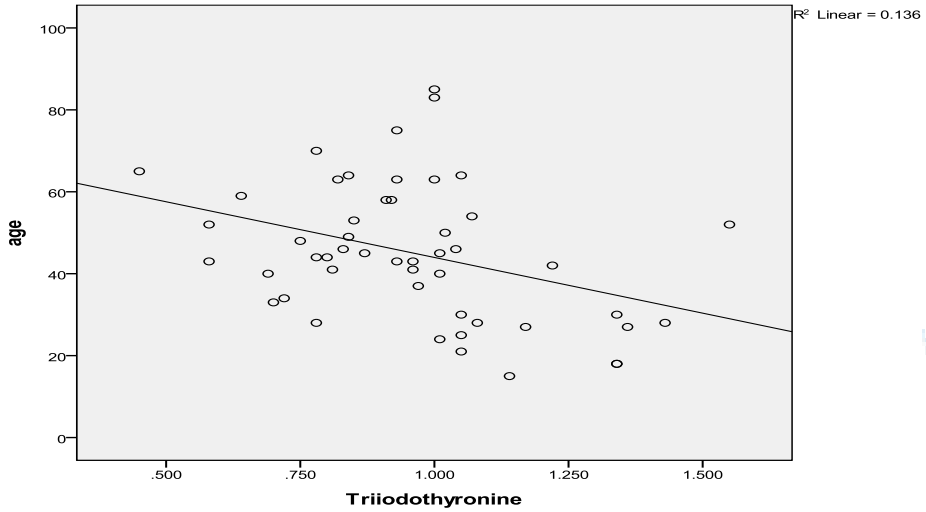

Fig. 2: Pearson's correlation between T3 and Age.

Discussion

Many articles have been published about the relation between thyroid function and CKD [3, 5, 6, 8], as it has been suggested that continuous kidney dysfunction may contribute to the onset of hypothyroidism [9], but the details are not yet known [10]. There are many factors affect the association between CKD and thyroid function such as, dysfunction of renal excretion because of CKD may reduce the clearance of inorganic iodine, that leads to increase in iodine, excessive iodine may reduce the synthesis of thyroid hormone by the Wolff–Chaikoff effect [11]. The mean age of the study group in this study was 45.08 ± 16.7 years, which is lower than that of study group in Egypt (56.92 ± 15.29 years) [12] and than that in Palestinian study (57.6 ± 14.5 years) where they excluded the young age [13], but similar to that of Mahmood in Bakstan (41.97 ± 9.76 years) [14]. In this study, we find high prevalence of primary hypothyroidism among CKD patients, out of 50 patients, 8 (16%) had TSH concentrations higher than normal level, half of them (8%) were with normal T3 and T4 concentrations which concede as subclinical hypothyroidism, this percent was similar to that demonstrated by Bichari et al., in Egypt 2020, where they found the prevalence of SHT was 5% [12], also, to that demonstrated by Nazzal et al., in Plastinin 2020, who demonstrate same percent of hypothyroidism (16.3 %) and 6.1 % with SHT [13], and with that in Saudi Aribia, where Alamoudi et al ., recorded high TSH levels in 15% of pre-dialysis patients [15]. On the other hand, it was different from other countries, as it was lower than that demonstrated by Mahmood et al., in Bakestan 2020 (31.94 %) [14], Batool et al., 2020, also has showed that the frequency of subclinical hypothyroidism was 21.1% out of 128 patients with chronic kidney disease [16], and 17.40% demonstrated by Roy et al., in Bangladesh 2020 [17]. The difference in percentage between studies might be related to different in definitions for hypothyroidism, due to the arguments about the accepted TSH level in haemodialysis, as some authors propose that levels less than 20 IU/ml, while other studies found that TSH even in high normal range of 3–5 μIU/ml was associated with a higher risk of mortality [18]. Accordingly, in our study, we considered TSH higher than 5μIU/

ml as abnormal. therefore, this could be a reason for the variations in the prevalence of hypothyroidism in different literature, in addition to geographic differences of the studies [13], as it was similar in Arabic world but different in other countries.

CKD is often associated with a change in thyroid hormone status leading to the development of euthyroid sick syndrome or low triiodothyronine (T3) syndrome. In this study, mean T3 and T4 levels were observed to be decreased significantly (p value <0.01) in comparison to expected values which is in agreement with Manohari et al., and Lim [19, 20], in addition, no significant difference we observed between TSH level and expected values. Our results are in agreement with results reported by Ibrahim et al. [4], but in disagreement with study of Jusufovic et al, who found TSH levels were significantly higher compared with the control group [21].

In our study the prevalence of lower T3 and T4 syndrome was 11% which lower than the prevalence,(30%) reported by Inaba et al., in Japan [22], however; we demonstrated the total T3 not the fT3. Earlier study found Haemodialysis patients with low levels of triiodothyronine or thyroxine carry an increased risk of mortality, especially due to cardiovascular causes [23].

No significant correlation demonstrated by this study between Thyroid hormones level with urea and uric acid levels, and this was in agreement with finding of Bachier et al., in Egypt [12]. On the other hand, we found a negative significant correlation between T4 level and, Creatinine concentration (P=0.005) which is in agreement with Rajagopalan et al [24]. Shamsadini et al., suggested that thyroid hormones increase catabolic activities resulting in increased levels of creatinine and BUN, which in turn shut down the secretion of thyroid hormones via a feedback mechanism [7].

In our study we found a negative significant correlation between T3 level and, age (P=0.008) which in disagreement with Bichari et al., who did not find any correlation between T3 level and age [12]. In addition, we found no significant correlation between thyroid hormones level and duration of hemodialysis (p-value >0.05), which was agree with study by Alamoudi et al., as they found no significant correlation between T3 and T4 level with duration of haemodialysis but longer dialysis duration was significantly associated with higher TSH level [15].

This study concluded high prevalence of Thyroid Disorders among CKD patients undergoing haemodialysis, that are known to be a strong risk factor for cardiovascular disease and an indicator of all-cause of mortality. Thus, we recommend periodic screening of thyroid function for CKD patients maintained on regular haemodialysis.

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Comparison of different types of artificial neural networks for diagnosing thyroid disease

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Abstract

Thyroid disease is one of major causes of severe medical problems for human beings. Therefore, proper diagnosis of thyroid disease is considered as an important issue to determine treatment for patients. This paper comparing between three ways of using neural networks to achieve high accuracy. first one is using a multilayer feedforward architecture of ANN is adopted in the proposed design, and the back propagation is selected as learning algorithm to accomplish the training process, with 3 inputs, 5 nodes of hidden layer and 8 output but only one is active with accuracy 99.2%. second one will be a Multi-layer Perceptron (MLP) ANN using back propagation learning algorithm to classify Thyroid disease. It consists of an input layer with 5 neurons, a hidden layer with 6 neurons and an output layer with just 1 neuron with accuracy 98.6%. Third one a multilayer feed forward network with Genetic Algorithm the input layer with 5 neurons equal to the number of the dataset features, 1 hidden layer which its neurons will be determined by the GA and it's 4 gene, and the output layer with only 1 neuron, the overall accuracy is 100% for training and in range between 96% and 98% for testing.

Keywords. Artificial Neural Network, Thyroids disease.

1. Introduction

In recent years, artificial intelligence techniques are exploited for developing professional systems to diagnose different kinds of diseases with high accuracy. These systems assist staff in hospitals and medical centers to quickly diagnose patients and give them essential treatments without need for a specialist doctor. As a result, these systems decrease cost and time for diagnosis. Artificial Neural Network is the most important artificial intelligence technique that has been used to design diagnostic system for several diseases such as diabetes, heart disease, breast cancer, skin disease, and thyroid disease[1] and those are computing tools like NNs, Fuzzy Logic and Genetic algorithm. ANNs due to advantages such as self-learning, associative memory, high parallelism strength and high speed and error tolerance against noises which might be in parameters and also their cheapness in reuse of available solutions is the best option to do this.[2] The ANN called connection-oriented networks which include a set of processors act as parallel, take the sets of input in a time and produce output based on processing algorithm.[3] Artificial Neural Network (ANN) is a powerful tool to solve classification and pattern recognition problems.[4] Hence, ANN has been used to identify the type of thyroid disease. In recent years, there are many researches that have been focused in this area. Most of them used the data set from University of California,

Irvine(UCI) repository of machine learning database.[5] In this data set, thyroid cases are only classified to three main types: euthyroidism (normal case), hyperthyroidism, and hypothyroidism. The thyroid gland is one of the most important organs in the human body. It produces two active hormones that are responsible for controlling metabolism, production of proteins, regulation of body temperature, and overall energy production.[6] Therefore, proper operation of thyroid gland is essential for every organ in the human body. However, thyroid diseases commonly occur and lead to produce too much or too little hormones. Severe case of thyroid disorders may lead to death. Hence, correct and fast diagnosis of thyroid diseases is necessary to provide patients the required cures in early stage of diseases.

In this paper, it is used MATLAB. a software due to the flexibility, many prepared functions and proper performance to ANN simulation. This software also causes the accuracy of results and comparing the performance of the networks become increased and it is achieved the best performance to learning network in the shortest possible time. In section 2 we will show the Previous works, section 3 the overview of ANN, in section 4 describe the data set, in section 5 training and testing set, in section 6 the evaluation and discussion finally the conclusion in section 7.

2. PREVIOUS WORKS

By studying literature, it seems that most researchers have been used widely ANN techniques to diagnose Thyroid disease. Most used techniques are under-supervision techniques in this feature in which the researchers increase the speed and accuracy of network by applying network architecture, proper Initialized of weights and choosing proper activating function due to the type of their diagnoses. For example, Dey et al [7] has been used ANN techniques to diagnose Diabetes disease. The applied data in this paper are taken from Manipal Sikkim Institution of Medial Science Hospital which includes 530 patients. The output includes 2 classes of 0 and 1. They suggest two feed forward architectures in which the first one includes the number of neurons in three layers as (6-10-1) and the second involves two hidden layers and the number of neurons in (6-14-14-1) layers. They indicate that log sigmoid activating function in the hidden layer neuron is considerably increase the speed and performance of networks. So, if the number of the layers increases, the abstract error will be increased. The accuracy of performance in this network for the architecture with a single hidden layer is 92.5%. In section [8], Kabari et al provide a framework to diagnose skin disease using MLP ANN and can reach to an acceptable level of accuracy. In this paper, researchers have been used 4 neurons in input layer, 3 neurons in hidden layer and 2 neurons in output layer, respectively to reach the accuracy to 90%. In [9], F.S. Gharehchopogh et al. have been used ANN to diagnose heart disease. Their architecture includes MLP ANN with 60 nodes in input layer, 4 nodes in hidden layer and 2 nodes in output layer. It is back propagation learning algorithm for network learning. The value of assigned parameters for rate learning and momentum are considered 0.2 and 0.3 respectively. The achieved accuracy of performance for training and test set is 0.95% and 0.85%, respectively. In [10], Shukla et al could achieve to the acceptable results using ANN techniques to diagnose Thyroid disease. They use 3 architectures of back propagation learning algorithm, RBF network and Learning Vector Quantization Networks. The number of layers for back propagation learning algorithm is considered with a single hidden layer and the number of neurons in hidden layer is 46 and learning rate is equal to 0.8. RBF network has

a single hidden layer, learning rate of 0.9 and the number of neurons in hidden layer is 100. Comparing the performance of these three architecture networks indicate that LVQ network has the best accuracy rate equal to 0.98%. Because LVQ like back propagation learning algorithm doesn't fall into the local minimum trap as well as RBFN network which doesn't require full cover of input space. But, among three applied ANNs in this paper, RBFN network has the least learning time. In [11], Isa et al have been used ANN to diagnose Thyroid disease. By selecting the proper activating function, they could improve the performance of ANN. The given data related to the data set of UCI site is used 215 data, MLP architecture, sigmoid activation function and a hidden layer with 7 neurons and reached to the accuracy rate of 97.6%. They also indicate that hyperbolic tangent function of MLP ANN is suitable to classify data to two classes and neural function for three classes.

3. Overview of Artificial Neural Network

Artificial neural network (ANN) is a well-known artificial intelligent technique for solving problems that are difficult to be solved by human beings or conventional computational algorithms [12].

1.3 MLF with backpropagation algorithm

a multilayer feedforward ANN is adopted to do the classification problem of thyroid cases because it is the most popular structure of ANN that is used for classification and pattern recognition problem [13]. In the data set, each sample is a vector of three entries (values of TSH, T4, and T3). Therefore, the designed ANN should have three neurons in the input layer. In contrast, the designed ANN should classify input samples into eight categories of thyroid cases. Thus, in the output layer, ANN should have eight neurons which are corresponding to these categories. As a result, inputs of ANN system are values of TSH, T4, and T3 for a certain sample, and output is the type of thyroid case for input sample as shown in Figure 1

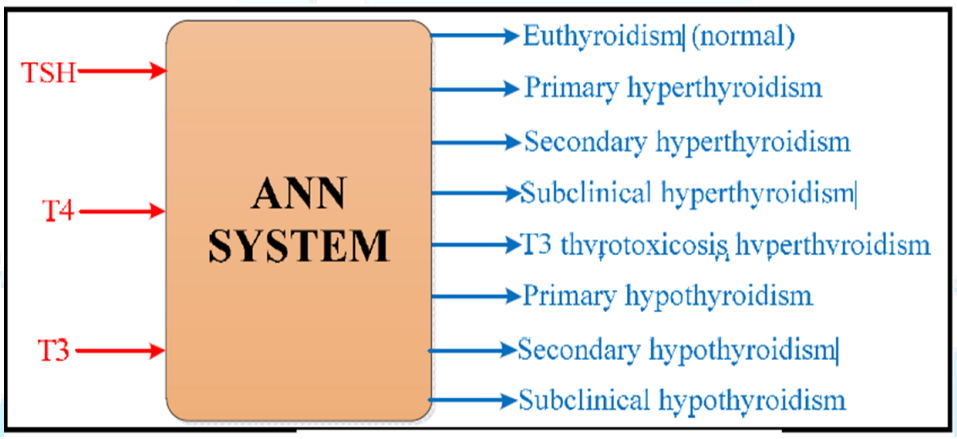


Figure 1 : The ANN system for thyroid diagnosis

back propagation is used as a learning algorithm to train ANN. At first, weights are initialized with random values Then at each iteration of back propagation algorithm, one input sample is applied

to ANN to produce the actual output. After that, the error is computed between the actual output and desired output. Depending on this error, the synaptic weights are updated as **Equation (1)** to minimize error.

(1)

$$W_{i+1} = W_i + \Delta W$$

Where $\mathbf{W_{i+1}}$ is updated value of the weights, $\mathbf{W}_i$ is current value of the weights, and $\Delta\mathbf{W}$ is the updated change of weights, which is determined as **Equation (2)**.

(2)

$$\Delta W = \eta \frac{\partial E}{\partial W}$$

Where η is the learning rate parameter, and is the derivative of error with respect to value of the synaptic weights.

These processes are continued until the error reaches a very small value (approximately zero). At this time, the algorithm converges, and the training process is stopped [14]. The flowchart of back propagation algorithm is shown in Figure 2. After that, a test process is commenced to evaluate the performance of trained ANN via applying test samples that are not used in the training process. In this work, the ANN performance is computed by calculating the classification rate as **Equation (3).**

(3)

$$Classification\ rate = \frac{Number\ of\ test\ samples\ that\ are\ correctly\ calssified\ by\ ANN}{Total\ number\ of\ test\ samples} \times 100$$

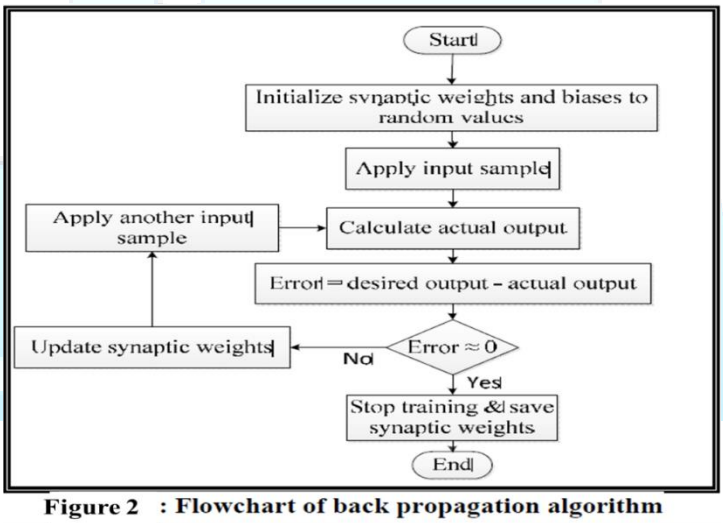
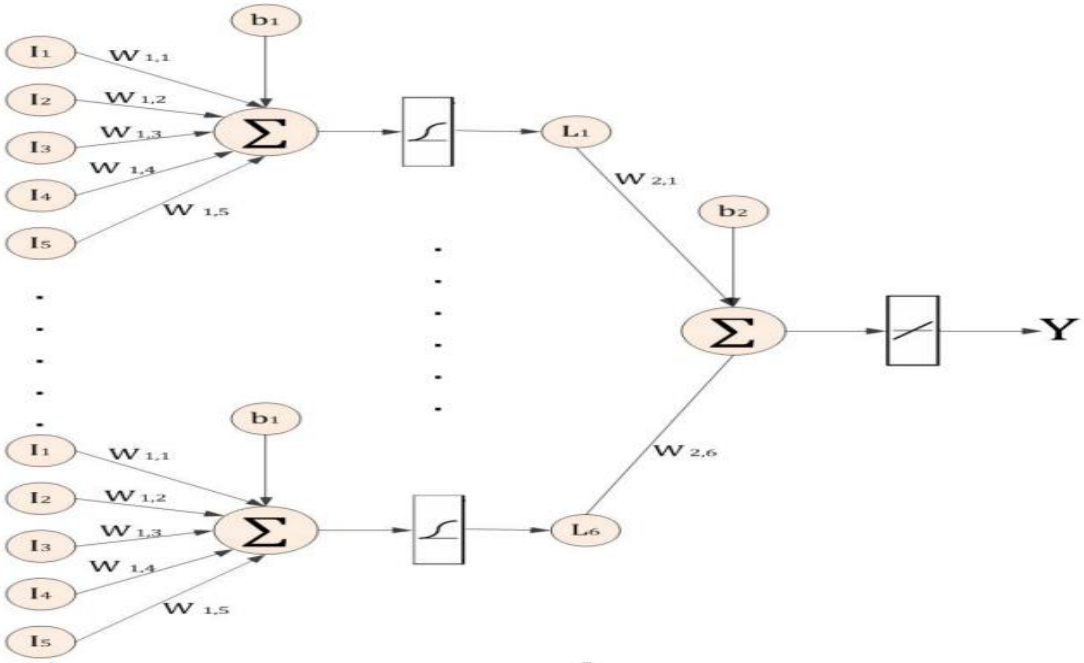


Figure 2 : Flowchart of back propagation algorithm

2.3 MLP with backpropagation algorithm

MLP ANNs architecture is shown in figure 3. The most popular architecture has three layer includes an input layer, a hidden layer and an output layer and all the connections are full in this architecture.



3.3 MLF with GA and backpropagation algorithm

a multilayer neural network structure of three layers; the input layer with five neurons equal to the number of the dataset features, one hidden layer which its neurons will be determined by the GA, and the output layer with only one neuron; that using a type of second order approach as a training algorithm is used for diagnosing thyroid disease. The GA is used to find an optimum network. These two techniques will be illustrated in details at the next subsections and the general steps of this approach algorithm will be listed in the third subsection.

The approach Algorithm.

The algorithm of this approach will be listed and explained in the following steps:

1. Coding (determine the chromosomes of the GA): Each chromosome will have four genes that represent the number of neurons in the hidden layer, values of the training parameters (**mu, mu_inc**, and **mu_dec**). The first gene is integer while the others genes are real.

2. Population Initialization: The population of the individuals (chromosomes) will be initialized randomly in some pre-specified ranges, for this approach, the size of the population is set to 50 individuals.

3. Chromosomes Evaluating (Fitness Function of the GA): The whole goal is to get high classification accuracy with optimum NN that has a minimum number of neurons with lower training epochs. Thus, our fitness function is as in **equation (4).**

(4)

$$Fitness = perf + hu/max\_hu + epochs/max\_epochs + (1 - acc) * 100$$

where, **perf** is the error function of the neural network, **hu** number of neurons at the hidden layer, **max_hu** maximum number of neurons possible at the hidden layer, **epochs** number of iterations needed by network for convergence, **max_epochs** the maximum number of iterations will be proposed for convergence which here is determined by 100. Finally, **Acc** is the classification accuracy which is calculated as in equations (5) and (6).

(5)

$$Acc = \frac{\sum_{t=1}^{|N|} calculate(n_t)}{|N|}, n_t \in N$$

(6)

$$calculate(n) = \begin{cases} 1 & if\ classify(n) = nc \\ 0 & otherwise \end{cases}$$

where **N** is the set of data items to be classified (the test set), **n Ɛ N**, **nc** is the class of the item **n, classify (n)** returns the classification of by the neural network individual.

4. Reproduction (GA search): The time of the GA search is get after the population initialization and evaluation of each individual by the fitness function. The basic genetic operators guide this search are:

4.1 Selection: Selection is an important operation. A combination between two selected techniques; Ranking and Tournament will be used to select the two parents.

4.2 Crossover: For each genetic cycle, the two selected parents will be recombined by using the uniform crossover to produce one child with probability **pc=0.8**.

4.3. Mutation: Each gene in the chromosome that obtained by the crossover will be muted by adding a value generated randomly in some range.

4.4. Replacement: After evaluating the new individual produced from the crossover and mutation, a selected individual of worse fitness will be replaced by the new individual under some condition.

5. Termination Conditions (GA Convergence): The proposed GA is iterated until either the number of the genetic cycles reaches to the predetermined maximum cycle's number which in this work is set to 100 cycles or the first half of the finest part of the population is not changed for some cycles that set for 10 in this work.

4- Data set

1.4 MLF network

we collected 655 samples of real patients from certified advanced hormones laboratory in Kerbala city.

The feature are 3 inputs

1- Thyroid Stimulating Hormone (TSH).

2- Total serum thyroxin (T4)

3- Total serum triiodothyronine (T3)

Most of samples (80%) are used to train ANN, and rest of samples (20%) are used to assess the performance of trained ANN.

No.	TSH	T4	T3	Thyroid case
1	3.29	102.35	1.67	Euthyroidism(normal)
2	0.07	142.81	3.11	Primary hyperthyroidism
3	7.05	222	3.9	Secondary hyperthyroidism
4	0.23	111.22	1.55	Subclinical hyperthyroidism
5	0.11	111	4.9	T3 thyrotoxicosis hyperthyroidism
6	29.44	23	0.55	Primary hypothyroidism
7	0.09	22	0.44	Secondary hypothyroidism
8	5.2	82.61	1.49	Subclinical hypothyroidism

Table 1: Examples of samples in the collected data set

No.	Thyroid case	Number of sample
1	Euthyroidism (normal)	328
2	Primary hyperthyroidism	44
3	Secondary hyperthyroidism	44
4	Subclinical hyperthyroidism	46
5	T3 thyrotoxicosis hyperthyroidism	40
6	Primary hypothyroidism	48
7	Secondary hypothyroidism	40
8	Subclinical hypothyroidism	65
	Total	655

2.4 MLP network

The data is UCI University of California Iverine, The total numbers of laboratory samples are 215. The features are

1. T3-resin uptake test. (A percentage)
2. Total Serum thyroxin as measured by the isotopic displacement method.
3. Total serum triiodothyronine as measured by radioimmuno assay.
4. Basal TSH as measured by radioimmuno assay.
5. Maximal absolute difference of TSH value after injection of 200 micro grams of thyrotropin-releasing hormone as compared to the basal value.

All features are connected and there is no loosed one. In **Table 3**, the numbers of laboratory samples are determined based on the type of disease.

Type disease	Number of samples	Type class of the UCI classification
Normal	150	1
Hyper	30	2
Hypo	35	3
Total:	215	

Third neural network the same second one.

5. Training and testing

1.5 MLF ANN

The tangent sigmoid is chosen as an activation function for hidden layer, while softmax is used for output layer. Then, we apply input samples in the data set and their target type of thyroid cases to train ANN with various number of neurons in the hidden layer. However, the efficiency of ANN depends on the initial value of weights. Furthermore, weights are initialized with random values. Therefore, we will obtain different result every time that ANN is trained. To solve this problem, we train ANN 10000 times. After that, we record the maximum, minimum, and average classification rates among 10000 trained ANNs with different number of neurons in the hidden layer as stated in **Table 4**.

This means that

classification rate and number of neurons in the hidden layer are directly proportional. Nevertheless, the maximum classification rate stops increasing when the number of neurons is more than 5. In other words, the maximum classification rate reaches saturated value when the number of neurons is 5.

Table 4 Classification rate of trained ANNs

Number of neurons in the hidden layer	Maximum Classification rate %	Minimum Classification rate %	Average Classification rate %
1	74.81	50.38	64.29
2	96.95	50.38	85.01
3	98.47	58.02	91.82
4	98.47	58.78	94.17
5	99.24	62.60	95.08
6	99.24	70.99	95.54
7	99.24	78.63	95.81
8	99.24	80.15	96.04
9	99.24	83.97	96.17
10	99.24	85.50	96.26

This means that classification rate and number of neurons in the hidden layer are directly proportional. Nevertheless, the maximum classification rate stops increasing when the number of neurons is more than 5. In other words, the maximum classification rate reaches saturated value when the number of neurons is 5. In **figure 4**

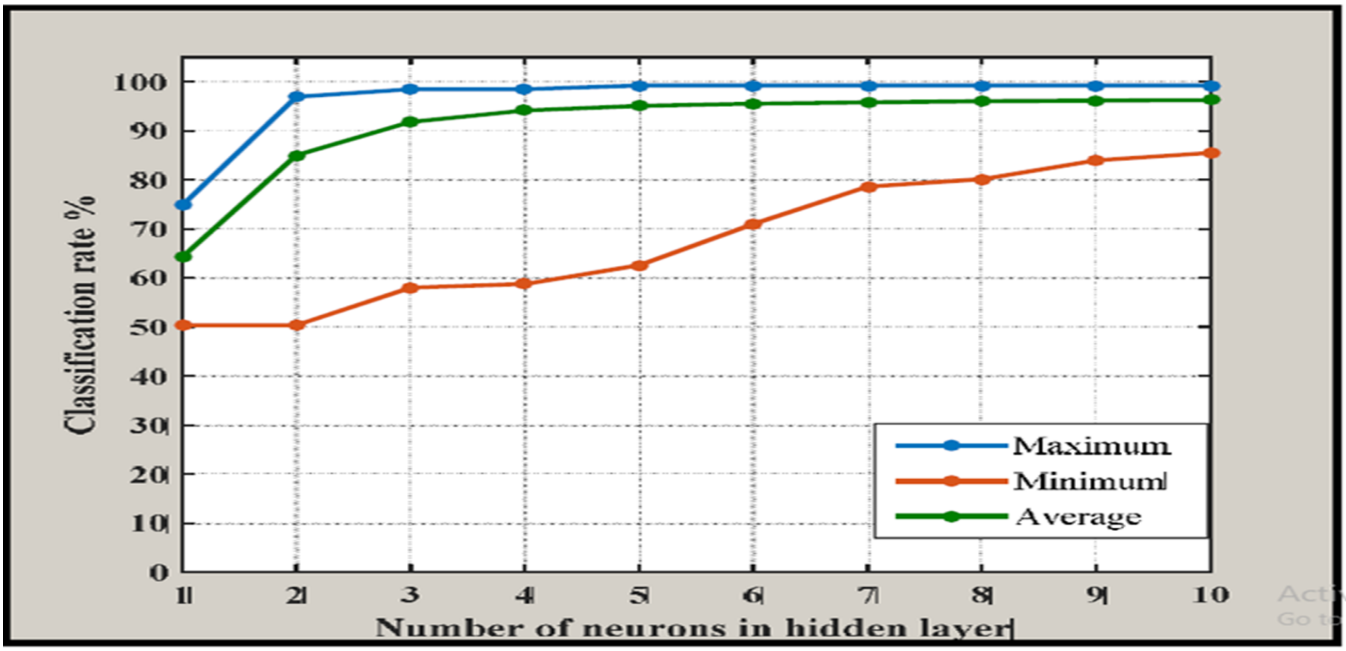


Figure 4: Classification rate of trained ANNs

To clarify the performance of final selected ANN, the confusion matrix is illustrated in **Figure 5** to show the classification rate of the network by using 131 test samples (20% of total samples in the data set) which are not used in the training process. The green diagonal cells of the matrix demonstrate the number of samples that are correctly classified by ANN and their percentages. On the other hand, the red off-diagonal cells show the number of samples that are misclassified by ANN.

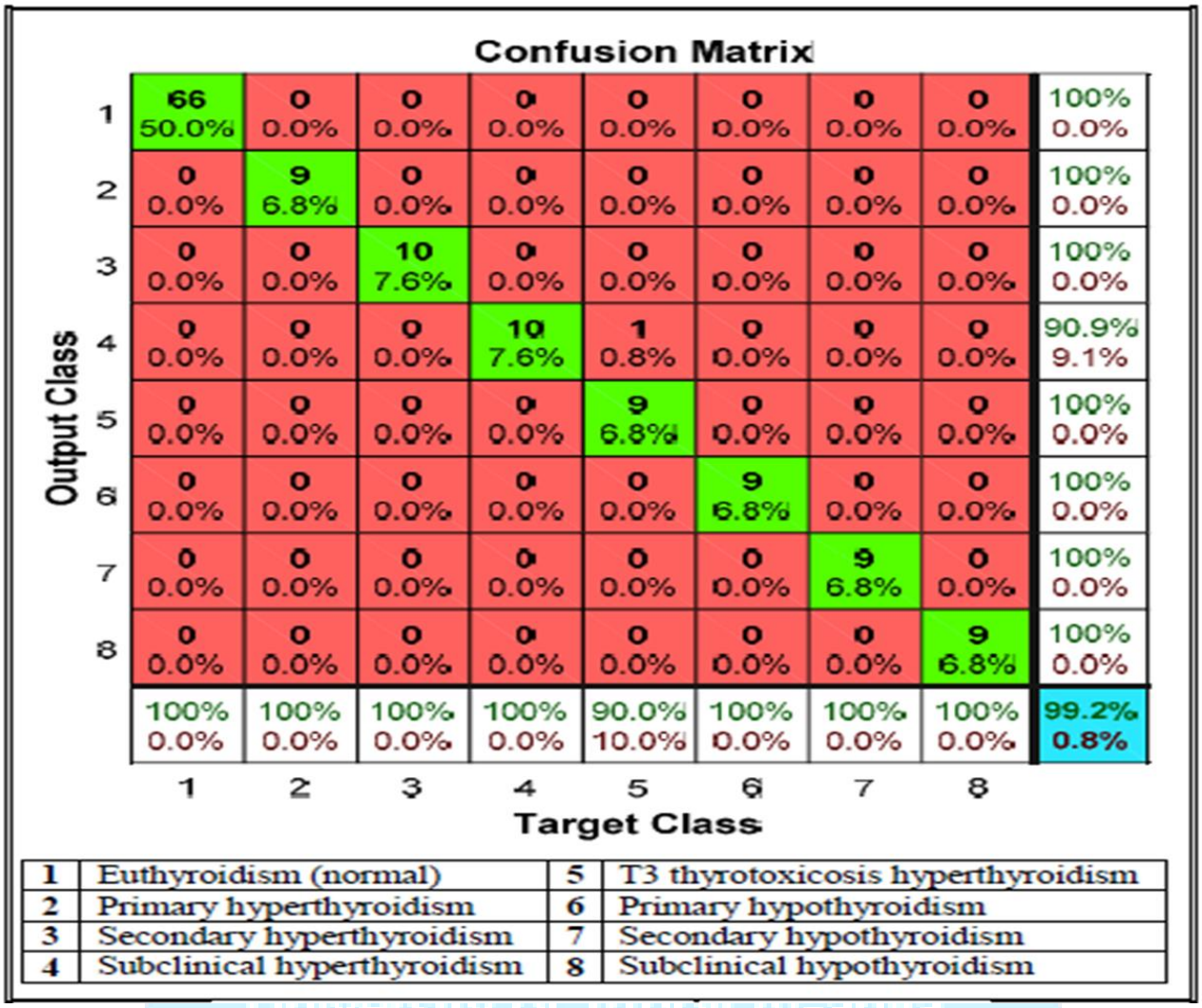


Figure 5: Confusion matrix of the designed ANN

2.5 MLP ANN

The techniques used to training an ANN are wide in which the most important is supervision or non-supervision learning techniques. Back propagation learning algorithm which uses undersupervision learning technique could learn well based on a set of training examples and then

capable of diagnosing each pattern [15]. Basic MLP constructive unit is a simple model of artificial neuron. This unit adds the inputs collection with the value of threshold. And the sum depending on type activation function (generally sigmoid) passes [16]. The network begins to train based on the random values of weights and biases [17, 18] and the training process will continue until the error is minimized [8, 17, 18]. Updating the values of all weights is performed based on error value as far as the difference between network input and output reaches to the desirable one. It gradually achieves from output layer, through hidden layer to input layer toward back [1]. Beside weights optimal adjustment, proper selection of activation function According to [11] Cause more optimal network performance. An activating function of MLP ANN has several major features such as continuous, differentiable, and monotonically non-decreasing [17, 19, and11]. The applied activation function is considered for hidden layer neurons is Logsig and for each output layer neuron is Purelin.

Due to the obtained results of Table 3, the best performance relates to the classification is 85% for Train data and 15% for Test data, respectively. The way of choosing data based on this classification is as random (using Randperm function).

Train	Test	Performance for Tansig	Performance for Logsig
70	30	0.00179	9.19e-9
75	25	0.032	1.33e-5
80	20	0.0085	0.056
85	15	0.90e-10	5.94e-10
90	10	2.6e-7	0.046
95	5	5.26e-5	0.0023

Table 6- choosing the best classification of test and train data

3.5 MLF ANN

In order to compare the performance of the genetic neural network techniques, firstly, data set is normalized and split into groups of training set and testing set. The splitting process will be done randomly three times with specific proportion at each time (10% to 90%, 30% to 70% , and 50% to 50%) in order to form different training/testing groups. Table 7 shows the number of instances that used as training set and testing set for each group. For each training/testing pair the GA will be applied five times to find the optimum network topology that gives a high accuracy.

Group Number	Training Set	Testing Set	Total
1	21	194	215
2	64	151	215
3	107	108	215

6. Evaluation and Discussion

First ANN is trained by back propagation algorithm. After training process, if inputs of a particular sample are applied to ANN, Only one neuron of output layer will be active (its value is approximately one). In contrast, the values of the other seven will be roughly zero. The active neuron represents the category of thyroid case for input sample. number of neurons in the hidden layer should be as smallest as possible to reduce the complexity of ANN which leads to decrease the response time of ANN. As a result, the lowest number of neurons that provides the highest maximum classification rate is selected in the proposed system. In this case, 5 neurons are chosen to be in the hidden layer. Hence, architecture of the designed ANN will be 3-5-8. Among 10000 trained ANNs, the one that provides the maximum classification rate is chosen in the final system for thyroid diagnosis. It can be shown that classification rate of designed ANN is 99.2% which is considered very high as compared to results of previous works. with confusion matrix Only one of the 131 test samples is misclassified. This implies that ANN is almost successfully able to classify samples into eight thyroid cases. The second ANN compare the performance of MLP ANN with the changes of activation function and the number of hidden nodes and to reach to the high accuracy. The back propagation learning algorithm performance is based on Gradient descent technique. It is considered to regulate weight connections among neurons to minimize system error between real output and target output. Although, back propagation learning algorithm is the most popular algorithm to ANN training but sometimes can be inefficient. One of the main training drawback whit the algorithm is the slow convergence. It is proposed methods to improve convergence rate which includes proper selection of activating function in neurons and accurate determination of size parameter of learning rate. we are used the architectures of (5, 6,1) with a single hidden layer. Figure 6 the numbers of hidden layer nodes to the network performance
Third ANN Table 8 shows the results obtained by each group

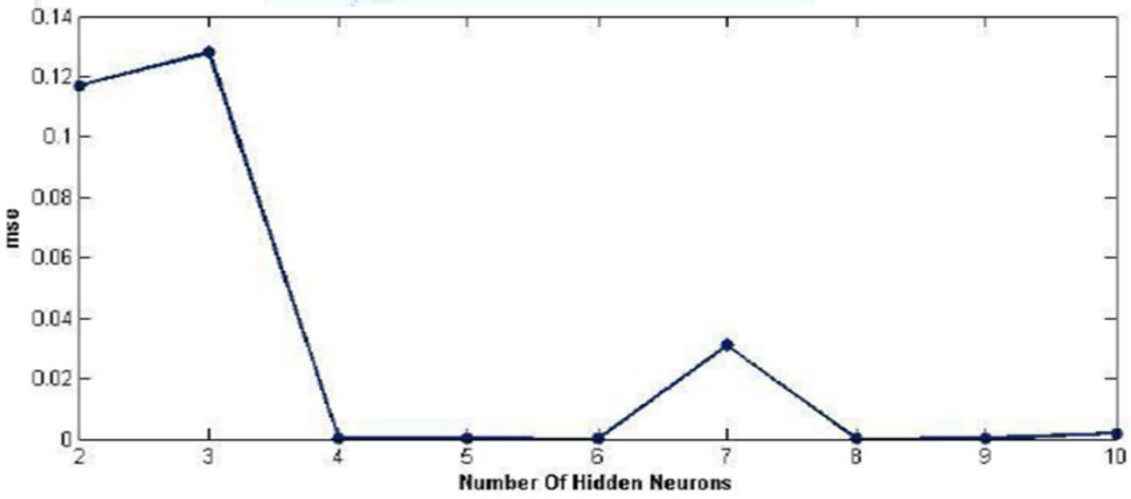


Table 8: Experimental results show the optimum network by the marker rows for each group.

7. Conclusion

In this work, diagnosis of thyroid disease is modeled by neural network techniques.
First one A multilayer feedforward is selected as ANN architecture, and back propagation is used as training algorithm. The results of this work show that classification rate of ANN and number of neurons in the hidden layer are directly proportional. After extensive search for best network, the one with only one hidden layer that has 5 neurons is chosen to perform thyroid diagnosis system. The selected ANN has high classification rate which is about 99.2%. As a result, the proposed structure of ANN can effectively categorize the type of thyroid cases.
Second one we consider the type of appropriate activation function, correct selection of layer number and the network complexity so as to achieve the best result by comparing their performance to reach the best possible answer. By selecting a hidden layer and Logsig activation function for hidden layer and 6 neurons in the hidden layer, we can reach the classification accuracy for Thyroid disease to 98.6%.
Third one presents a study on thyroid disease diagnosis by using neural networks with second order training algorithm. The genetic algorithm was used to find the optimum network structure with high classification accuracy. Three different proportions of training/testing groups are formed. According to the results, it was seen that neural network structures could be successfully used to help diagnosis of thyroid disease. Overall accuracy of diagnosis is 100% for training and in range between 96% and 98% for testing.

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The Value of Platelet to Lymphocytes and Neutrophil to Lymphocyte Ratios as Prognostic Markers of Multiple Myeloma in Iraqi Patients

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Abstract

Background: Multiple myeloma considered being the most common bone related malignancy. It occurs, especially in older persons, in an increasing frequency trend. In various malignancies, recent researches showed the ration of neutrophils to lymphocyte and platelet to lymphocyte works as an indicator of progression free survival [PFS] and overall survival [OS]. **Patients & Methods**: This case-control study has been conducted in the clinical biochemistry department at the National center of Hematology in Baghdad for a period from January 2021 till July 2021, enrolling sixty subjects, thirty patients diagnosed as multiple myeloma and thirty persons as a control group. In this study, for MM patients, the PLR and NLR the relevance has been investigated. Whole blood counts have been used to calculate NLR and PLR. **Results**: 30 patients were assessed, compared with 30 apparently healthy subjects. The Mean NLR level was 2.06 for patients and 1.79 for control, Mean PDW levels were 16.34 for patients and 15.77for control, PLR levels were 135.60 for patients and 265.5 for control, PLT levels was 257.39 ul for patients and 344.4 ul for control. Based on ROC analysis, the NLR cut-off level of ≤ 1.1 in multiple myeloma patients, and the PLR cut-off level of ≤ 120. Results revealed that reduced PLR affects the result negatively. **Conclusion**: From the results drawn from the experimental work, we came up with the conclusion that in a newly diagnosed MM patient the significant prognostic factor was PLR.

Keywords: Multiple Myeloma, The Ratio of Neutrophil-To-Lymphocyte, The Ratio of Platelet-To-Lymphocyte, New Marker of Prognosis

INTRODUCTION

Researches showed that, multiple myeloma (MM), which contributes to nearly 10% of the total hematologic cancers [1], is a cause of plasma cell malignancy. Basically, it gets developed from the stage of an asymptomatic premalignant of clonal plasma cell proliferation, which is “monoclonal gammopathy of undetermined significance (MGUS)”. It is noted that, (MGUS)

occurs about more than 3% in above 50 years population and, then, progresses, at a rate of 1% every year, to myeloma or related malignancy [2]. Further, intermediate asymptomatic was noticed in few patients, but it has been clinically recognized that, in case of more advanced premalignant stage considered to be (SMM) [3]. There are two main staging systems used for MM are the "international staging system" (ISS). This is depending on the blood plasma levels and beta-2 macroglobulin, and the Durie Salmon system (DSS). This depends on the M protein level, level of red blood cells calcium, along with the degree of necrosis in bones. These conditions divided by the system into three stages. However, the most severe stage was found to be third stage. There are three stages for ISS cases. Stage I is for people with a B2M less than 3.5 mg/L and albumin > 3.5 g/dL. Stage III for those with a B2M higher than 5.5 mg/L and Stage II is between stage I and Stage II [4].

Regarding Multiple myeloma risks factor, it increases with age. Sex is about 1.5× more common among men than women. Higher rates of obesity and consumption among men, though none of these risk factors have been confirmed in multiple myeloma [5]. In black persons, it occurs high than, as twice, in the white population in rate. Most importantly, the factors of the surrounding environment could get interacted with underlying genetic factors resulting in an increasing the risk of MM [6]. Ionizing radiation, chemicals like benzene, pesticides, chemotherapy, smoking cigarettes, viral infection and genetic disorders are recognized as multiple myeloma risk factors [7,8]. However, these risk factors can only explain minority cases and the etiology of multiple myeloma remains largely unknown [9].

Patients recognized with multiple myeloma that is firstly appears when patient's complaint of difficult to explain backache or may be with bone pain. In addition, it commonly appears in long bones, skull, pelvis and ribs. Besides, many patients have a diagnostic of multiple lytic skeletal lesions [2]. It has been noticed that, the most occurring symptoms of multiple myeloma are anemia that appears in nearly 75% of patients and contributes to fatigue. Approximately 80% of patients have Osteolytic skeletal lesions [10]. Neutrophils are view as the final influential cells for the inflammatory response acute stage which has a main role in the extracellular pathogens' clearance. the functions of these cells have been extended in latest proof. This resent discovery reserves the effector molecules in the neutrophils including extracellular traps in a broad array, cytokines and effector molecules of the humoral arm of the innate immune system. The Neutrophils role was devoted to activate the regulation and the function of effector functions for both adaptive and innate immune cells. Consequently, the neutrophils' role was critical in the pathogenesis of a vast range of diseases. For instance, the case of infections triggered by intracellular pathogens, autoimmune diseases, and chronic inflammation cases [11]. Platelets are defined as small cells without nucleus, it way of traveling described as fragments of resting discoid inside the circulation system. The life of theses platelets about 8–9 days in average. Their elegant formation in addition to its cellular processes, described with finely orchestrated series, called thrombopoiesis and megakaryocytopoiesis. The process includes the committing of hematopoietic stem cells, terminal differentiation of megakaryocytic progenitors, proliferation and maturation of megakaryocytes to produce functional platelets. This very complicated mechanism happens in specialized in the bone marrow endosteal and vascular niches where megakaryocytes form proplatelet projections and releasing platelets into the circulation [12]. Different in its function, but similar in its appearance,

Lymphocytes defined as the white blood cells that which includes (T, B, and natural killer cells). They are involved in the process of antibody production. In another words, these cells get involved in tumor cells, and regulation of the immune response and virus infected direct cell-mediated killing [13]. The aim of the study is : To use the NLR and PLR values as a prognostic marker in(MM) patients in routine practice.

PATIENTS AND METHOD

A case control study had been conducted in the department of clinical biochemistry at the National center of Hematology in Baghdad for a period from November 2020 till June 2021, involving a total of sixty person, thirty patients diagnosed as multiple myeloma and thirty persons as a control group with regard to their age and gender they were matched with MM group. An informed consent was taken from all participants to be enrolled in the study that was approved by the ethical committee of Mustansiriyha University/ College of medicine (MOG/146 on the 23rd NOV 2020). Multiple myeloma patients, the guidelines of International Myeloma Working Group (IMWG) have been used to diagnosed and assessed [14,15]. All cases were collected from the National center of Hematology / Mustansiriyha University and fulfill the diagnostic criteria of MM. For all patients under investigation, a complete blood count (CBC)was taken at the diagnosis, the control group was selected randomly from those who attend the National center for routine visits. Beckman Coulter LH 780 has been utilized to perform a whole blood between systems in use, whereas data from of the (CBC) count during the diagnosis time have been used to calculate both PLR and NLR. The NLR has been obtained as the absolute value count of neutrophil divided by the lymphocyte absolute count. The PLR was obtained as the blood of platelet count divided by the blood of lymphocyte count of the treatment patients.

Statistical analysis: Data were expressed as means ± standard deviation with standard error of the mean, A student-t test was used to analyze the significance of difference between the two groups. (ROC) Curve was applied to determine the cut off value for NLR and PLR with the maximum sensitivity and specificity, p value was significant when less than 0.05.

RESULT

The total number of all enrolled persons was 60 samples divided into 30 newly diagnosed with multiple myeloma were included in this study and 30 healthy subjects for control. The mean age for patients and control were 64±2.1 and 62 ±3.2 respectively. The male formed 68% and 32% female in patient group while 55% in control group as shown in table 1.Mean NLR were 2.06 for patients and 1.79 for control, Mean PDW level was 16.34 in patient group while 15.77 in control. Mean PLR levels were 135.60 for patients and 265.50 for control. Mean PLT level was 257.39 for patients' group and 344 for control as shown in table 2. Table 3 refer to the cut-off level of PLR, NLR, Sensitivity, and specificity in multiple myeloma patients in which based on (ROC) analysis were PLR ≤120, NLR < 1.10 respectively as shown in fig 2 and fig3.

(ROC) Curve was applied for PLR analysis and clarified in figure 2 which showed at the cut-off value of ≤120. the sensitivity was 100% and specificity 100% with 95% CI (0.920 to 1.000), area under curve 1.00 with a significant p- value 0.0001. While (ROC) Curve was applied for NLR

analysis and clarified in figure 3 which showed at the cut-off value of ≤1.1 the sensitivity was 95.5% and specificity 36.4% with 0.634, area under curve and a significant p value 0.093.

Table 1: the primary criteria of patients and controls

Characteristics	Patients (No. =30)	Control (No.=30)		p-value
Age (years)	64±2. 1	62 ±3. 2		0.061
SEX				
Male	18 (68%)	17 (55%)		0.082
Female	12 (32%)	13 (45%)		
BMI mean and percentage %				
>25 Kg/m^2	22.1 (12%)	No.=15	22.9 (12 %)	0.07
25-29.9 Kg/m^2	27.91 (23%)	No.=8	26.53 (22 %)	
More than 30	32.03 (65%)	No.= 7	33.02 (66 %)	

Table 2: the hematological parameters and ratios of healthy subject versus control group.

Parameters	Normal case (Control groups)	Patients (Multiple Myeloma)	p-value
	Mean ±SD	Mean± SD	
NLR	1.79±0.52	2.06±1.61	0.701
PDW(fL)	15.77±1.72	16.34±3.55	0.1912
PLR(fL)	265.50±69.49	135.60±41.94	P<0.001*
PLT 10^3/µL	344.40±75.75	257.39±73.90	0.0912

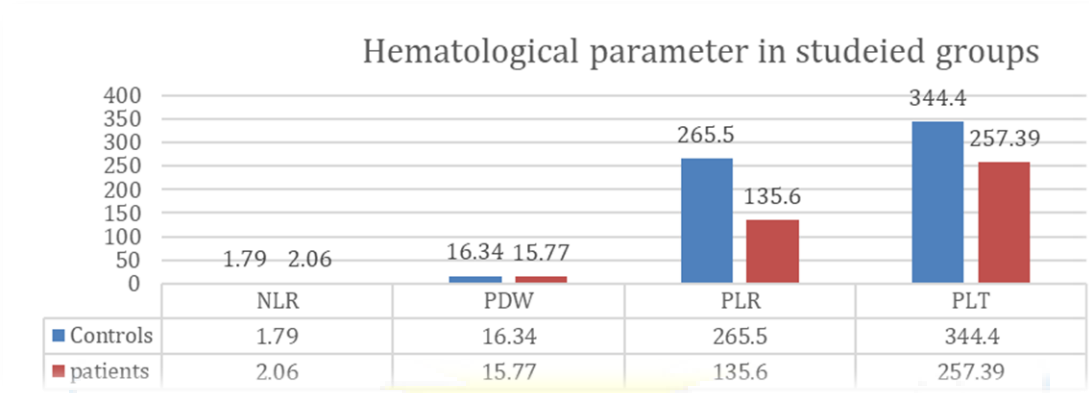

Figure 1: Relation NLR, PDW, PLR and PLT parameter with multiple myeloma and control groups

Table 3 : The cut-of level of Around Study for NLR and PLR Sensitivity and specificity in multiple myeloma Patients

Parameters	Cutt-off	Area under the ROC curve	Sensitivity	Specificity	p-value
PLR	≤120	1.0	100	100	<0.0001
NLR	≤ 1.1	0.634	95.5	36.4	0.093

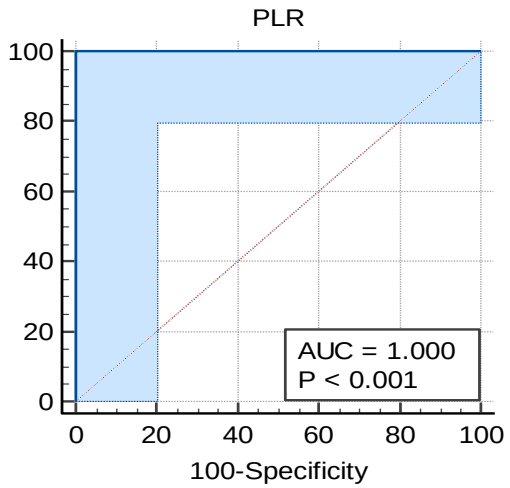

Figure 2:(ROC) Curve analysis of (PLR) In (MM) versus control

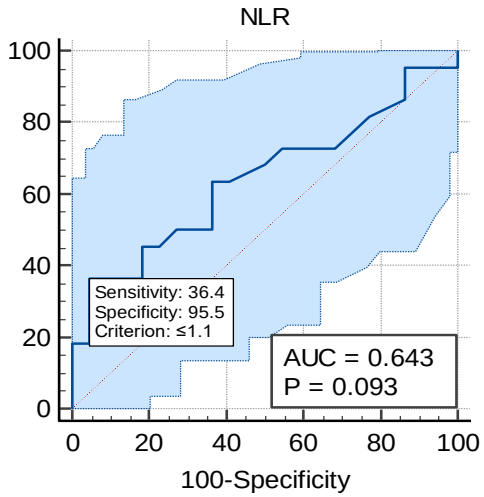

Figure 3: (ROC) Curve analysis of (NLR) in (MM) versus control

(ROC) Curve was applied for PLR analysis and clarified in figure 2 which showed at cut off value of (≤120) the sensitivity was (100%)and specificity (100%) with area under curve (1.00) with a significant p value (0.0001).(ROC) Curve was applied for NLR analysis and clarified in figure 3 which showed at the cut-off value of (≤ 1.1)the sensitivity was (36.4%) and specificity(95.5%) with area under curve (0.643) with a p-value (0.093).

DISCUSSION

Prognosis prediction has been crucial in treatment planning for patients with multiple myeloma. Tumor growth is intimately linked to inflammation [16], and neutrophils and lymphocytes are the primary cells involved in inflammation and immunological responses [17]. Patients with a high platelet count are at a greater risk of developing cancers, as well as particular types of cancer that have a stronger association with thrombocytosis [18]. Multiple past studies established the predictive value of platelet count in the range of solid tumors including the cases of hepatocellular, renal-cell, lung, colorectal, gastric, and gynecological [19,20]. As a result, we analyzed data from patients treated at our facility in order to deeply investigate, in case of multiple myeloma, the type of the relation between NLR, PLR, and prognosis prediction.

Neutrophil to Lymphocyte Ratio(NLR); lymphopenia and Neutrophil[relative] were predicted based on the natural response of the immune system of the body during inflammatory process [21]. Numerous researches have been conducted recently on the immunological profile of individuals with MM, and the specific characteristic of immunology was proven to be linked with overall survival [22]. The neutrophil-lymphopenia ratio (NLR) is a direct indication of balance between neutrophilia and lymphopenia. NLR has been a prognostic factor in a variety of severe illness states and malignancies. There are considerable inconsistencies in the research about NLR influence on overall survival (OS) and progression-free survival (PFS) in patients with hematologic malignancies [23-25]. Our findings indicated that the (NLR) value raised in patients (2.06 1.61) but was not statistically significant [p=0.701] when compared to controls (1.79 0.52). The cut-off value was determined to be [1.1]. Solmaz [26] achieved similar results to ours, indicating that NLR =1.9, or less than 2. In another study, Kelkitli et al., the authors, divided the participants in their study into two main groups depending on the NLR cutoff criterion of 2.0.The authors discovered that MM patients with an NLR less than(2.0) lived longer than those with an NLR greater than (2.0). [27]. This research was the first one to demonstrate a relation between NLR and OS in MM. Numerous scientists have recently focused their attention on the prognostic significance of NLR in malignancies [28]. A meta-analysis of 15 studies on the predictive value of NLR in breast cancer found that elevated NLR was linked with poor overall survival and progression-free survival [29]. Wei performed a meta-analysis on the prognostic significance of NLR in urinary malignancies and came to the same conclusion [30]. Although some research has been conducted on solid tumors, scientists have begun concentrating their efforts on hematological malignancies. Keam demonstrated that pre-NLR 3 was a significant predictor of poor outcome in cases with diffuse large B-cell lymphoma [31]. Another research reached the identical conclusion [32]. The precise mechanism through which elevated NLR correlates with a worse prognosis for cancer is unknown. This outcome can be interpreted in a variety of ways. To begin, lymphocytes

contribute significantly to the antitumor immune response by blocking malignant cell growth and metastasis [33]. Systemic inflammation induced by malignant cells can result in immunological suppression, allowing tumor cells to evade the host immune response [34]. Second, neutrophils invade a variety of tumor tissues. Tumor-associated neutrophils are connected with cancer progression because they are the principal source of circulating vascular endothelial growth factor (VEGF), which has been shown to increase tumor-associated angiogenesis [35,36]. By stimulating growth, neutrophils directly assist tumor cells in surviving [37]. Thus, elevated NLR. Consequently, the increased neutrophils and decreased lymphocytes, shows that the balance between pro- and anti-tumor status has been broken and tilted toward a pro-tumor inflammatory state, resulting in tumor progression and poor prognosis. The ratio of Platelet to Lymphocyte PLR; in respect of PLR, our findings indicated a highly significant reduction in MM patients (135.60±41.94) as compared to the control group (265.50±69.49) (p 0.001) with a cut off value of 120. In keeping with our findings, a low platelet count or low PLR (cut-off = 100) has been considered as a poor prognostic factor in patients with multiple myeloma [38,26]. In contrast to these findings, a high PLR level has been attributed to a poor prognosis in both hematological and non-hematological cancers [39,40]. This discrepancy in MM may be attributable to the disease's pathophysiology. In MM, the increase of malignant plasma cells in the bone marrow impairs normal thrombopoiesis. Another study revealed that individuals with multiple myeloma have a considerably shorter platelet half-life [41]. Shi et al. demonstrated that higher NLR and MLR levels, as well as a reduction in PLR, has been related to worse outcomes in a newly MM diagnosed patients [42]. According to the results of multivariate Cox analysis, PLR is not a meaningful independent prognostic factor and cannot be utilized to predict the OS and PFS of patients with multiple myeloma [43]. All of these results may be because (PLR) considers both pro-tumor and anti-tumor immune status, which causes this index to be imprecise because platelets and lymphocytes must be considered concurrently. The cut-off values for (NLR) and (PLR) were inconsistent in prior cancer studies. As a result, we used (ROC) analysis to determine the appropriate cut-off positions for the PLR and NLR[44].

As a consequence, we found that PLR is a significant predictor of overall and progression-free survival for MM newly diagnosed patients. While NLR was related with a poor prognosis for individuals with multiple myeloma who were treated, it could be a significant predictor for the outcome of therapy in patients diagnosed with MM. The predictive value of PLR and NLR in patients with multiple myeloma is yet unknown. Additional potential studies are required to determine its benefit as a prognostic marker in MM patients treated in normal practice.

CONCLUSION

From our data, we concluded that, platelets are essential for the progression of the disease regulation in the bone marrow microenvironment of multiple myeloma. Further, and suggest a new prospective therapeutic strategy that could target the platelet-cancer interaction and (IL-1) as a promising target for probable early interventions of therapeutic or chemoprevention in MM.

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Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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Attitude of Teaching Staff and Students at Medical Faculty of Benghazi University toward the Undergraduate Medical Education Program

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Abstract
Background: Quality is one of the key elements of the Millennium Development Goals, the definition of quality in higher education is multi-dimensional including teaching, staff-students relationships, services, facilities and research. **Aims:** to assess the perceptions of the graduates (interns) regarding about quality their educational Programme at medical faculty Benghazi university: (curriculum , methods of examination , training program ,and services) during year 2009 - 2010. Also, the attitude of teaching staff at medical faculty at Benghazi university in the same year toward medical education. **Subjects and methods**: A cross sectional study of attitude of the respondents teaching staff and perceptions of interns at different teaching hospital at Benghazi university during year 2010. A pre-coded structure interview questionnaire was used according to criteria of the National Center for Quality Assurance and the adoption of educational and training institutions of ministry of education of Libya for evaluation of curriculum, methods of examination, training program , and services**. Results**: The current study reported that only less than one third (29.4%) of students were satisfied with the admission policy at Medical faculty Garyounis University at Benghazi and Curriculum Achieves Medical Education Objectives, and Slightly more than one third of the interns were satisfied with examination systems of medical faculty (35.3%). Nearly two thirds of students (61%) were not satisfied with teaching methods. 80%of the teaching staff agree that no training programs or support to the teaching staff**.** **Conclusion**: Poor perception of medical students to medical education and training Programme and most respondents staff unsatisfied with the university financial, administrative and training services for the teaching members of the medical faculty at Benghazi university Several areas which need great attention have already been recognized based on the data obtained in this study further studies are needed to improve the medical education quality at Benghazi university.
Key words: Satisfaction, Curriculum**,** Quality Assurance, Attitude**.**

Introduction:

The improved health of all peoples is the main goal of medical education. This is also the overall mission of the World Federation for Medical Education (WFME) (1). In keeping with its constitution, as the international body representing all medical teachers and medical teaching institutions, WFME undertakes to promote the highest scientific and ethical standards in medical education, initiating new learning methods, new instructional tools, and innovative management

of medical education. In accordance with this mandate, WFME in its 1998 position paper launched the program (1).

Standards in Basic Medical Education, *it became clear* that specifying global standards in any restricted sense would exert insufficient impact on the medical schools and their curricula, and indeed would have the potential to lower the quality of medical education. This led to the concept of the WFME standards (1). There are two different levels of standards:

(a) Basic standards or minimum requirements
(b) Standards for quality development.

That the WFME *Standards would have the status as an accreditation instrument was considered from the outset*.

The WFME Global Standards presented in this trilogy covers all three phase of medical education:

1. *Basic medical* Education
2. Postgraduate medical education.
3. Continuing professional development

There are variations among countries in medical education due to differences in teaching tradition, culture, socio-economic conditions, these differences can also occur within individual countries (1). The scientific basis of medicine is universal, the task of medical education everywhere is the provision of health care and there is a high degree of equivalence of structure process and product of medical schools worldwide(1).

Students' satisfaction is an educational process outcome and is an indicator of quality of medical education. It is associated with future professional attitudes, career commitment and retention (2). Satisfied person is likely to be willing to exert more efforts than unsatisfied (3,4). Quality is one of the key elements of the Millennium Development Goals, the definition of quality in higher education is multi-dimensional including teaching, staff-students relationships, services, facilities and research (5,6) .

The effectiveness of a curriculum can be evaluated using direct performance measures (e.g., comprehensive performance measures (e.g., students' satisfaction with the evaluations, presentations, and projects) and by indirect curriculum) (5,6). The opinion and satisfaction of students is especially important in assessment of teaching at the faculties and may have a considerable role in monitoring, identifying positive and deficient areas and in implementing necessary revisions of an educational program (7,8). Also, student satisfaction surveys could identify concerns about course shortfalls, provides room for improvements that contribute to improving the quality of teaching and learning (9,10).

This study was aimed to find out the attitude and satisfaction level of teaching staff and medical students about the undergraduate medical education at Benghazi University, Libya :(curriculum ,training program , methods of examination , and Services) during year 2009 - 2010.

Subjects and Methods

A cross sectional study of attitude of the interns trained at different teaching hospital at Benghazi university during year 2010. A questionnaire were used according to criteria of the National Center

for Quality Assurance and the adoption of educational and training institutions of ministry of education . The sample size was: 150 intern & 50 medical teaching staff. An Interview questionnaire were used to assess the knowledge and attitude of interns and medical teaching staff about the quality of medical education at Garyonis Medical University in Benghazi . An ethical consideration, a written consent had been taken from all respondents. Then, data analyzed after feeding the Pre-coded questionnaire to SPSS-program _ version 25 .

Results:

The sample size was 136 for interns' medical students and 21 teaching staff could be interviewed and agree to participate in the study. The current study reported that only 40 (29.4%) of students were satisfied with the admission policy at Medical faculty Garyounis University at Benghazi. Less than one third of students 40 (29.4%) Curriculum Achieves Medical Education Objectives, and Courses at the Faculty of Medicine conform to international standards. Slightly more than one third of the interns were satisfied with examination systems of medical faculty 48 (35.3%). Regarding the teaching methods Less than one third of students 40 (29.4%) satisfied with teaching methods, while nearly two thirds of students 83(61%) were not satisfied with teaching methods and only 23(16.9%) agreed that teaching aids used in medical school were modern. 24 (17.6) satisfied with the methods of assessment of practical training in the medical faculty. Nearly one fifth 26 (19.1%) agreed that the means of education were appropriate with the objectives of the educational program. 96(70.3%) disagreed that the extent of eligibility for computer programs and Internet sites at medical faculty. More than more than half 82 (53.9%) disagreed that faculty members were regular and Commitment to time in all departments. Nearly one fourth 30 (22.1%) of student their opinion that the number of actual and approved hours for courses and certificates offered was appropriate (Table1).

The present study assessed the library catalog and information's flow. The current study indicated that nearly one third 43(31.5) of students agreed and absolutely agreed about the library information's flow and catalog, one third 46 (33.8) of medical students agreed that the library contains an appropriate and efficient system for trading office materials and one quarters 33 (24.2%) of the students agreed that had an electronic office with the traditional library (table 2).

The present study reported that 46 (33.8%) medical students satisfied with the availability of transportation for medical students and 49 (36%) their opinion about the transportation at faculty was good , 85(62.5%) of students that hostels were poor, 113(83.7%) of students their opinion that university hospital accommodation of interns were poor. The current study reported that 59 (43.4%) of students their opinion about the administrative services offered by the university were poor (Table 3) .

Table1: Students opinion about the curriculum, educational and examination methods of medical faculty at Garyounis university 2010

Questions	Agree	Neutral	Disagree
	No. (%)	No. (%)	No. (%)
1. There are clear policies for admission to the Faculty of Medicine?	40(29.4)	28(20.6)	83(61)
2. Curriculum Achieves Medical Education Objectives.	40(29.4)	30(22.1)	66(48.5)
3. Courses at the Faculty of Medicine conform to international standards	47(34.5)	29(22.3)	44.2)
4. How much does the college have for students in examination systems	48 (35.3)	33(37.5)	55(53.9)
5. How appropriate are the teaching methods used in the college, including the use of information technology for medical education?	40(29.4)	28(20.6)	83(61)
6. How modern are the teaching aids used in medical school .	23(16.9)	46(33.9)	67(49.2)
7. What is the college's assessment of practical training.	24 (17.6)	56 (41.2)	56(41.2)
8. How appropriate are the means of education with the objectives of the educational program?	(19.1) 26	39 (28.7)	71 (52.2)
9. What is the extent of eligibility for computer programs and Internet sites	18(13.2)	22(16.3)	96(70.3)
10. How regular are faculty members and Commitment to time in all departments.	13 (9.6)	51(37.5)	82(53.9)
11. What is the extent to which the College complies with the educational guidance systems and foundations	23 (16.9)	43 (31.8)	60 (51.9)
12. How appropriate is the number of actual and approved hours for courses and certificates offered	31(22.8)	30(22.1)	75(55.1)

Table 2: Respondents opinion about the library in the faculty of medicine at Benghazi university 2010

Questions	Number	%
1. The extent to which the library is cataloged and the information flows		
a) Agree & absolutely agree	43	31.5
b) Natural	48	35.3
c) Disagree &absolutely disagree	45	32.3
2. The extent to which the library contains an appropriate and efficient system for trading office materials		
a) Agree & absolutely agree	46	33.8
b) Natural	45	33.1
c) Disagree & absolutely disagree	45	33.1
3. To what extent does the establishment support the electronic office with the traditional library		
a) Agree & absolutely agree	33	24.2
b) Natural	33	24.3
c) Absolutely disagree & disagree	71	51.5
Total	136	100.0

Table 3: Respondents attitude toward satisfaction about the general services of Medical Faculty at Benghazi university 2010

Questions	Good	Fair	Poor
	No. (%)	No. (%)	No. (%)
1. The availability of transportation for medical students:	46(33.8)	22(16.2)	68(50.0)
2. What is your opinion about the transportation at faculty	49(36)	39(28.7)	48(35.3)
3. What do you think about student hostels	24(17.6)	27(19.9)	85(62.5)
4. What do you think about university hospital accommodation?	10(7.7)	13(9.6)	113(83.7)
5. What do you think about the administrative services offered by the university?	42(30.9)	34(25)	59(43.4)
6. What do you think of the study rooms and desks in the Faculty of Medicine?	63(46.3)	41(30.2)	32(23.5)
7. What do you think of public parks in the Faculty of Medicine?	69(50.7)	27(19.9)	40(29.4)
8. What do you think about cafes and public facilities in the college (toilets)?	18(13.3)	36(26.5)	82(60.3)

9. What do you think of the social and recreational activities at the university?	38(27.9)	51(37.5)	47(34.6)
10. How financial support is available for the fourth and fifth year:	20(14.7)	29(21.4)	87(63.9)
11. Availability of financial support for students of excellence.	**11(8.1)**	**11(8.1)**	**114(83.8)**
12. Availability of university book purchase support.	**51(37.1)**	**33(24.3)**	**52(38.2)**

Discussion

The current study revealed that the teaching methods Less than one third of students satisfied (29.4%) with teaching methods, and only 16.9% agreed that teaching aids used in medical school were modern. 24 (17.6) satisfied with the methods of assessment of practical training in the medical faculty. Jalili M. et al (2008) (8) reported that 28.4 % the overall satisfaction of the students with the training program at medical faculty Tehran University Iran (8).

Medical Education should be a concern of every medical student as it shapes not only the quality of future doctors, but also the quality of health care" Realizing our role in medical education is not an easy task. Getting student to understand their role is even more difficult (10).

Conclusion

From the analysis of the opinion of interns the quality of medical education at faculty of Benghazi university is below the standard of national committee for accreditation of high education and below the standard of (WFME) in all components .

Recommendations: from the study we recommend: Improvement of training of interns in practical in all branches, financial support to intern, generalization of computer and internet source made available for the staff and the student support library. Sharing of the faculty of medicine in more international conference and scientific media.

Acknowledgement

The first of all thanks for Allah , and then thanks to all interns and doctors and staff who were participated in the research.

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تحت شعـار: جـــــــودة التعليـــــم والتعلـــم والبحث العلـمي

Study on the correlation of zinc and copper status with glycemic control and body mass index among patients with type II diabetes mellitus

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Abstract
Type 2 diabetes mellitus (DM) is associated with increased morbidity and mortality due to the development of complications, especially due to poor glycemic control. Trace elements especially zinc and copper are cofactors of many enzymatic reactions which are involved in protein, lipid and glucose metabolism. Obesity is a chronic condition linked to disturbances in the metabolism of zinc and copper. The aim of the study was to estimate zinc and copper levels in type2 diabetes mellitus patients and to investigate their relations to glycemic control and body mass index (BMI). The study included 46 type2 diabetic patients and 43 healthy subjects aged 30-60 years for both sex (males and females). Blood glucose, HbA1c, lipid profile parameters were biochemically estimated in the study along with the measurement of BMI and systolic, diastolic blood pressure. All the results were statistically analyzed and were significant between the study and control groups. Zinc levels were inversely correlated with serum glucose, HbA1c, serum cholesterol, Triglyceride, LDL cholesterol, systolic, diastolic blood pressure and BMI levels and positively correlated with HDL cholesterol. Copper levels were positively correlated with blood glucose, HbA1c, serum cholesterol, Triglyceride, LDL cholesterol, systolic, diastolic blood pressure and BMI levels and negatively with HDL cholesterol. It is concluded that zinc and copper levels play major roles in glycemic control and alterations in lipid profile parameters among type 2 diabetes mellitus patients. Obesity contributes to changes in zinc and copper levels.
Key words: Diabetes mellitus, glycemic control, BMI, Obesity and lipid profile**.**

Introduction:

Diabetes Mellitus is a metabolic disorder characterized by hyperglycaemia resulting from defects in insulin secretion, insulin action or both. Type2 diabetes is characterized by insulin resistance with relative insulin deficiency and it accounts for 90% of all diabetic cases [1]. Zinc is a trace element that acts as co-factor for synthesis, storage and secretion of insulin by pancreas. The predominant effect of diabetes on zinc homeostasis may be the result of hyperzincuria or decreased intestinal absorption of zinc or both [2]. Zinc has an important role in the glucose utilization by muscle and fat cells. It is required as a cofactor for the function of intracellular enzymes that may be involved in protein, lipid and glucose metabolism. Zinc participates as an integral component of several antioxidant enzymes. It is a cofactor of antioxidant enzyme Cu, Zn-superoxide dismutase (SOD), which is suppressed under Zn deficient conditions [3]. Impaired metabolism of trace elements like copper (Cu) and zinc (Zn) has been reported to result in higher sensitivity to oxidative damage and development of diabetes and diabetic complications [4]. Both of these metals are involved in glucose homeostasis and their status is modulated in DM [5, 6]. Many of the complications of diabetes

may relate to an increase in intracellular oxidant and free radicals associated with decrease in intracellular zinc and zinc dependent antioxidant enzymes [7, 8]. Multiple studies have demonstrated the interaction between obesity and Zn homeostasis. In particular, blood Zn levels were found to be significantly decreased in obese patients [9, 10].

Several studies have demonstrated the correlation of zinc and copper status with the development of type II diabetes mellitus. Since lack of available data regarding zinc and copper stutus among patients with type II diabetes mellitus in Wadi Alhayah, southwest Libya. Therefore, the aim of the study was to estimate zinc and copper levels among patients with type II diabetes mellitus and to investigate their relations with glycemic control, lipid profile pattern and obesity.

Material and methods:

Study population

Case control study was conducted between the months of January 2021 to July 2021 at Albalsam clinic, Garma, southwest Libya. The study involved 46 diabetes mellitus patients and 43 healthy subjects as a control group whose ages ranged between (30–60) years for both sex (males and females). Both groups were matched in ages. All participants were informed of the purpose of the study, were free to ask questions throughout the study and signed an informed consent form.

The study excluded type1 diabetes mellitus, pregnant and lactating women, and persons receiving trace element supplements in the previous three months, persons with gastric or diuretic treatment, patients with renal failure and patients with a recent surgery or acute infection.

Sample collection

Peripheral venous blood samples were obtained after 12 hours of overnight fasting. Five ml of blood were collected from type II diabetic patients and healthy individuals for the measurement of glucose, HbA1c, lipid profile (cholesterol, TG, HDL and LDL) and zinc, copper levels. The body mass index (BMI) was calculated by using the formula: BMI = weight in kilogram divided by height in meter square. The blood pressure (systolic and diastolic blood pressure) was recorded in both arms after five minutes of sitting. Blood was allowed to clot at room temperature, and the serum was separated by centrifugation.

Methods and Biochemical analysis

The FBS was done by the enzymatic calorimetric method and HbA1c estimation was done by sandwich immunodetection method. Serum total cholesterol and HDL were done by cholesterol oxidase method. Serum triglyceride by glycerol peroxidase method on auto analyzer. Serum LDL-Cholesterol is calculated value by Friedwald's equation. Serum zinc was measured colorimetrically with 2-(5-Bromo-2- Pyridylazo)-5-(N-Propyl-N Sulfopropylamino-) phenol by Bioscientia, Germany. Serum copper was also measured by Bioscientia Germany.

Statistical Analysis

All the results were tabulated and analyzed using Statistical Package for Social Sciences (SPSS) version 14 to apply one way ANOVA test and Pearson's correlation coefficient. One way ANOVA test was used to compare the means and standard deviations of zinc, copper, Fasting blood glucose (FBS), Glycosylated hemoglobin (HbA1c), cholesterol, triglycerides, high density lipoprotein(HDL), low density lipoprotein (LDL), systolic blood pressure and diastolic blood pressure of diabetic subjects with their controls. Moreover, one way ANOVA test was

used to compare the differences of biochemical parameters among the study groups in relation to BMI. All values were presented as means and standard deviations (SD) for continuous variables. Person's correlation coefficient test was used to assess the relationship of zinc, copper levels with serum glucose, HbA1c and BMI levels.

Results:

The results of the present study have been presented and summarized in the form of tables and figures. A total of 46 type2 diabetes mellitus patients and 43 healthy subjects as a control group were included in this study, with an age ranged 30-60 years. All the results were tabulated and analyzed using Statistical Package for Social Sciences (SPSS) version 14 for applying one way ANOVA test to compare the means and standard deviations of biochemical parameters of patients and control groups. The results were considered statistically significance at p. value< 0.01.

The mean age was 43.98±7.30 years in type2 diabetic patients and 44.09±7.7 years in the control group. There were not statistical significance in ages between the two groups (P. value= 0.94).

Table1 illustrates the clinical and biochemical characteristics of the patients and controls. The type II diabetic patients group had significantly higher serum glucose, HbA1c, BMI, serum cholesterol, Triglyceride, LDL cholesterol, systolic, diastolic blood pressure and copper levels than controls (p value < 0.01). Conversely, zinc and HDL-cholesterol were significantly lower in patients with type II diabetes mellitus as compared to control (p value < 0.01).

Table2 illustrates the distribution of biochemical parameters' results in relation to BMI levels. The study group's results were divided into three groups in accordance to body mass index (healthy weight 19-24.9 kg/m2, overweight 25-30 kg/m2 and obese > 30 kg/m2). All biochemical parameters in the three groups were statistically analyzed by using one way ANOVA test to find out statistical significance among different biochemical variables in the three groups. The results were considered statistical significance at P. value < 0.01.

Ages were matched and not statistically significant among the three groups. All biochemical parameters were statistically significant among the three groups P. value < 0.01.

Table3 shows the correlation between zinc, copper levels and blood glucose, HbA1c and body mass index levels. By applying Pearson's correlation coefficient, it was found that zinc was inversely correlated with serum glucose, HbA1c and BMI (r= -0.8, -0.7 and -0.8 respectively), whereas copper was positively associated with serum glucose, HbA1c and BMI (r= 0.9, 0.7 and 0.9 respectively).

The correlations of zinc and copper levels with serum glucose, HbA1c, and BMI have been illustrated in **figures** 1, 2, 3,4,5,6.

Table1: Comparison of biochemical variables' results in the study and control group

Parameters	Control group Mean±SD	Case group Mean±SD	P. value
Age years	44.09±7.74	43.98±7.30	0.94
BMI kg/m2	21.24±1.84	29.50±5.85	P. value <0. 01
Fasting blood glucose (mg/dl)	88.95±12.56	143.22±16.35	P. value <0. 01
HbA1c %	5.19±0.66	8.12±3.14	P. value <0. 01

Serum cholesterol (mg/dl)	141.51±6.04	183.39±24.29	P. value <0. 01
Triglyceride (mg/dl)	114.51±20.54	186.74±24.26	P. value <0. 01
HDL-Cholesterol(mg/dl)	46.55±8.99	22.40±11.89	P. value < 0 .01
LDL-Cholesterol (mg/dl)	80.33±8.48	136.26±25.92	P. value <0. 01
Systolic blood pressure mmHg	109.30±8.88	150.98±25.30	P. value <0. 01
Diastolic blood pressure mmHg	72.95±6.37	100.04±19.99	P. value <0. 01
Serum zinc (mg/dl)	119.35±21.11	67.09±20.11	P. value <0. 01
Serum copper (mg/dl)	88.07±12.31	120.98±16.09	P. value <0. 01

The results were analyzed using Statistical Package for Social Sciences (SPSS) version 14 for applying one way ANOVA test to compare the means and standard deviations of biochemical parameters of patients and control groups. The results were expressed as means and standard deviations (SD). The results were considered statistically significance at P. value<0.01.

There was statistical significance between the two groups regarding BMI, Fasting blood glucose, HbA1c, serum cholesterol, Triglyceride, HDL-Cholesterol, LDL-Cholesterol, systolic, diastolic blood pressure, serum zinc and serum copper ($p < 0.01$).

Table2: Distribution of biochemical variables in the study group in accordance to Body Mass Index.

	Body Mass Index (BMI) Kg			
Parameters	**Healthy weight n= 16 19- 24.9 kg/m2 23.23±1.21**	**Overweight n= 11 25-30 kg/m2 27.86±1.44**	**Obese n= 19 > 30 kg/m2 35.74±2.38**	**P .value**
Age years	44.56±7.80	41.45±6.18	44.84±7.28	0.43
Blood glucose (mg/dl)	124.87±8.68	143±3.31	158.78±6.65	p = 0.07
HbA1c %	6.30±2.04	8.52±2.31	9.42±3.46	p < 0.01
Serum cholesterol (mg/dl)	156.25±6.23	179.09±5.28	208.73±9.12	p < 0.01
Triglyceride (mg/dl)	158.62±6.18	185.54±8.09	211.10±8.55	p < 0.01
HDL- cholesterol (mg/dl)	30.11±9.49	23.09±9.16	15.50±9.49	p < 0.01
LDL- cholesterol (mg/dl)	107.18±6.90	132.549.26	162.89±9.12	p < 0.01
Systolic blood pressure mmHg	122.81±4.27	147.72±8.03	176.57±12.05	p < 0.01
Diastolic blood pressure mmHg	81.56±6.43	94.90±9.54	118.10±16.58	p < 0.01
Serum zinc (mg/dl)	84.37±19.47	68.36±10.70	51.78±10.84	p < 0.01
Serum copper (mg/dl)	103.66±5.66	118.36±3.85	137.15±7.99	p < 0.01

The results were analyzed using one way ANOVA test to find out the statistical significance between the different variables in the three groups. The results were considered significant at p

value < 0.01. Ages were not statistically significant among the three groups. All biochemical parameters' results were statistically significant among the three groups.

Table3: Correlation of zinc and copper status with serum glucose, HbA1c and BMI.

Parameters	Serum glucose (mg/dl)	HbA1c %	BMI Kg/ m2	Copper (mg/dl)
Serum zinc (mg/dl)	-0.8	-0.7	-0.8	-0.8
Serum copper (mg/dl)	0.9	0.7	0.9	/

The results were analyzed using software SPSS version 14 for applying Pearson's correlation coefficient to investigate the correlation between zinc, copper levels and serum glucose, HbA1c and BMI levels. Serum zinc levels were negatively correlated with serum glucose, HbA1c and BMI levels (r=-0.8, -0.7 and -0.8 respectively). Copper levels were positively correlated with serum glucose, HbA1c and BMI levels (r= 0.9, 0.7 and 0.9 respectively).

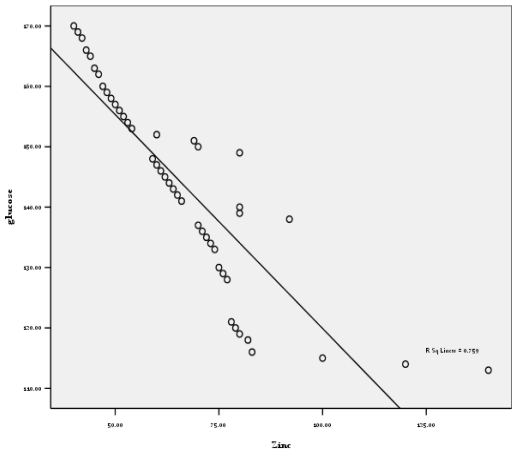

Figure 1 shows the correlation of zinc levels and serum glucose levels. They are negatively correlated (r= -0.8).

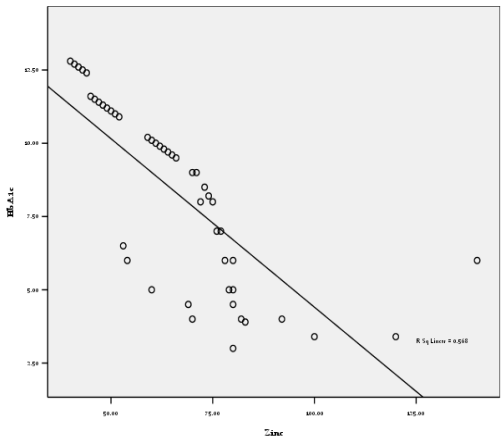

Figure 2 shows the correlation of zinc levels and HbA1c levels. They are negatively correlated (r= -0.7).

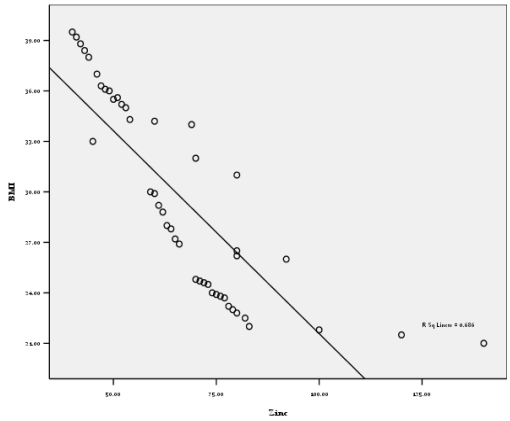

Figure 3 shows the correlation of zinc levels and BMI levels. They are negatively correlated (r = -0.8).

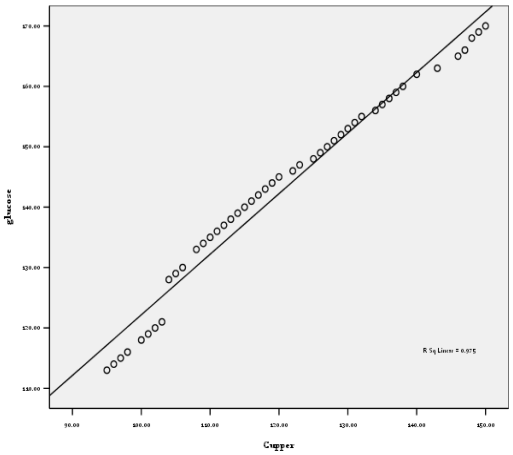

Figure 4 shows the correlation of copper levels and serum glucose levels. They are positively correlated (r= 0.9).

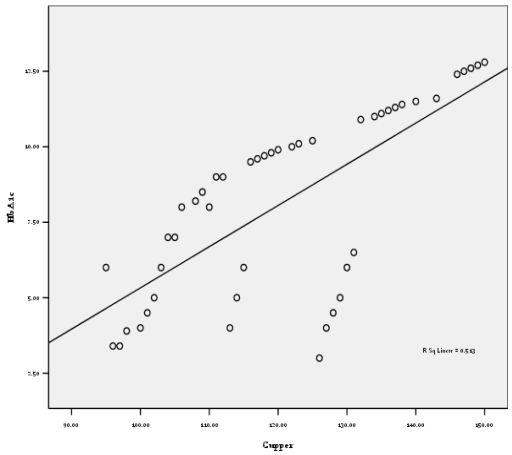

Figure 5 shows the correlation of copper levels and HbA1c levels. They are positively correlated (r= 0.7).

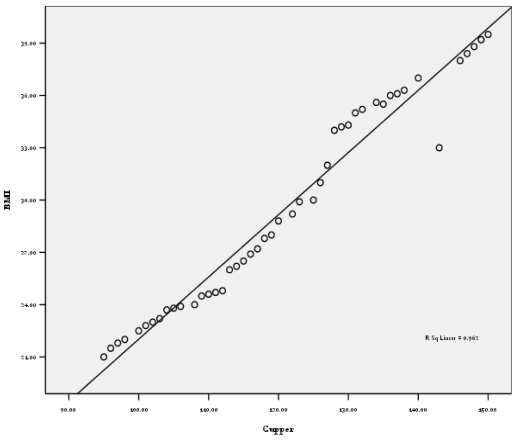

Figure 6 shows the correlation of copper levels and BMI levels. They are positively correlated (r= 0.9).

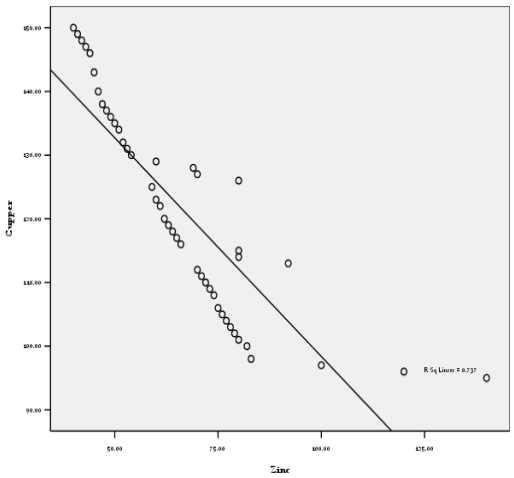

Figure 7 shows the correlation of zinc levels and copper levels. They are negatively correlated (r= -0.8).

Discussion

Diabetes mellitus is one of the most common diseases of the mankind which is linked with alterations in mineral metabolism. Trace elements are essential for optimum human health, due to their diverse metabolic characteristics and functions. These trace elements play specific roles in the pathogenesis and progression of type II diabetes mellitus [11].

The present study showed that diabetic patients had significantly low mean zinc level 67.09 ± 20.11 mg/dl than control subjects 119.35 ± 21.11 mg/dl ($p<0.01$). The findings were consistent with several studies which found that serum zinc is significantly lower in diabetic patients as compared to control [12, 13]. Zinc increases insulin sensitivity by increasing the binding ability of insulin to its receptors. Decrease in Zinc levels in diabetic patients is due to the decreased gastrointestinal absorption and increased urinary excretion [14].

The study revealed that the mean of serum copper levels was 120.98 ± 16.09 mg/dl in diabetic subjects as compared to control 88.07 ± 12.31 mg/dl. The higher the copper level, the more likely the person was to have complications from diabetes, including retinopathy, high blood pressure, or vascular disease [15]. Increasing in copper levels is related to increased inflammatory processes which in turn increase in the production of the copper carrier protein (ceruloplasmin). Increasing in ceruploplasmin leads to elevate availability of copper and bound within haptocytes and released into circulation [16]. Zinc competes copper for binding sites on cell membrane and therefore, affecting each other [17]. It is well known that there is an antagonism behavior between zinc and copper status [16, 18].

Copper to zinc ratio has a significant role in oxidative stress. The ratio has been previously studied as a measure of susceptibility or progression for a range of neurological, developmental and metabolic disorders, including diabetes and cardiovascular disease. The Cu/Zn ratio is clinically more important than the concentration of either trace metal [16]. Maintenance of adequate copper

to zinc status is important for supporting anti-oxidative functions of Cu/Zn- superoxide dismutase (SOD) and protection from damage [19].

It was observed from the present study that the mean fasting blood glucose level was 143.22±16.35 mg/dl and HbA1c level was 8.12±3.14 % in type 2 diabetes mellitus patients and were found to be very significantly higher than that of the controls 88.95±12.56 mg/dl and 5.19±0.66% for blood glucose and HbA1c levels respectively ($p < 0.01$).

The FBS and HbA1c levels in type II diabetes mellitus patients were negatively correlated with serum concentration of zinc ($r = -0.8, -0.7$ respectively) and positively with copper level ($r= 0.9, 0.7$ respectively). The zinc level was significantly low in patients with poor glycemic control compared to patients with good glycemic control. The findings of the present study were also consistent with several studies which found a negative correlation between zinc levels and serum glucose, HbA1c [12, 15, and 18]. Hyperglycemia interferes with the active transport of zinc back into the renal tubular cells leading to more urinary excretion of zinc [20].

In this study, It was observed that there were high levels of cholesterol 179.09±5.28 mg/dl, triglycerides 186.74±24.26 mg/dl, LDL cholesterol 136.26±25.92 mg/dl and low level of HDL cholesterol 22.40±11.89 mg/dl as compared to control subjects. Moreover, the serum zinc levels in type II diabetes mellitus patients were negatively associated with high levels of cholesterol, triglyceride, LDL cholesterol and positively with HDL cholesterol. On the other hand, copper levels in type2 diabetes mellitus patients were positively correlated with cholesterol, triglyceride and LDL cholesterol and negatively correlated with HDL cholesterol. Additionally, zinc levels were negatively associated with systolic and diastolic blood pressure whereas; copper had a positive relation with systolic as well as diastolic blood pressure. The effect of zinc on lipid profile and blood pressure was documented also in some other studies. The findings were in agreement with a previous study which observed lower level of serum zinc in hyperlipidemic nonobese patients compared with the control group, as well as a significant negative correlation between serum zinc and cholesterol, LDL, triglyceride [21].

Low zinc levels are associated with an increase in metabolic disorders such as insulin resistance, inflammation and fat metabolism [22, 23].

Zn is an important regulator of zinc-alpha-2-glycoprotein (ZAG) homeostasis, which plays important roles in lipid metabolism and glucose homeostasis. The primary biological role of ZAG is lipid mobilization in white adipose tissues. Obese patients present low serum concentrations of Zn and ZAG, as well as decreased expression of the genes encoding this protein which may affect lipid and glucose metabolism and seems to constitute a linkage between Zn and obesity complications [24].

The study showed a positive correlation of blood copper with TC, TG, and LDL-C. Rise in blood Cu levels and low in blood zinc with high levels of lipid profile indicates the development of cardiovascular diseases (CVD) [25, 26].

Zinc supplementation decreases triglycerides, cholesterol, LDL, and blood pressure after 12 weeks of therapy. In this study, the systolic and diastolic blood pressures were negatively correlated with serum zinc level [27]. There was significant improvement in blood pressure after vitamin/mineral including zinc supplements [28].

Multiple studies have revealed that zinc supplementation had beneficial effects on lipid profiles in patients with diabetes or metabolic syndrome [28, 29]. Zinc supplementation increases HDL-cholesterol and reduces TG in patients with type 2 diabetes [27]. Zinc supplementation at 30 mg daily for 8 weeks increased serum zinc by 15% and urinary zinc by 56%, but no significant difference was found with respect to TG and HDL-cholesterol after zinc supplementation [30]. Zinc supplementation for 4 weeks did not have a beneficial effect on lipid levels in normal glucose-tolerant obese women aged 25–45 years [31]. A similar study based on an eighteen-day supplementation of 20 mg zinc per day revealed different results and found decreased BMI, improved lipoprotein profiles, and reductions in the total cholesterol and low-density lipoprotein (LDL) fraction [32].

It was observed by the study that there was a reverse relation between zinc and BMI, in which zinc levels were lowering as BMI was increasing. In the present study the cases were divided into three groups in accordance to BMI, healthy weight (19-24.9 kg/m2), overweight (25-30 kg/m2) and obesity (> 30kg/m2). The levels of zinc were 84.37±19.47 & 68.36±10.70 and 51.78±10.84 respectively.

Inflammatory process in obese individuals affect zinc metabolism by increasing TNF-a [33]. The inflammation promotes the zinc accumulation in the liver and in adipocytes which may have contributed to the negative correlation of serum zinc level with BMI in obese patients [34].Increasing in cortisol hormone in obese individuals leads to accumulation of zinc in adipose tissues which results in chronic inflammation [34]. Cortisol is an important regulator hormone of trace metabolism, especially of zinc. It activates the gene expression of metallothionein and zinc is redistributed from the plasma to deferent tissues, especially to the liver and adipose tissues leading to hypozincaemia in obesity [35].

Conclusion: It is concluded that zinc and copper status have great roles in maintaining glucose homeostasis, lipid profile metabolism and blood pressure. Obesity has reverse effect on zinc and copper status which contribute to the development of type II diabetes mellitus complications.

Limitations: The study has some limitations which including low sample size, other main trace elements such as magnesium, calcium were not included in the study.

Recommendations: Regular measurements are needed for zinc and copper levels in patients with type II diabetes mellitus, maintaining healthy weight in patients with type II diabetes mellitus is useful for preventing the development of type II diabetes mellitus.

Further studies are needed for investigating other elements such as calcium, magnesium along with zinc and copper status and finding out their relations with type II diabetes mellitus, moreover, studies are needed for investigating zinc/copper superoxide dismutase antioxidant and its relation with zinc deficiency in type II diabetes mellitus.

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Online Versus Attendance Assessment in Undergraduate Medical Education

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Abstract

Background: A rapid growth of electronic learning requires correlative electronic assessment methods. Unfortunately, these methods have many challenges that negatively impact academic integrity, including technical problems and a high chance of online cheating. **Aim:** to compare online and attendance assessments by evaluating differences in grades for the same students. **Subjects and methods:** A case-control study was conducted on undergraduate medical students attending the neuroscience module performed through online and attendance exams for all enrolled students. Students were divided into two groups; the first exam was done as attendance for the first group and as an online exam for the second group through Google form that was held at the same time and for ten minutes with the same question delivered for both groups, the second exam done a few days later through the same procedure but reversing the groups insuring each student take one online and another attendance exam. Data assembled and analyzed through a T-test equation. **Results:** Among 282 students, 179 students completed online and attendance exams and enrolled in the study. The mean grades for all students for online and attendance exams were 9.207 and 4.894, respectively, with a highly significant P-value. The mean grades for online and attendance exams for male students were 9.220 and 4.415, respectively. While for female students, the mean grades for online and attendance exams were 9.196 and 5.299, respectively. Both males and females show highly significant P-values when considered as separate entities. Comparing differences in means between male and female students show a non-significant P-value of 0.055. **Conclusion:** Based on the above findings, high and significant difference in means of grades suggests the unreliability of online assessment methods in its current form and necessitates being aware of the high opportunity to cheat. Therefore, more advanced methods are needed in the future to combat online cheating.

Keyword: Online Cheating, Academic Integrity, Medical Education.

Introduction

Although many medical schools experienced the new growth of unprecedented electronic learning in the last two decades, rapid growth and enormous expansion have been experienced in the last few years after the declaration of COVID-19 as a pandemic. (1)

Different modalities of electronic education were used to substitute the traditional way of education, discontinuing the known face-to-face models. Additionally, these models of electronic education required new and correlative methods for electronic assessment. However, newly appearing assessment methods have different challenges for academic staff and learners. These may include technical difficulties such as difficulty entering the exam, slow loading of questions, unstable internet connections, and non-technical including online cheating that becomes a new known term and practice of dishonesty negatively impact the reliability of assessment and the academic integrity. (1-3)

Ensuring the integrity of online assessment requires awareness of different types of cheating methods and knowing the different cheating sources. These may include immediate access to different search engines and direct communication with other learners and students through instant messaging applications and social networks. Additionally, as cheating is more harmonious in online assessments than in traditional ones, it is required to detect and prevent this dishonesty by applying different methods to detect online cheating both during and after the exam. (4-6).
This study aimed to compare the online versus attendance assessment methods by analyzing the end scores of students.

Subjects and Methods

This is a case-control study performed using different assessment modalities; the study was done by performing two exams for the undergraduate medical students in the neuroscience module, which is held as part of an integrated educational method delivered to third-year class at Al-Kindy College of Medicine – University of Baghdad. The time of the exams was during November 2021. Students were divided into two main groups, namely groups A and B; each exam was done for all students, with a group undergoing the exam as an attendance type for ten minutes. The other group took the exam electronically at their homes simultaneously through Google form. A few days later, a second exam was done with different questions through the same procedure but reversing the groups by making each student perform one electronic and another attendance exam to ensure the same opportunities for each of them to take different models of exams.
Questions were delivered through single choice type in the field of neuroanatomy as a main topic within the neuroscience module with five questions for each exam; Grades were valued according to answers. Students fail to attend one or two of the exams were excluded from the study.
Scientific and ethical approval was obtained from the scientific committee of Al-Kindy College of Medicine, The University of Baghdad, with verbal information about the study was provided to all students entering the exam.
Statistical analyses were performed after collecting and assembling the data, and by using SPSS software, Paired T-tests were used with a P-value less than 0.05 was regarded as significant.

Results

Among 282 students, the total number of students enrolled in the educational neuroscience module Al-Kindy College of medicine, 179 made online and attendance exams, making them eligible to enroll in the study. All Participants were 19 years of age or above, male to female ratio was 0.85:1 . The mean grades for students who made online assessments were 9.207, while 4.894 for attendance assessments. A highly significant P-value of 0.0001 was recorded with a 95% Confidence Interval.
Table 1

Table (1) Grades differences between online and attendance exams by Paired T Test for all students.

Exam type	Number	Mean of Grades	Standard Deviation	Standard Error Mean	P-Value	T-Value
Online	179	9.207	1.648	0.123	0.0001*	18.34
Attendance	179	4.894	2.946	0.220		
Difference	179	4.313	3.147	0.235		

* Highly significant
95% CI for mean difference: (3.849, 4.777)

The mean of grades for online and attendance exams for male students were 9.220 and 4.415, respectively, while for female students, the mean of grades for online and attendance exams was 9.196 and 5.299, respectively. Both were highly significant, with a P-value of 0.0001 when considered a separate group according to gender. Table 2 and 3.

Table (2) Grades differences for male students between online and attendance exams by Paired T Test.

Exam type	Number	Mean of Grades	Standard Deviation	Standard Error Mean	P-Value	T-Value
Online	82	9.220	1.564	0.173	0.0001*	13.55
Attendance	82	4.415	2.977	0.329		
Difference	82	4.805	3.210	0.355		

* Highly significant
95% CI for mean difference: (4.099, 5.510)

Table 3. Grades differences for female students between online and attendance exams by Paired T Test

Exam type	Number	Mean of Grades	Standard Deviation	Standard Error Mean	P-Value	T-Value
Online	97	9.196	1.724	0.175	0.0001*	12.60
Attendance	97	5.299	2.873	0.292		
Difference	97	3.897	3.046	0.309		

* Highly significant
95% CI for mean difference: (3.283, 4. 511)

Differences between students' grades in online versus attendance exams were non-significant between both genders; a mean of differences was 4.805 and 3.897 for male and female students, respectively, with a P-value of 0.055. table 4.

Table 4. Differences in mean between both genders

Gender	Number	Mean of Grades	Standard Deviation	Standard Error Mean	P-Value	T-Value
Male	82	4.8	3.21	0.35	0.055*	1.93
Female	97	3.90	3.05	0.31		

* Non-significant
95% CI for mean difference: (-0.021, 1.837)

Discussion

During the pandemic era of COVID-19, and as new technologies surround the world, medical colleges were forced to use modern technologies and different methods for teaching and assessment.

There are many benefits of online assessments and exams, including money, papers, and time-saving; however, there are many obstacles regarding these types of assessments, starting from the defect in the delivering internet services in many regions in our country going to cheating. Moreover, the tendency to cheat explains the high marks in a given exam compared with the same paper questions.

This study agrees with many of the same concerns that cheating is very prevalent and easy online exams delivered from some applications compared with online protected exams through more advanced ones. More protected methods and applications with advanced technologies make cheating harder (7). However, it disagrees with a study that shows no difference between online and traditional exams when both exams are conducted in the college. The variability in marks is explained by the preparation for the exam rather than the method used (8 .(

Although the new technologies facilitate the online exams when there are no other alternatives, it facilitates cheating from many researchers' points of view because it makes it easy for the student to use social networks and search for answers from the websites (1 .(

Lastly, many studies agree with this study that gender has no difference in attitude toward cheating. Both males and females have the same attitude when the opportunity permits (9,10). However, another study done by Clariana et al. shows that males were more likely to cheat than females, although this study was based on an interview and questionnaire designed to evaluate the traditional type of assessments that could cause disagreement (11).

Our study has its limitation; this may include the lack of a concurrent interview or an online questionnaire based on identifying the real attitude and causes of this habit.

Conclusion

Online methods of assessment helped the education during the pandemic era. However,it introduce many challenges, the biggest one was more possibilities for online cheating that negatively impact academic integrity specialty when conducted without control. So, to improve this method of examination, colleges must use controlling and protective programs to eliminate or decrease cheating and increase the benefit of using online education.

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The Relationship between Permanent Teeth Eruption and Nutrition Status in 7-9 Years Old School Children: (A comparison Between Two Regions in Az Zawiyah City)

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Abstract:
The process of tooth eruption is complicated and influenced by various factors; nutrition is one of these factors. Therefore, the current study aimed to determine whether there is a significant relationship between the numbers of erupted permanent teeth with nutritional status in children aged 7-9 years in Az Zawiyah City.The descriptive cross-sectional study was carried out from February to March 2021 among (120) elementary school pupils from (4) schools from two regions (city center and country-side) at Az Zawia City. The visual examination was done to assess the stage of permanent teeth eruption, and the nutritional status of pupils was calculated based on the Body Mass Index (BMI) according to age from the anthropometric measurements of body weight and height. Valuation of nutritional status was performed using the WHO Centers for Disease Control and Prevention (CDC). The obtained data was statistically analyzed using the **IMB** Statistical Package for Social Sciences **(SPSS) Statistic** software version **23**, Spearman's correlation test and one way ANOVA analysis test. The results showed that the Spearman's correlation test has obtained the value of r = 0.012, which showed a weak strength positive direction relationship between the number of teeth and nutritional status. One way ANOVA analysis test has obtained the value of p = 0.25, which showed there is no significant differences in the number of teeth according to the gender variable. The study concluded that there is a positive relationship between nutritional status of a child and the number of erupted permanent teeth. In addition, the study proved that there are differences between country side's and city center's schools in relation to number of permanent teeth; however, these differences might not be considered as significant differences.
Keywords. Permanent Teeth, Eruption, Nutrition Status, Old School Children.

Introduction

Tooth eruption is known as a biological phenomenon, where the tooth starts to move from its development site in alveolar bone to its functional position in the oral cavity. The tooth eruption process is allocated into five stages: **a.** pre-eruptive movements, **b.** intraosseous stage, **c.** mucosal penetration, **d.** pre-occlusal stage **e.** post-occlusal stage [1]. The teeth eruption timing is reliant on many factors such as: gender, height, weight, socioeconomic status, craniofacial growth and morphology, primary teeth early extraction, environmental factors, and nutrition factors [2, 3].

The concept of nutrition is known as sufficient nutrients in quantity, quality, and the capability of human body to use them properly for body's metabolism. The proper nutrition during childhood is very important to complete biochemical activities that used for child's body growth and development. In addition, the early stages of tooth growth process are influenced by a number of elements in the diet (Ca, P, F, and vitamins) [4, 5]. Both the quality and quantity of food choice have the potential role to enhance or interfere with normal growth and development [6].

Moreover, nutritional deficiencies will cause growth and development problems due to incompetent of human body to carry out the daily activities [7]. Also, malnutrition affects the tooth development as well because the role of nutrition for the oral tissue is similar to other tissues of the body's organs [8].
Generally, permanent teeth start emerging into mouth cavity at age of the 6th year, and the first molars are the first permanent teeth appear into mouth cavity. The eruption of teeth could be too early or delayed. Though, delaying in tooth eruption is more mutual issue, and that can affect occlusal relationship which may lead to malocclusion and mastication problem as a sequence [9].
According to Suri, nutritional deficiencies can cause delaying in the process of teeth eruption [10]. During the period of tooth growth and development, deficiencies in consumption of some elements for example: carbohydrates, proteins, fats, iodine, calcium, magnesium, phosphorus, vitamin C, and vitamin D can cause delaying in tooth eruption [11]. If the delayed tooth eruption is in the anterior teeth, it will give a negative psychological influence to the child due to the aesthetical aspect [12].
There are a number of studies focused on the effects of malnutrition on timing of tooth formation, however the finding of these studies are differing. While some studies did not find a significant delay in tooth growth in malnourished children [13, 14], others submitted that there was a significant effect of malnutrition on dental development [15, 16].
Therefore, this study aims to determine whether there is a significant relationship between the number of erupted permanent teeth with nutritional status in children aged 7-9 years and compare eruption age with BMI in a group of children from schools in two regions in District of Az Zawia City.

Methods

1. Data, Participants, and Procedures

A description cross sectional study was conducted to assess the nutrition and eruption of permanent teeth. The study was carried out on pupils of four public elementary schools at Az Zawiyah city, two schools located in the area of country side (Osama ben Zead school and Bear Terfas school) elementary schools, and the other two schools are located in the area of city center (Asmaa Bent Abi Bakr school and Az Zawiyah central elementary school). This survey study was conducted in March, 2021 within the total sample of 120 participants with the age of 7-9 years old; 30 pupils were selected randomly from each school. The data was collected during the field study which permissioned from the undersecretary for scientific affairs of the school of medical Technology to school managers.

2. Data Collection Method

Questioner

A questioner paper designed to include: name of school, name of pupil, age, Gender, weight, height, body mass index, number and type of permanent teeth for the purpose of this study. The number of eruptions of permanent teeth is calculated based on the number of permanent teeth that have penetrated the oral mucosa (emerge).

Oral examination

The examination was performed inside the school in the classroom with room light as a direct light source and sunlight as an indirect light source. After giving a lecture regarding to raise the awareness of children toward their oral hygiene and how to use dental brush and teeth paste to maintain their oral health, the students were subjected to oral examination to determine the number of erupted teeth for each student. Tooth eruption was defined as having occurred of any tooth surface had pierced the oral mucosa, visual examination was carried out using tongue depressor starting from the posterior right side of the maxilla and then anterior and posterior to the left maxilla, then the left mandibular posterior teeth then anterior and right posterior to the lower jaw.

Anthropometric measurements

Height measurement of the students was performed using a calibrated tape attached to a wall, the students were asked to remove footwear before measuring, ensure the tool slide at the top position,

and stand upright, just below the slide tool, the position of the head and shoulders back, arms, buttocks, the view straight ahead, and hands-free in a dependent position. The tool slide is moved until it touches the top of the head of the students, and make sure the tool slide is right in the middle of the head of the students. Body weight was calculated for each student using a digital weighing machine. The body height and weight were recorded on the questionnaire form of each student.

Body Mass Index (BMI)

Anthropometric measurements are commonly utilized for measuring individuals' nutritional status, with easy procedures, non-aggressive, and cost-effective technique. Nutritional status is calculated based on the (BMI) according to age from anthropometric measurements of body weight and height. Assessment of nutritional status used the WHO Centers for Disease Control and Prevention (CDC) child and teen BMI Calculator. Based on individual BMI values, the children were classified into four classes using the criteria given by the Centers for Disease Control and Prevention (CDC) as follows: underweight (BMI for age $<5^{th}$ percentile), normal (BMI for age 5^{th} to 85^{th} percentile), fat (BMI for age 85^{th} to 95^{th} percentile), obese (BMI for age $>95^{th}$ percentile). Data is based on the number of permanent teeth that have been erupted and nutritional status.

Data analysis

After the data collection process was completed data analysis was performed using SPSS version 23, where data were entered, and the comparison between the mean age of eruption of permanent teeth in females and males was done using t-test. Comparison of BMI and age of eruption of permanent teeth was done using ANOVA, a significant difference was determined with a value of $p < 0.05$. Spearman's correlation test applied to determine whether there is a significant relationship between the numbers of erupted permanent teeth with nutritional status in children aged 7-9 years, a significant relationship was determined with a value of $\rho < 0.05$.

Results:

In this section, there will be a discussion of results of the current research which studies the relationship between nutrition status and permanent teeth eruption at two regions in the district of Az Zawiyah city. This study was carried out in the period between (February- March) 2021. The total number of participants who were enrolled in this study (sample size) was 120 students aged 7-9 years old, 30 pupils from each school from 4 different schools two schools located in the country-side named (Beer Terfas school, and Osama ben Zed school), and the other two schools located in the city center named (Az Zawiya central primary school, Asmaa Bent Abi Baker school).

First: (Schools of the Country-side):

The total number of pupils of the country side was 60, the number of 30 sample were male with percentage of 50% and 30 of them were female with percentage of 50%.

The number and percentage of samples according to pupils' gender and age (table 1). In the age of 7 years, the number of all pupils was 20, where number of 8 pupils was male with percentage of (% 26.67) of total number of male pupils and 12 pupils were female with percentage (% 40) of total number of female pupils. While in the age of 8 years, the number of male pupil was 12 pupils with percentage of (%40) of total male pupils and 8 female pupils with percentage of (% 26.67) of total number of female pupils. Whereas in the age of 9 years, the number of male pupil was 10 with percentage (%33.33) of total male pupils and 10 pupils were female with percentage (%33.33) of total female pupils.

Table 1: number of pupils for each age and gender of schools of the country-side

Age	M	Percentage	F	percentage
7 years	8	% 26.67	12	% 40
8 years	12	% 40	8	% 26.67
9 years	10	% 33.33	10	% 33.33

The number and percentage of male pupils according to their BMI were as the following: there was a pupil (%3.33) in the category of under-weight. However, the number of pupils with healthy weight was (24) pupils were healthy weight with (%80) of all male pupils, a pupil was fat which represent about (%3.33) of total male pupils, and the number of 4 pupils was obese with (%13.33) of total male pupils.

While the number and percentage of female pupils according to their BMI which were as the following: the number of 2 pupils was underweight with (% 6.66) of total female pupils, 21 pupils were healthy weight with (%70) of total number of female pupils, where 4 students were fat with (%13.33) of total female pupils, and 3students were obese with percentage of (%10) of total female pupils.

The results show the mean number of erupted permanent teeth for pupils with 7 years old was as followings (4 teeth, 6 teeth, and 8teeth) for under-weight, healthy weight, and fat respectively. Where in 8 years groups exhibited that the number of teeth is direct proportion with the BMI where the number of erupted teeth increased whenever the student nutritional statue increased. However, in 9 years group the results showed that the mean of erupted teeth in underweight and healthy weight almost the same and in the erupted teeth in the group of fat is more than in the obese group (table 2) (figure 1).

Table 2: The mean of permanent teeth number for each BMI group of the pupils of the country-side schools

BMI	7 years	8 years	9 years
U. Weight	4 teeth	--	12 teeth
H. Weight	6 teeth	9 teeth	11 teeth
Fat	8 teeth	--	13 teeth
Obese	5 teeth	10 teeth	10 teeth

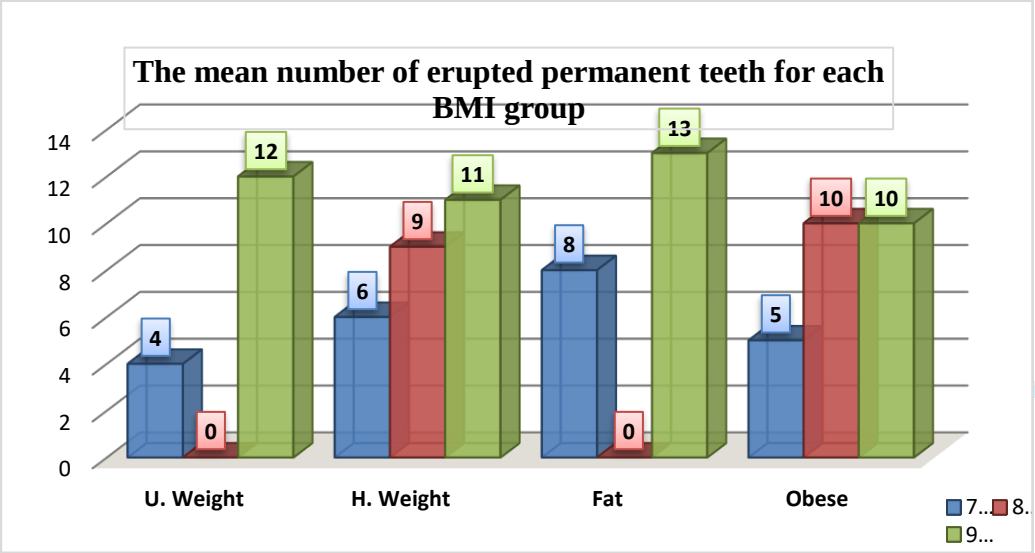

Figure 1 The mean number of erupted permanent teeth for each BMI group of city center pupils

Table 3 and figure 1 illustrate the differences between male and female of erupted permanent teeth for country-side pupils. For 7 year age group the results showed that, in the category of under-weight nutrition status was 1 male pupil with 1 erupted tooth while there was not any female pupil in this category. However, in the healthy-weight pupils the results showed that the female pupils had more mean number of erupted teeth than that in male pupils. In addition, the mean number of erupted teeth for pupils with fat status was equal with 8 teeth for both male and female pupils. But in the category of obese status, male pupils had more erupted teeth than that in female pupils.
Though in the group of pupils with 8 years old, the results exposed that there were not any male nor female pupils in category of under-weight, as well as in the category of fat nutrition status. Nevertheless, in the healthy weight again the female pupils had more mean of erupted permanent teeth than that in male pupils; however in the obese category the result was the number of erupted teeth in male more than that in female pupils.
But in the students with 9 years old group, the mean of erupted teeth in female is more than in the male students for 4 different categories; hence in both under-weights nutrition status and fat nutrition status were with no male students.

Table 3: The mean number of erupted permanent teeth for each BMI group of country-side pupils

BMI / Age	Under-weight		Healthy weight		Fat		obese	
	Male	Female	Male	Female	Male	Female	Male	Female
7 years	1 tooth	--	4 teeth	7 teeth	8 teeth	8 teeth	8 teeth	1 tooth
8 years	--	--	9 teeth	10 teeth	--	--	11teeth	10 teeth
9 years	--	12 teeth	10 teeth	11 teeth	--	13 teeth	8 teeth	12 teeth

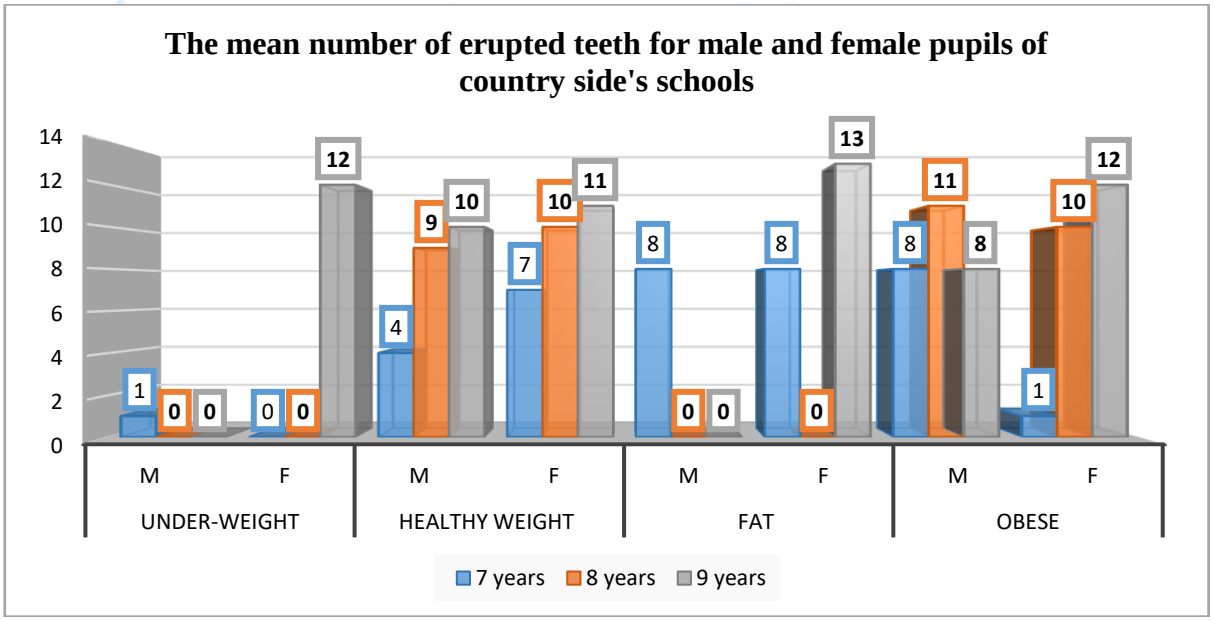

Figure 2: The mean number of erupted permanent teeth for (male and female) for each BMI group in Country-side's pupils

➢ **Second:** (schools of city center):

The total number of enrolled pupils from city center's schools was 60, a number of 25 pupils was male with (%41.66) and a number of 35 pupils was female with (%58.33).

In the age of 7 years, the number of male pupils was 9 with (%36) of all male pupils; 11 pupils were female with percentage (%31.42) of all female pupils. Within the age of 8 years, number of male pupils was 6 with percentage (%24) of all male pupils and 14 female pupils with percentage of (% 40) of all female pupils. Whilst, the number of pupils in 9 years old was 10 pupils for male with (%40) of all male pupils and 10 female pupils with (%28.57) of all female pupils.

The number and percentage of male pupils according to their BMI were as the following (table 4) there were no pupils in the category of under-weight among male pupil. However, the number of pupils with healthy weight was (18) pupils were healthy weight with (%72) of all male pupils, 3 pupils were fat which represent about (%12) of total male pupils), and the number of 4 pupils was obese with (%16) of total male pupils.

Table 4: BMI of pupils in schools of city center.

BMI	M	Percentage	F	Percentage
Under weight	-	% 0	4	%11.43
Healthy weight	18	%72	18	%51.43
Fat	3	%12	9	%25.71
Obese	4	%16	4	%11.43

While the number and percentage of female pupils according to their BMI were as the following: the number of 4 pupils was underweight with percentage of (% 11.43) of total female pupils, 18 pupils were healthy weight with percentage of (%51.43) of total female pupils, and where 9 pupils were fat with percentage of (%25.71) of total pupils, and 4 pupils were obese with (% 11.43) of total female pupils.

The mean number of erupted permanent teeth in the group of pupils aged with 7 years was as display in (table 5) (figure 3). The number of 6 teeth for under-weight pupils, healthy weight status pupils with 5 teeth, and 7 teeth for fat and obese status pupils. Where in the group of 8 years pupils, the results exhibited that the mean number of erupted permanent teeth that under-weight and healthy-weight with 9 teeth, where in the pupils with nutrition status of fat and obese had the same mean number which was 12 teeth for each.

However in 9 years group the results showed that the mean of erupted teeth in under-weight status pupil with 8 teeth, healthy weight status pupils with 10 teeth, fat status group was with 11 teeth, and the obese status pupils the mean number of erupted teeth was 13.

Table 5: The mean of permanent teeth number for each BMI group of pupils in city center schools

BMI	7 years	8 years	9 years
U. Weight	6 teeth	9 teeth	8 teeth
H. Weight	5 teeth	9 teeth	10 teeth
Fat	7 teeth	12 teeth	11teeth
Obese	7 teeth	12 teeth	13 teeth

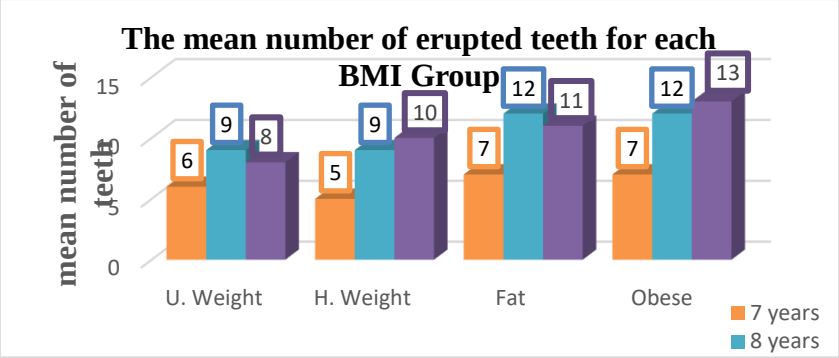

Figure 3: The mean of permanent teeth number for each BMI group in city center schools pupils

The table 6 and figure 4 show that the differences between the male and female pupils in the mean number of erupted permanent teeth for each age according to their BMI categories. The first group was the pupils who were 7 years old, the results showed that there was not any male pupil with under-weight nutrition status; however there was one female pupil with number of 6 erupted permanent teeth. In the same group which is pupils with 7 years old, the mean of erupted teeth for female pupils with healthy weight status was more than that in the male pupils. Again the findings showed that, there were not male pupils in the category of fat status, but the mean number for female pupils was 7 teeth. Though in the obese group, the mean of teeth in the male was 7 teeth, and there was not any female pupil in this group.

The second group was the group of pupils with age of 8 years old, the results showed that there were not any male pupils in the category of under-weight status; however, the mean of erupted teeth for female pupils was 9 teeth. Moreover, in the group of healthy weight the mean of erupted teeth was 9 teeth for both male and female pupils. The mean number of erupted teeth for female pupils with fat status was in female more than that in male pupils. However, in obese status was in female with 12 teeth and there was not male pupils.

The third group was consisted the pupils with 9 years old, below the category of under-weight status was no male pupils and the mean number of erupted teeth of female was 8 teeth. But in the group of healthy weight there was no difference between male and female in the mean number of erupted teeth which was 11 teeth for each. Although, in the fat category, the mean in the male pupils was more than that in female pupils and that the opposite of the obese status where was the mean of female more than in the male pupils.

Table 6: differences between (male and female) city center pupils in the mean of permanent teeth number for each BMI group

BMI / Age	Under-weight		Healthy weight		Fat		obese	
	Male	Female	Male	Female	Male	Female	Male	Female
7 years	--	6 teeth	4 teeth	5 teeth	--	7 teeth	7 teeth	--
8 years	--	9 teeth	9 teeth	9 teeth	10 teeth	13 teeth	--	12 teeth
9 years	--	8 teeth	11 teeth	11 teeth	12 teeth	10 teeth	12 teeth	13 teeth

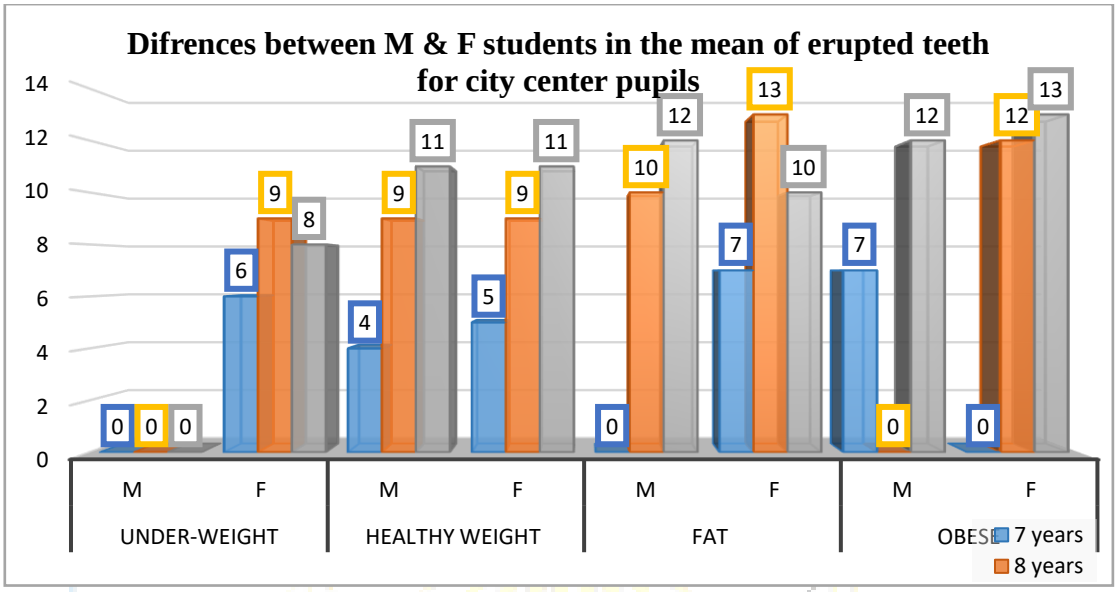

Figure 4: The differences between (male and female) city center pupils in the mean of erupted permanent teeth for (male and female) each BMI group

In one-way ANOVA test it was found that there was no significant differences in the number of erupted teeth and the gender (males and females) with a value of p = 0.25 (table 7).

Table 7: one-way ANOVA analysis on the significance of differences between number of teeth and gender

Teeth no	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	52.267	1	52.267	26.55	0.25
Within Groups	55.333	28	1.97		
Total	107.600	29			

The numbers of permanent teeth that have been erupted and nutritional status of the samples were tested utilizing Spearman correlation, and table 12 indicated that there is a weak positive relationship (0.012). This is clear that there is an insignificant correlation where sig = 0.974.

Table 8: The spearman's correlation between the number of teeth and nutritional status

Correlations			BMI	Teeth no
Spearman's rho	BMI	Correlation Coefficient	1.000	.012
		Sig. (2-tailed)	.	.974
		N	10	10
	Teeth no	Correlation Coefficient	.012	1.000
		Sig. (2-tailed)	.974	.
		N	10	10

Table 9: differences between the schools of country side and city center in relation to number of permanent teeth

	Sum of Squares	Mean Square	F	Sig.
Between Groups	16.719	5.573	.593	**.631**
Within Groups	122.222	9.402		
Total	138.941			

Discussion:

This description cross-section study was conducted to determine the relationship between nutritional status of 7-9 years old school children and permanent teeth eruption in two regions at district of Az Zawiyah City (City Center Region and Country Side Region). The total number of samples in present study was 120 pupils, 60 pupils for each region. In the region of country side, 30 of surveyed pupils were female with a percentage of % 50, and 30 pupils were males with percentage of % 50. In schools of country side, the results showed that the majority of males (%80) were with healthy weight, and the other %20 represented as (%13.33) of obese pupils and (% 3.33) for each underweight and fat pupils. As well as the majority of females (%70) were with healthy weight, followed by (% 13.33) of fat pupils, (%10) of obese pupils, and underweight BMI status.

However, in the city center's schools the number of surveyed female was 35 pupils with percentage (%58.33), and 25 of them was males with percentage of (% 41.66).

In city center's schools, the outcomes presented the highest percentage (%72) of male pupils were with healthy weight followed by (%18) of obese pupils, and (%12) pupils with fat MBI status. Also the results of female pupils indicated that the majority of them (%51.43) were with healthy weight, (%25.71) with fat status, and (%11.43) for pupils with underweight and obese status.

In terms of the examine the relationship between the number of erupted teeth and the gender of surveyed pupils, the results exhibited that the mean number of erupted teeth in female pupils was greater than that in the male pupils in both regions as it illustrated in tables 3 & 6.

On one hand, the findings of current study were in agreement with the results of earlier researches claimed by [17, 18, 19].

On the other hand, the obtained results contrasted with the findings of a previous studies conducted by Lailasari, et al.,(2018)[11] ; Kochhar & Richardson.,(1998) [20] which concluded that the occurrence of second molars eruption in males was earlier than that in females and explanation of this incidence was as a result of later beginning of sexual maturity in the males [20].

Moreover, the differences between number of teeth and gender were examined utilizing ANOVA analysis test table 7. The finding of one-way ANOVA analysis test displayed that there is no significant differences in the number of teeth according to the gender variable ($\rho = 0.25$) > 0.05.

In comparison between the pupils of country side and city center in the BMI status, it was obvious observed that the percentage of male and female pupils with obese and fat status is greater in city center than pupils of schools in country side, and that could be as a result of life style differences between the two regions which could affect the pupils nutritional status and the eruption of permanent teeth as a sequence. Whereas table 8 showed there were no significant differences between the schools of country side and city center in relation to number of permanent teeth 0.631 which is > 0.05).

Furthermore, the current study examined the relationship between delaying of teeth eruption and BMI status for school children, the results exhibited that except one female child from city center region, school children in underweight category showed delayed teeth eruption compared with healthy weight pupils for all age groups. These outcomes were in line with the results of those studies done by Bagewadi et al., (2018) [21] and Chohan et al., (2007) [22] in which it was found that children who were under-weight showed a delayed eruption time than those children who are within healthy weight.

As well, when the number and the timing of teeth eruption was compered in the underweight samples and obese and fat samples, the results showed that the pupils with fat and obese BMI status had earlier eruption ages compared with those with underweight BMI status for all age groups tables 2, 3, 5, and 6. The findings of present study was similar to results that acquired by Almonaitiene et al., (2010) in which there was a positive correlation between BMI status and teeth eruption.

As for the study that conducted in the city of Az Zawiyah, we found that from the findings of Spearman's correlation between nutritional status and the number of teeth, it is clear that is a weak positive relationship ($\rho = 0.012$), there is an insignificant correlation where sig = 0.974.

Conclusion:

This descriptive cross-section study focused on studying the relationship between the number of erupted permanent teeth and nutrition status of 7-9 years school children in two regions in Az Zawiyah city, Libya. It was the first study that focused on studying the relationship between nutrition and eruption of permanent teeth in Libya.

From the current study, it is concluded that the percentage of pupils of country sides with healthy weight were higher than that in the city center, and that perhaps due to the life style of those in the country side region. Moreover, there is a positive relationship between nutritional status of a child and the number of erupted permanent teeth, and the higher nutritional status of a child more number of erupted permanent teeth. In addition, the study proved that there are differences between the schools of country side and the schools of city center in relation to number of permanent teeth, but they are insignificant differences.

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Iron Deficiency Anemia and Dietary Habits among Libyan Children

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ABSTRACT
Background and aims: Anemia is a global public health problem, with important consequences for human health and the social and eco-nomic development of each nation. The aim of present study was to assess the frequency of anemia and iron deficiency anemia and dietary habits association among Libyan children between 2 months and 14 years of age, **Methods**: This was a cross-sectional study enrolled 69 children admitted to the pediatric ward of Tobruck Medical Center with anemia, **Results**: results of the study revealed that hemoglobin was ranged between 3.7 – 11.7 with a mean value of 8.08±1.967. MCV was ranged between 48 – 94.2 with a mean value of 69.85±10.164. MCH was ranged between 12.8 – 33.8 with a mean value of 22.57±4.988. MCHC was ranged between 13.3 – 40.3 with a mean value of 31.42±4.288. RDW was ranged between 10.3 – 206.0 with a mean value of 22.29±28.218, meanwhile, results showed that 55(82.1%) had iron deficiency anemia and 12(17.9%) had non iron deficiency anemia and no correlation between Libyan dietary habits and anemia **Conclusion**: Iron deficiency anemia is a common problem among Libyan children; incidence was more common in children below 10 years old.
Keywords: Anemia, Iron Deficiency, Children, Dietary Habits, Maternal Anemia.

Introduction
Anemia is a global public health issue with significant implications for human health as well as each country's social and economic development [1]. Anemia, defined as a hemoglobin level that is two standard deviations below the age-related mean, is common in newborns and children all around the world [2]. 1It is caused by a single or several reasons that work simultaneously, affecting children's health, cognitive and physical development, and immunity, increasing the risk of infections and infant death [3,4]. According to a global survey of the incidence of anemia, preschool-aged children are the most affected age group, with a prevalence rate of 47.4%. [1]. Iron deficiency (ID) is the most frequent nutritional deficit worldwide, with newborns and small children being the most vulnerable. Iron deficiency raises the risk of developmental delays and behavioral problems in young children. Iron deficiency anemia (IDA) has also been linked to it [5]. The most common cause of anemia is iron deficiency, which is caused by a lack of bioavailable iron in the diet [6]. It could also be due to factors like reduced absorption during meals (e.g., due to tannin in tea and phytate in unleavened bread) or infection with intestinal helminths that cause blood loss (e.g., Trichuris trichiura, Schistosoma mansoni, hookworms, Fasciola spp.) or interfere with iron absorption in the intestine (e.g., Giardia intestinalis, Ascaris [7]. High birth order, large family size, poor mother education, and low family income are all risk factors for IDA [8]. Over the last three decades, research has found correlations between iron deficiency (especially in early life) and impaired cognitive, motor, and psychomotor development [9]. High RDW has also been linked

to respiratory distress and illnesses, according to research [10]. As a result, unfavorable connections between childhood anemia and academic achievement, such as grades, attendance, and attainment, have been discovered [11]. The goal of this study is to determine the frequency of anemia and iron deficiency anemia, as well as the relationship between dietary habits and anemia, in children aged 2 months to 14 years old at Tobruk Medical Center, which has never been done before.

Methods

Patients and data collection

From October 2019 to April 2020, children admitted to the pediatric ward at Tobruck Medical Center with anemia were included in this cross-sectional study. A systematic interview questionnaire was used to collect data. Sex, residence, nationality, family size, mothers' education, chronic illness, blood transfusion, dietary habit, school performance, and anthropometric measurements were among the sociodemographic characteristics investigated. Patients were assessed clinically and in the laboratory for complete blood counts, serum ferritin, and blood films, if needed.

Statistical analysis

The description of data will be in the form of mean (±) SD for quantitative data, and frequency and proportion for qualitative data. Student-t Test (t): use for comparison between two groups as regards normally distributed (parametric) quantitative data. Mann-Whitney Test (Z): use for comparison between two groups as regards non-parametric quantitative data. Chi-Square Test (x2): use for comparison between two groups as regards qualitative data. Spearman correlation coefficient test (r): use to test a positive or negative relationship between two variables. Results were considered significant if P <0.05 and highly significant if <0.01.

Results

Table (1) shows demographic data of the studied group. Age ranged from 2-168 months with mean value 36.36±41.261 months. Males were 34(50.7%) while females were 33(49.3%).

Table (1): Distribution of studied sample according to patient's demographic data

	Number	Percent%
Age (months)		
≤10 years	63	94.0
>10 years	4	6.0
Range	2-168	
Mean±S.D.	36.36±41.261	
Sex		
Male	34	50.7
Female	33	49.3
Family Size	39	58.2

≤5 >5	28	41.8
Range Mean±S.D.	2-11 5.98±2.073	
Chronic Illness **No** **Yes**	54 13	80.6 19.4
Weight Mean ± S.D	15.17±13.636	
Height Mean ± S.D	87.99±27.597	
Head Circumference Mean ± S.D	44.73±7.652	

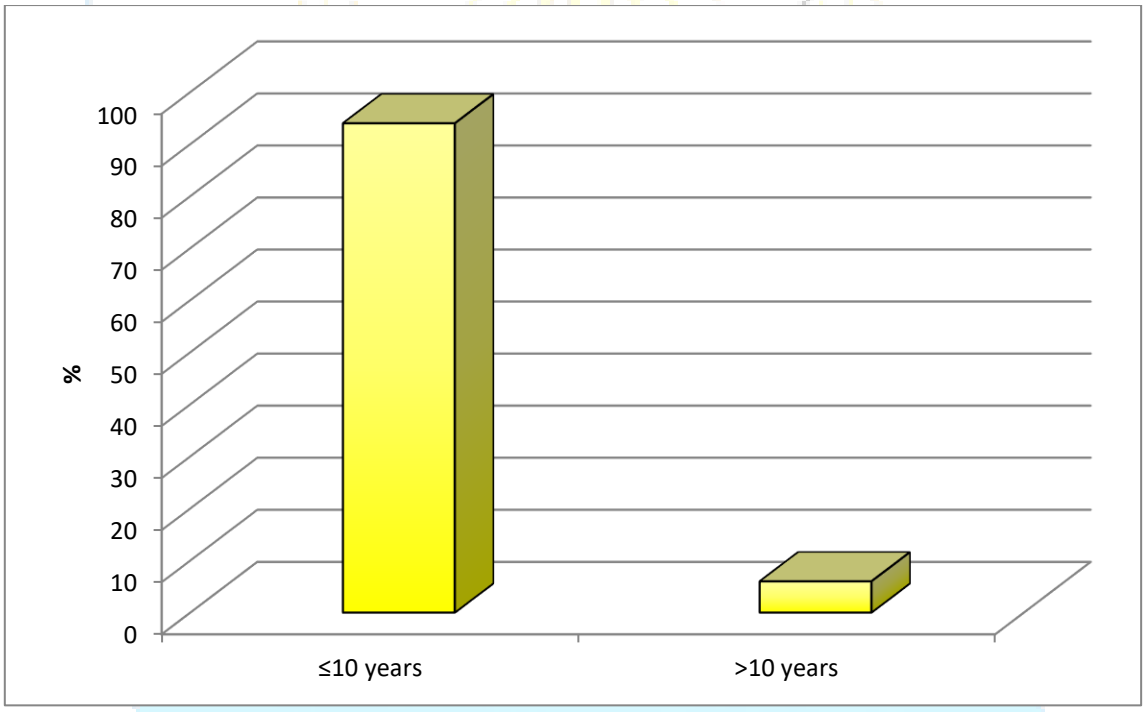

Figure (1): Distribution of studied sample according to patient's age.

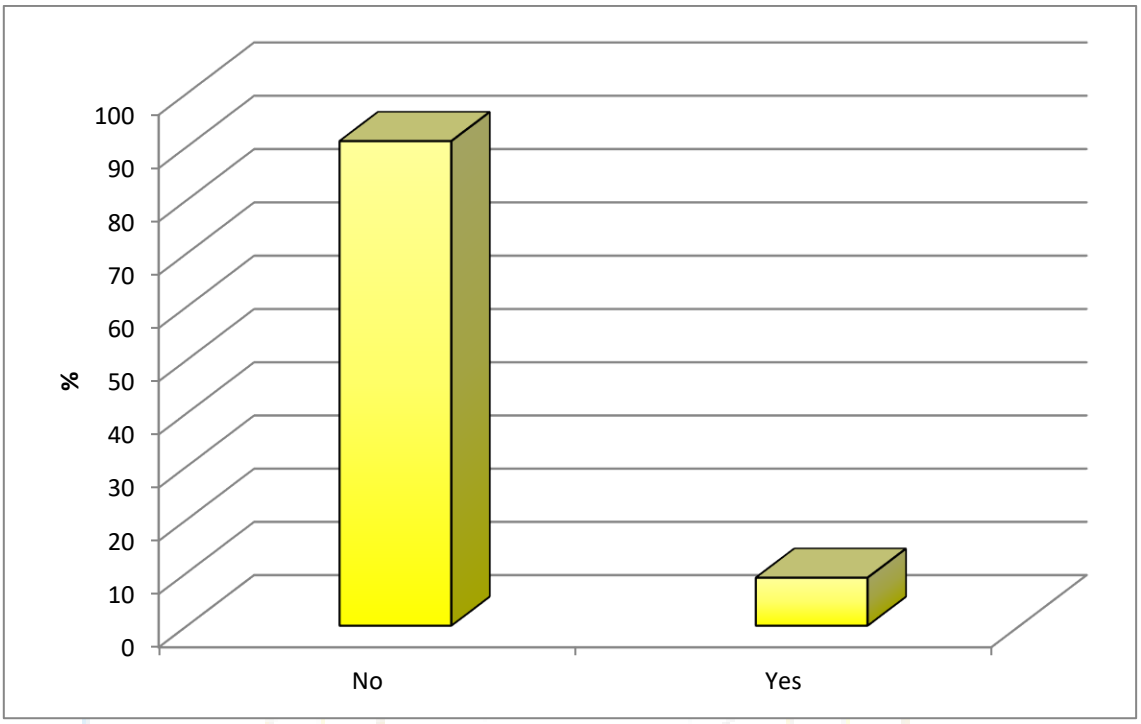

Figure (2): Distribution of studied sample according to patient's Blood Transfusion

Figure (2) shows Blood Transfusion of the studied group show that 6(9.0%) need blood transfusion.

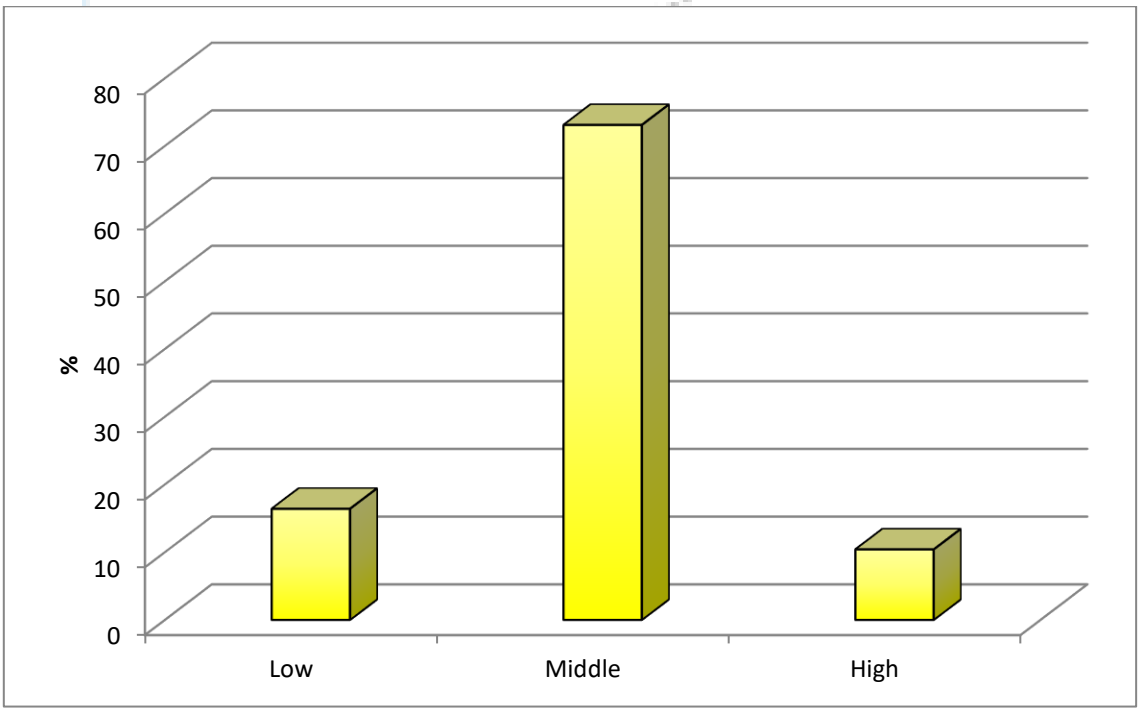

Figure (3): Distribution of studied sample according to patient's Socioeconomic status

Figure (3) shows Socioeconomic status of the studied group show that 11(16.7%) were low, 49(73.1%) were middle and 7(10.4%) were high Socioeconomic level.

Table (2) shows Maternal education of the studied group show that 6(9.0%) were Illiterate, 8(11.9%) were Under-moderate, 43(64.2%) were Secondary (Moderate) and 10(14.9%) were high.

Table (2): Distribution of studied sample according to patient's maternal education

Maternal education	Number	Percent
Illiterate	6	9.0
Under-moderate	8	11.9
Secondary (Moderate)	43	64.2
High	10	14.9
Total	67	100

Table (3) shows Maternal IDA in pregnancy of the studied group show that 31(46.3%) had Maternal IDA in pregnancy.

Table (3): Distribution of studied sample according to patient's Maternal IDA in pregnancy.

Maternal IDA in pregnancy	Number	Percent
No	36	53.7
Yes	31	46.3
Total	67	100

Table (4) show age of weaning and cow milk product. age of weaning was ranged between 4 – 18months with a mean value of 6.09±2.610. Age of Cow milk Product was ranged between1 – 14months with a mean value of 6.48±2.231.

Table (4): Distribution of studied sample according to patient's age of weaning and cow milk product

	Min. – Max.	Mean ± S.D.
Age of Weaning	4 – 18m	6.09±2.610
Age of Cow milk Product	1 – 14m	6.48±2.627

Table (5): Distribution of studied sample according to patient's lab investigations

	Min. – Max.	Mean ± S.D.
Hb	3.7 – 11.7	8.08±1.967
MCV	48 – 94.2	69.85±10.164

MCH	12.8 – 33.8	22.57±4.988
MCHC	13.3 – 40.3	31.42±4.288
RDW	10.3 – 206.0	22.29±28.218
Platelet	87 – 929	395.43±187.646
WBC	3.40 – 70.50	13.80±10.152
Ferritin	3 – 1520.0	136.12±313.529

Table (6) shows type of weaning of the studied group show that 39(58.2%) with fruits, 40(59.7%) with vegetables and 43(64.2%) with rice.

Table (6): Distribution of studied sample according to patient's Type of Weaning.

Type of Weaning	Number	Percent
Fruits	39	58.2
Vegetables	40	59.7
Rice	43	64.2

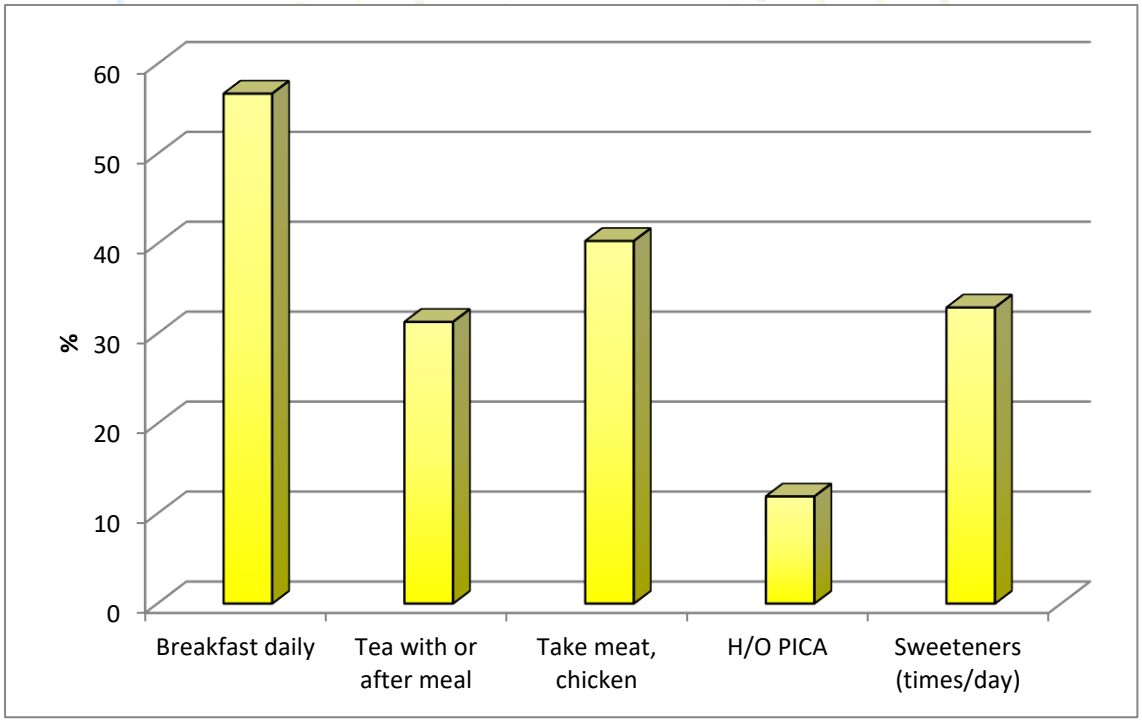

Figure (4): Distribution of studied sample according to patient's Nutritional habits

Figure (4) shows Nutritional habits of the studied group show that 38(56.7%) take Breakfast daily, 21(31.3%) take Tea with or after meal, 27(40.3) Take meat, chicken, 8(11.9%) H/O PICA and 22(32.9%) take Sweeteners most of them take it one time per day (29.9%).

Table (7) shows Type of Anemia of the studied group show that 55(82.1%) had iron deficiency anemia and 12(17.9%) had non iron deficiency anemia.

Table (7): Distribution of studied sample according to patient's Type of Anemia.

Type of Anemia	Number	Percent
Iron deficiency anemia	55	82.1
Non iron deficiency anemia	12	17.9
Total	67	100

Distribution of IDA according to demographic data Table (8) shows Distribution of IDA according to demographic data and it show that there were no statistically significant differences between IDA groups and patient's gender and age.

Table (8): Distribution of IDA according to patient age and gender

	IDA				P value
	Yes		No		
	No.	%	No.	%	
Age (months)					
≤10 years	38	92.7	24	96.0	1.000
>10 years	3	7.3	1	4.0	
Range	2-168		6-144		0.807
Mean±S.D.	40.93±46.376		29.32±31.695		
Sex					
Male	22	52.4	12	48.0	0.803
Female	20	47.6	13	52.0	

Table (9) shows no Correlation between Hb and nutritional habits with P=> 0.3.

Table (9): Correlation between Hb and nutritional habits

	Hb	
	r	P
Nutritional habits		
Breakfast daily	0.034	0.788
Tea with or after meal	-0.022	0.862
Take meat, chicken	-0.106	0.392
H/O PICA	0.019	0.878
Sweeteners (times/day)	0.015	0.904

Table (10) shows Correlation between IDA and other parameters. And it found that there was negative significant correlation between IDA and weight where r=-0.332 and P=0.048 and no significant correlation between IDA and types, age of weaning and nutritional habitis .

Table (10): Correlation between IDA and other parameter

	IDA	
	r	P
Age	-0.295	0.077
Sex	0.084	0.623
Age of weaning	-0.012	0.953
Type of feeding	-0.099	0.560
Maternal IDA	-0.096	0.571
Types of weaning		
Fruits	-0.045	0.806
Vegetables	0.090	0.624
Rice	0.094	0.610
Weight	-0.332	0.048*
Height	-0.169	0.452
Head Circumance	-0.348	0.204
Chronic Illness	-0.019	0.913
Family Size	-0.097	0.583
Nutritional habits		
Breakfast daily	0.114	0.502
Tea with or after meal	-0.074	0.663
Take meat, chicken	-0.142	0.402
Sweeteners (times/day)	-0.186	0.271
Socioeconomic state	-0.140	0.409
Maternal education	-0.070	0.681

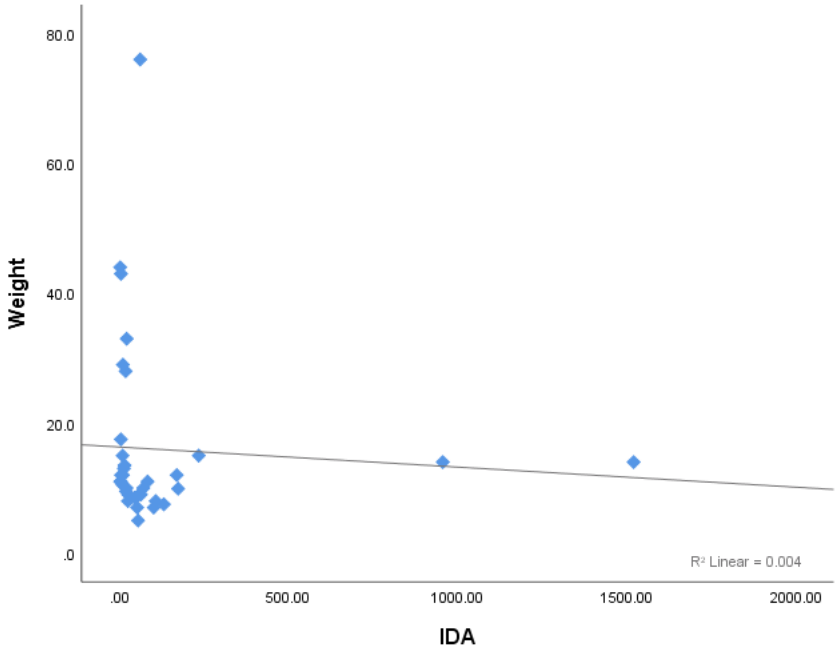

Figure (5): Correlation between IDA and weight.

Discussion

Anemia has long been a public health issue around the world. The goal of our research is to determine the prevalence of anemia and iron deficiency anemia and diteray habits affection in children aged 2 to 14. A total of 69 children with anemia were enrolled in our cross-sectional study at Tobruck Medical Center's pediatric unit. The key conclusion drawn from the above data is that iron deficiency anemia is a prevalent condition among Libyan children, with the incidence being higher in children under the age of ten. In terms of the demographics of the research group. The average age was 36.3641.261 months, with a range of 2-168 months. 94.0 percent of them were under the age of ten. Male patients accounted for 34 percent of all cases (50.7 percent), while female cases accounted for 33 percent (49.3 percent). [12], [13], [14]& [15] had similar results. [16] found that the majority of the children studied (75.1 percent) were females and that 80 percent of them were under the age of ten. This is in line with our findings. In our study, the family size of the analyzed group ranged from 2 to 11 individuals, with a mean value of 5.982.073. In addition, the socioeconomic status of the study group revealed that 11 (16.7%) were low, 49 (73.1%) were intermediate, and 7 (10.4%) were high.

Because of its link to decreased physical and intellectual development in children, as well as a reduced immune system response, iron deficiency anemia is a priority measure among healthcare strategies, with important social and economic ramifications. High poverty levels have also resulted in greater food insecurity due to curfews and closures, as well as high unemployment, resource depletion, and strained social support networks [17].

Healthy and anemic children differed significantly in terms of socioeconomic status and family size, according to various research. Children under the age of six who live in densely populated and impoverished areas have a higher risk of nutritional health problems, according to several studies. [18], [19], and [20] all reported similar findings.

A slum is defined as an urban neighborhood lacking essential utilities (sanitation, potable water, and electricity), inadequate housing, overcrowding, unhealthy and hazardous sites, insecure tenure, and social marginalization, according to the United Nations Center for Human Settlements (UNCHS/UNHABITAT). Sub-Saharan Africa has the biggest proportion of slum residents (71.8%), with large family sizes, low socioeconomic status, and a greater prevalence of iron deficiency anemia [19]. Although many causes of anemia have been identified worldwide, according to a WHO report, if anemia prevalence is greater than 40.0 percent, the most likely cause is an iron-deficient diet. Iron deficiency of dietary origin is the most common cause of anemia and is attributed to poor nutritional iron intake. Maternal iron insufficiency during pregnancy and breastfeeding, which is a prevalent problem in developing countries, is another cause of IDA. Maternal IDA in pregnancy was found to be present in 31 (46.3 percent) of the pregnant women in our study.

In our study, the maternal education of the participants revealed that 6 (9.0%) were illiterate, 8 (11.9%) were under-moderate, 43 (64.2%) were secondary (moderate), and 10 (14.9%) were high. Education and culture of the mother are essential factors in preventing nutritional problems in children; a well-educated mother should be aware of proper feeding habits and when to seek medical guidance. The mother's illiteracy and low educational level was determined to be a significantly significant risk factor for IDA in a study by [19]. In terms of the distribution of the examined sample based on the patient's milk type, 19 (28.4%) had bottle feeding, 31 (46.3%) had breast feeding, and 17 (25.4%) had both. The average age of weaning was 6.092.610, ranging from 4 to 18. Cow milk has been around for a long time. The product was rated from 1 to 14, with a mean of 6.482.231. In contrast to our findings, [21] found that at four months, 5.7 percent of the participants had iron shortage and 3.4 percent had iron deficiency anemia. At six months, the percentage of children with iron deficiency had grown by more than fourfold to 26.1 percent, with iron deficiency anemia found in 23.9 percent of the infants evaluated. Growth velocity was substantially linked with iron deficit at six months of age. Breastfeeding exclusively protects infants from iron deficiency and malnutrition.In the study of [22] they concluded thatpersistent childhood anemia was likely influenced by the low iron content of breast milk, an indication of maternal anemia and poor nutrition.

The association between cow's milk consumption during the first year of life and IDA is documented in many previous studies [23]& [24].

Regarding measurements, Weight was ranged between 4.1 – 76.0 kg with a mean value of 15.17±13.636 kg. Height was ranged between 45.5 – 172 with a mean value of 87.99±27.597. Head Circumference was ranged between 8.5 – 54.0 with a mean value of 44.73±7.652

Anemia is caused by a lack of folic acid, vitamin B12, and iron in the diet, which are all essential for erythropoiesis. Drinking tea with food and eating foods high in phytate can reduce iron absorption in Libya, which is part of the Arabic world. Consuming a diet low in iron-rich foods causes iron deficiency anemia as a result of inadequate dietary iron intake. Meat, fish, legumes, and foods fortified with extra ir iron are the finest sources of iron in foods [25].Analysis of the food of the investigated samples revealed a shortage of these sources, implying a clear link between dietary habits and the development of IDA..

Regarding type of anemia among the studied chilgren, 55(82.1%) of the studied children had iron deficiency anemia and 12(17.9%) had non iron deficiency anemia.

Anemia is a severe public health problem among Egyptian children, particularly schoolchildren, according to prior studies. It affects about 30-40% of children. Iron deficiency anemia was discovered to be the most common cause of anemia in Egyptian infants aged 6 to 24 months with a poor socioeconomic status, afflicting 43% of them [26]. This data backs up our findings, which show that IDA is the most common kind of anemia in the children investigated. [27]conducted a study to determine the prevalence of iron deficiency anemia in an Egyptian pediatric population. They came to the conclusion that 64 percent of the youngsters evaluated had IDA (20 percent mild, 41.7 percent moderate, and 2.3 percent severe). These findings are in line with our findings, and we believe that nutritional anemia, particularly iron deficiency anemia (IDA), is the most common among children in impoverished nations.

There were no statistically significant differences between Type of Anemia groupings and patient demographic data when it came to Type of Anemia distribution based on demographic data. There was no significant impact or relationship between age or sex differences in the development of IDA in the children tested, and there was also no correlation between vitamin D distribution and demographic data. These findings are in line with [26]& [27]. [20]There was a substantial negative association between weight and the development of IDA when it came to the correlation between IDA and other examined factors. This contradicts the findings of [16]& [19].

Conclusion

Iron deficiency anemia is a widespread condition in Libyan children, especially among those under the age of ten. In our study, socioeconomic status, mother education, and family size were all key determinants of IDA. There was also no link between anemia and food patterns in Libya. The nutritional status of the youngsters should be given special consideration. Fortified iron-fortified meals could be an excellent option for school-aged youngsters.

Recommendations

- Further studies on large geographical scale and on lager sample size to emphasize our conclusion.
- It was recommended based on this study that community nutrition education, especially on exclusive breastfeeding and introduction of complementary foods, should be improved.

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Designing and Building an Automated and Secure Employee Attendance Management System Using QR Code Technology and Encryption

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ABSTRACT

Software development has become an asset for the organizational and administrative process in institutions and companies. Since the process of registering attendance is somewhat repetitive and time-consuming, establishing an automated system for tracking employee attendance and departure has become one of the most important administrative and organizational aspects. The automated attendance system could save human labor and increase the efficiency of taking attendance. The paper introduced an automated system that will handle an issue to monitor attendance. The proposed system uses QR code to identify the people who work in the organization. Each staff member's data was first encrypted using the Simplified Data Encryption Standard (SDES) algorithm and then printed as a QR code on an employee card. At the QR reader stage, the system automatically checks the QR code against the data in the database. If the data matches, it will automatically record the employee's check-in or check-out time in the system and appear on the scanner screen. Through experiments, it was found that this system facilitates the process of organizing and storing employee attendance data, and a flexible process of searching for employees according to available options.

Keywords*:* QR Code, QR generator, QR Recognition, S-DES algorithm, RS algorithm.

1. INTRODUCTION

Nowadays, attendance is among the most important and indispensable mechanisms within the major institutions and companies. Different mechanisms were resort to in order to save time and effort in tracking the working hours of the employees. The attendance system can be defined as the limitation of the time that the employee dedicates to the performance of his work, which is useful to monitor the movement of entry and exit of employees, in addition to assisting companies in the calculation of production hours for each employee separately, which gives indications of good production or not.

In the past, companies resorted to appointing one or more employees in the company responsible for setting records for employees' attendance system provided that they manually record separately all attendance (IN/OUT) movements for each employee which was then analysed and summarized as well as the days of absence from work. this method was very tiring in counting the working hours of employees. Furthermore, overall, such method is considered as inaccurate due to the verity of errors received as this requires a lot of effort throughout the month for the inventory process, especially in companies that have a large number of employees [1].

2. RELATED APPROACHES STUDY

With the expansion of technology and the spread of its use in most fields, most institutions have turned to automating systems and dispensing the manual method, through the use of biometrics, which is based on identifying the people using different technics such as fingerprint, face, and iris of the eye.

An attendance monitoring system in the educational institution using Fingerprint Recognition is introduced by [8]. This system records attendance during the lecture and provides flexibility in automated attendance management system.

Author in [9] presented another biometric technique namely: face recognition. This system is developed to monitor attendance using the face recognition method. Although the accuracy of this method was slightly low compared to both the iris recognition and fingerprints, it was widely used because due to system processes simplicity of analyzing the face. Generally, Biometric technologies usually have a very high installation cost and cannot be afforded by all organizations.

Therefore, to avoid such drawbacks, a technique was introduced by [10] uses barcode technology. Whereas a barcode is a method of encoding information in a visible, machine-readable pattern, referred to as linear or one-dimensional (1D).

However, barcode technology also has some drawbacks presented as slow response when reading the code, as well as the ease of forgery, and the inability to resist distorted codes. To analyze such mentioned negatives, a study was made by researcher in [11] related on the technology of the two-dimensional bar code D2 and compared it with a single barcode Dimensions D1. It was reported that the integrity of one-dimensional codes was less compared to two-dimensional barcodes and that the barcode can be read easily by scanning the lines. In terms of a web-based system, authors [3] developed a system that monitors student attendance using QR Code technology with SMS notifications. furthermore, the system notifies the parents on a weekly basis about the attendance of the students. Among the most important results that were reached is that the system was able to efficiently manage the attendance record of students.

3. THE PROPOSED SYSTEM OVERVIEW

3.1. Data Encryption Algorithm

An encryption algorithm is the method used to convert data into ciphertext. The algorithm will use the encryption key in order to change the data in an unpredictable way, so that although the encrypted data will appear randomly, it can be returned to plain text using the decryption key.

Therefore, to increase the level of security and preserve employee data, the Simplified Data Encryption Standard (S-DES) algorithm has been used, which is an algorithm for encrypting blocks of data using the symmetric key, which is a 64-bit encryption code, but it uses (56 bits) are used only for the encryption process, and (8 bits) - the first rightmost bit of each byte - are used for error checking. It takes a 64-bit block of the original text and outputs a 64-bit ciphertext. In its work, it relies on the substitution and permutation process. The algorithm contains 16 cycles in which the compensating and switching process is repeated until it produces the final ciphertext.

3.2. Concept of Quick Response Code (QR Code)

3.2.1 Structure and mechanism of QR Code

The term QR is known from the acronym (Quick Response Code) and it was named because of the immediate response it provides through reading [4], which is an updated barcode technology that transforms data into a special encoding in a random way in the form of a two-dimensional bar code used to record thousands of characters The numbers are in a small picture arranged in black and white columns and rows designed for my QR reader to read [2]. The QR mechanism was performed by scanning a QR code and encrypted data, that were converted into a unique 2D arrangement of the squares. In QR reading phase, a scanner was passed over those squares and translates their arrangement back to the original shape for that data [3]. A QR code is shown in Figure 1, the QR structural consists of black and white patterns on the surface of a geometric plane in two dimensions, where the black pattern is used to represent the binary number 1, and the white pattern is used to represent the binary number 0, and the code contains a function to correct the error for the missing reading when reading it, which is the black pattern [6].

Figure 1: Quick Response Code

3.2.2 Error Correction Algorithm

The QR code has the ability to correct the errors for recovered data if the code was exposed to any external factors that made it unreadable (corrupted). there are four error correction levels available for users to choose according to the operating environment [6]. Raising this level improves the ability to debug but also increases the size of the data QR code.

To determine the level of error correction, various factors such as the operating environment and the size of the QR code must be considered. Level Q or H can be selected for a factory environment that exhibits more damage to the QR code than any other environment, while Level L can be selected for a clean environment that contains a large amount of data. Level M (15%) is usually chosen more frequently [3]. QR Code error correction feature was implemented by adding a Reed-Solomon Code, RS to the original data, and RS can be defined as error correction codes widely used in D2 technologies, including QR code. RS codes operate on a block of data and on a set of finite field elements called codes, which are capable of detecting and debugging multiple codes [5].

3.3. SYSTEM IMPLANTION

Figure 2, presents the system design which were classified into two main stages: encoding and decoding of QR code.

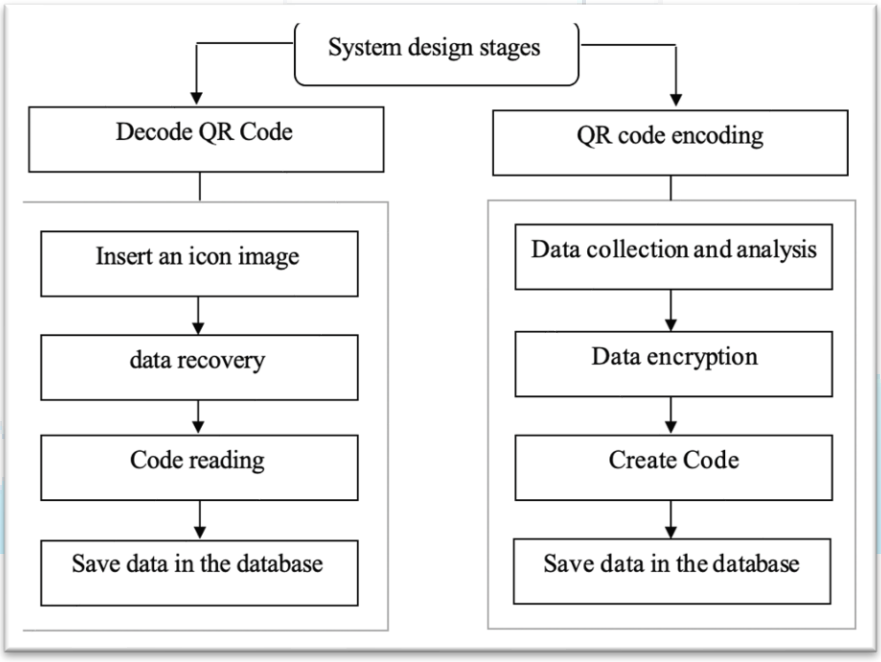

Figure 2 Show the main stages of system design

3.3.1 Encoding Phase

The process starts with data analysis which aims to analyze the input data flow to identify many characters of the encrypted data and capability of encoding different types of data. The QR code has various modes for transferring characters to QR code efficiently including numeric mode, alphanumeric and byte modes. These modes were switched during character transfer as needed in order to convert data into binary string based on the method rules respectively. The bitstream sequence consists of one or more methods. the data sequence is divided into lots of blocks in order to apply the error correction cipher. After the error correction code words are generated for each part, the code words are added at the end of the data sequence.

The next process of the method is to arrange the code words for the data and correct the error from different parts. And then putting the password modules into the array with finder patterns, commas, timing patterns, and alignment patterns. After that data masking was taken place by data masking patterns in the code coding area to improve the light and dark unit balance and reduce the appearance of false patterns. Finally, the format information, version information, and complete the code were created [12].

3.3.2 QR Code Decoding

The QR decoding is the inverse process of the QR coding. The QR reader identifies the three researcher patterns and identifies the white and dark block Then, the format information was decoded where the release masking patterns are edited and the error is corrected in the format information pane. The codec is considered successful when attempting to effectively decode a mirror image of the format information, and if this is not the case, error correction is used to aid in the decoding. While the next process is to select the QR Code version. At this point, the version information is read and the QR code version is verified.

Reading the characters, detecting the error and restoring the data (Restore Data and RS code) use the RS algorithm and the error correction code word to correct the error. The error is then modified when any kind of error is detected. The data code words were classified into two parts: light mode indicators and character count indicator. the obtained characters base file was decrypted in one or more modes and result in the original data [12].

4. RESULTS AND ANALYZES

The paper addressed the schematics and theories in QR and data encryption. the QR technique was selected as a special method for managing employee attendance and departure. The system was implemented based on basic features of QR: payload (data size), error rate and security. the proposed system emphasized that several advantages of this system were provided, including the

inventory of attendance and departure cases with high accuracy and efficiency, in addition for providing reports that would limit the cases of delays and the actual number of hours.

i. Time consuming various file size

the encoding time increases almost linearly with the increase in data size as shown in Figure 3. Where the rate of any encryption algorithm indicates how fast the algorithm is during the encryption and decryption processes.

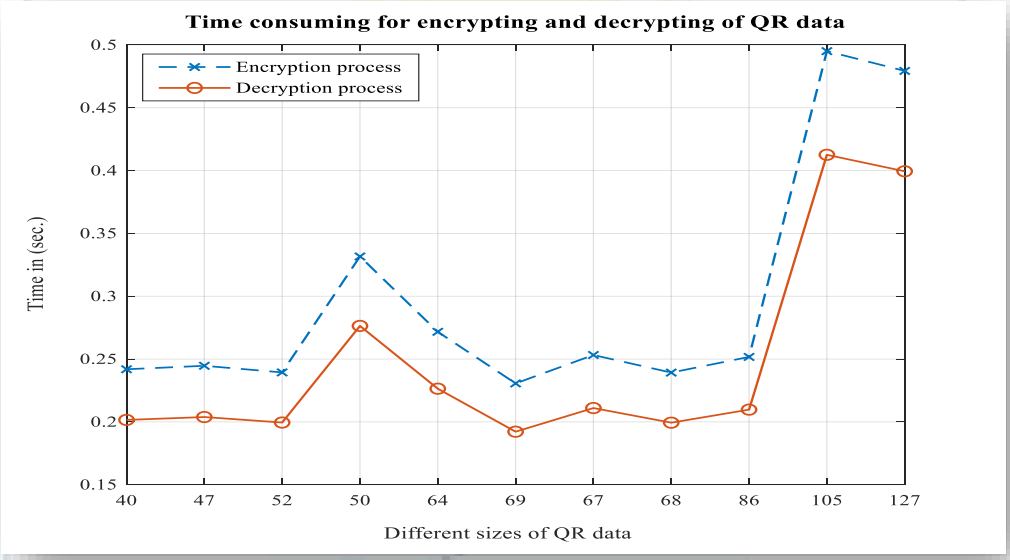

Figure 3 Shows the encoding and decoding time of the tested text data

ii. Objective of quality

- Homogeneity

Figure 4 illustrates the QR code homogeneous rating scale. This metric returns a value that indicates how closely the distribution of items in the GLCM is from the image to its diagonal. To assess the homogeneity of the QR code, the gray-level co-occurrence matrix (GLCM) is normalized so that the sum of its elements is 1. The most homogeneous cases were observed if 38 characters were used to create the QR image and decreased almost linearly with increasing data size.

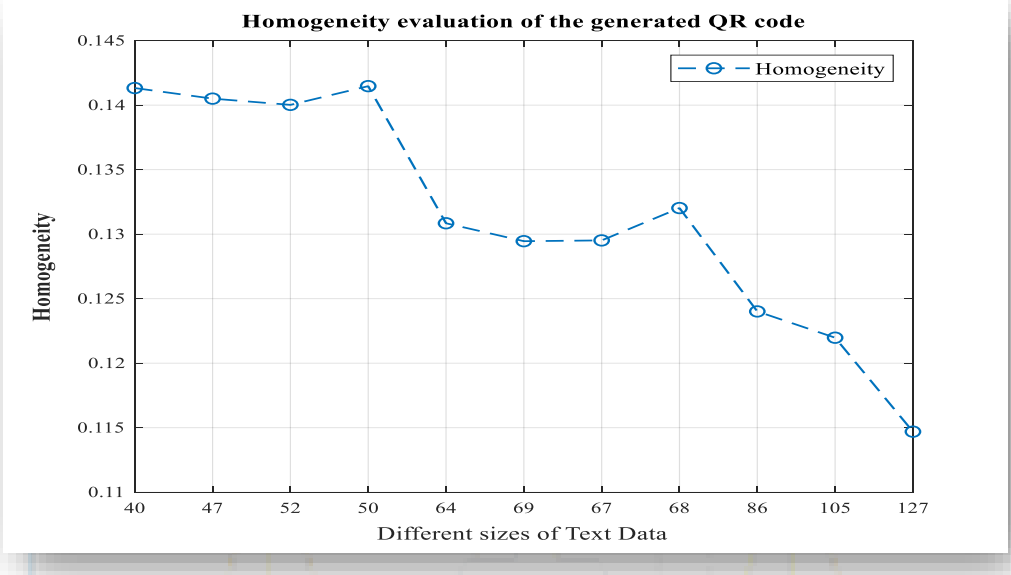

Figure 4 Shows the Homogeneity Evaluation of the QR code.

- Energy

the relationship between energy and different sizes of data is shown in Figure 5. The QR code with lower characters has higher energy. therefore, as the QR data increases the energy decreases which leads to high frequency.

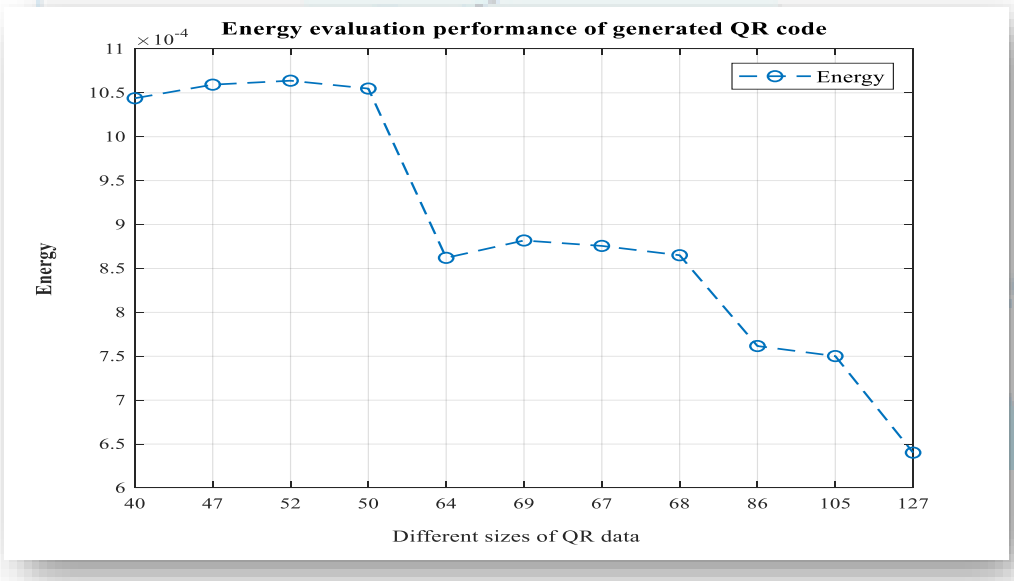

Figure 5 Shows the Energy Evaluation of the QR code.

- Contrast

Since the contrast is a reflection of the clarity and brightness of an image, It was used to measure the extent of internal variations of Gray level elements. Figure 6 shows that as the data increases this increases contrast or luminosity of QR.

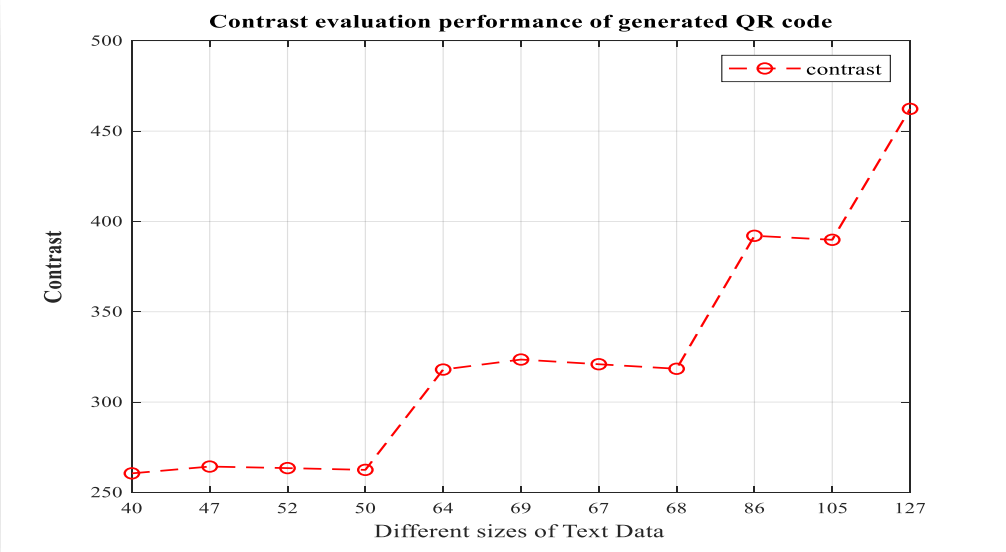

Figure 6 Shows the Contrast Evaluation of the QR code.

iii. Robustness

table 1 represents robustness measurements and what attacks may affect the system. the attacks are classified into three different categories as listed within the Table.1.

Table.1 Shows The performance of the proposed scheme under various image attacks

Performance / Type of attack	Parameter	Can reconstruct Secret data? (yes/no)
Rotation	15◦	Yes
	30◦	Yes
	45◦	Yes
	60◦	Yes
Resizing	0.125	Yes
	0.25	Yes
	0.5	Yes
	0.75	Yes
	1.25	Yes
	1.5	Yes
JPEG Compression	Quality = 90	Yes
	Quality = 80	Yes
	Quality = 70	Yes
	Quality = 60	Yes
	Quality = 50	Yes
	Quality = 40	Yes
	Quality = 30	Yes
	Quality = 20	Yes
	Quality = 10	Yes

5. CONCLUSION

The main objective of this paper was to develop an automated and secure employee attendance management system using QR technology. The presented system was validated through a series of experiments demonstrated the ability of the proposed and designed model to generate QR from encoded data. The results of the experiments were very positive indicated the proposed system could provide an optimal balance between embedding capability and security. To increase the layer of security, data to be included was encrypted using the S-DES algorithm. A hybrid key-based method was used to randomly switch host transactions (input data) in each block of candidate data within a specified frame. As a result, hacking hidden information without knowing the encryption key is almost impossible for unauthorized people who are not familiar with the algorithm. The robustness of the QR Code system proposed in this project has been validated by measuring its robustness against attacks. The robust performance is also determined at nearly 100% on average by measuring the BER of the retrieved data bits (data derived from the decoding process), which makes the proposed QR Code system perform excellent compared to other technologies.

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The Role of Translation Process in Enhancing English Language Competence and Performance as a Second Language

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ABSTRACT

This study addresses the role of the translation process in enhancing the English language competence and performance as a second language in terms of methods and strategies. It is also intended to identify the difficulties and obstacles that prevent the role of the translation process in enhancing English language competence and performance as a second language and discovering ways to solve and overcome them. To reach these objectives, a closed questions questionnaire was submitted to ten Libyan fifth-semester students from the Translation Department of the Faculty of Arts at Zawiya University, Libya (2022-2023). The questionnaire analysis reveals that good English language competence may be a positive predictive variable on the performance of students in translation. The analysis also demonstrates that translation plays a key role in raising teaching and learning by enhancing English language skills in terms of competency, and performance.

Keywords: Translation -English language – Arabic language – Performance – Competence.

INTRODUCTION

English language competence and translation performance are equally important for professional life as well as for students of translation. Therefore, Language proficiency is very important in the field of translation teaching, as knowledge of foreign languages is a prerequisite for anyone wishing to study translation.

Translation is one of the means and tools that help a translator enhance his/her competence and performance in English as a second language. Since translation is the conveying of the meanings of written texts from one language to another, this requires dealing with the units of translation in terms of meanings, grammatical structures, and linguistic functions. Thus, a translator works to convey the meanings of words in their translation units according to the contexts of their use by searching for them in several dictionaries, electronic encyclopedias, websites, and specialized books to reach the final product that performs the same function as the original text. The relationship between translation and language learning involves many disciplines and can be explored from different perspectives. According to Roy (2012:76):

"The English Language plays a vital role in providing the translated book to the wide readers by bringing them to a global platform. English is known as a *window' to the world as well as a library, so fortunately the mission of translating books into English has been successful".*

In view of this, substantial research studies have been conducted to investigate several English language and translation issues. Most of them focused on the role of translation in helping the learner to improve their English language knowledge and proficiency.

In one of these studies, Alshamiry (2020) investigated the Communication Efficiency of Saudi English Language Learners at the Institute of Language and Translation. He employed a questionnaire to collect the data for this study. The results show the extent to which Saudi students' first language affects the direction in which they use some targeted language communication strategies. He recommended that Language proficiency must be taught implicitly and functional abilities must be taught explicitly in spoken English classes, which can compensate for their lack of exposure to the target language.

Hussein &Al-Talqani (2019) conducted a study to shed light on two of the fundamental language abilities (reading and speaking skills). Students will perform sight translation with efficiency. They employed a fifteen-closed items questionnaire to collect the data for this study. The results show that the students were ready to notice the numerous roles of language skills and the way they are vital in their performance in Sight Translation. The two researchers recommended all the interpretation instructors and translation students target the language skills to reinforce the students' performance in (SIT) because there is no smart performance while not language skills and their information are going to be restricted during this style of translation.

Similarly, (GROUPS) 2013 investigated the role of translation in teaching languages in the European Union. He collected data from a questionnaire for experts and language teachers. The results showed that translation and language learning complement each other. Therefore, translation is necessary because not everyone learns all languages, and language learning is required to ensure translation availability because there are not enough “natural bilinguals” or “natural translators” to cover the market.

Correspondingly, Mbotake (2013) conducted a study to evaluate the role of language ability in translation performance. He collected data by testing a protocol to translate 300 words into English. The results show that students perform poorly in translation, not because of a lack of training in translation methods and skills, but because of a lack of proficiency in the working language.

Dagiliene (2012) conducted a study to focus on the use of translation to help learners acquire, develop, and strengthen their English language knowledge and proficiency. He collected data from this study through a brief overview of the theoretical literature, analysis of language classroom activities, and analysis of questionnaire results. The findings reveal that translation is a great tool in English courses that tailor students' foreign language skills.

In view of the above literature review, it has been found that the present study partially concurs with the previous studies addressing the subject of the role of translation in enhancing English language competence and performance. Good command of the English language can be a positive predictive variable of the performance of translation students. It was also found that few studies made use of English language proficiency and performance through translation. Through this study, the researcher seeks to study the role of the translation process in enhancing the English language competence and performance as a second language by achieving the

following objectives:1. Investigating the role of the translation process in enhancing the English language competence and performance as a second language in terms of methods and strategies. 2. Exploring the difficulties and obstacles that prevent the role of the translation process in enhancing English language competence and performance as a second language and discovering ways to solve and overcome them. 3. Measuring the extent to which translation can enhance the English language competence and performance as a second language.

Research Problem

Proficiency in two languages is a requirement of translators, as they convey the meanings from and to oneanother. Translation can be described as an intermediary tool between two languages. If we apply it to Arabic and English languages according to the research topic. Some translators speak Arabic as their SL, and others speak English as their TL because they learned it until they mastered it well.

Some translators who were born in English-speaking countries may be lucky because they acquired their mother tongue (Arabic) through home and culture and at the same time they acquired the second language (English). After all, they live in an English-speaking country, which enables them to know their culture and customs. Those lucky translators may not be included in the study because they combined the two languages at the same level of proficiency. As for the unlucky translators, who try and struggle to learn the English language through courses, books, media, websites, and all that is available to them. They can learn and understand it in a way that qualifies them to translate from or into it.

Research Hypotheses

Researcher belongs translators who have learned English in their country and have experience in translating from English to Arabic and vice versa, they hypothesize through their experiences that working in translation may help translators, especially beginners, in enhancing their English language competence and performance.

They assume that the more a translator deals professionally in the process of translation, the more beneficial it is in playing a role in enhancing the English language competence and performance, whereas it is the less, the less it may be to achieve this goal.

Research Questions

Further to the statement of the problem, the researcher can raise a question in this study: Can translators who learn English through learning and practice enhance English language competence and performance through translation as a mental process dealing primarily with words, their meanings, grammatical structures, and linguistic functions?

Research Significance

1. Translation plays a significant role in improving teaching and learning by enhancing English skills competence and performance.
2. Highlighting the role of translation in enhancing English language competence and performance as a second language.
3. Introducing the importance of translation to enhance the English language skills competence and performance as a second language.

METHODOLOGY

Quantitative research strategies were used to collect information and respond to analytical questions.

Procedure

For this purpose, the researcher designed a questionnaire and administered it to the students using Google Forms. The questionnaire contains twelve statements. Five points of the scale indicated the degree of consent or disapproval of the information process by selecting one response from the subsequent responses: strongly agree, agree, neutral, strongly disagree, and disagree.

It is designed to report the students' attitudes and opinions towards the impact of the English language in learning and teaching translation. It also intends to establish whether English skills directly affect the students' performance in translation. It consists of twelve items (closed-questions). Some of the questionnaire items ask students about their attitudes towards translation, in general, and the other items about enhancing English language competence and performance through translation. The quantitative data obtained from the form were analyzed by descriptive statistics (number and percentage).

Research Population

A sample of 10 students was designated by the fifth semester, Department of Translation, Faculty of Arts, zawiya University, Libya. All the students are Libyan. They were educated under a similar instructional system, and they have several things in common. They are six males and four females and vary in age from 23 to 24 years.

Data Collection

The researcher adopts the appropriate procedure for collecting data a closed questions questionnaire.

RESULTS AND DISCUSSION

This research paper is a comparative model. It aims to investigate the role of the translation process in enhancing the English language competence and performance as a second language in the English-Arabic translation rules. The researcher adopts a descriptive approach that represents how translation trainees enhance English language competence and performance through translation. They use a questionnaire of twelve (12) questions, which is particularly relevant as a tool for collecting specific data to test the hypothesis. It can be analyzed as follows: 1- Do you believe that your English skills can be enhanced through translation? The respondents' answers to this question indicate that 60 % agree that their English skills can be enhanced through translation, 20% of them strongly agree, 10% of them disagree, and 10 % of them strongly disagree. The above percentages of the answers show that translation can play a great role in the enhancement of English language acquisition. 2- Do you think translation as a subject becomes easier according to English language skills acquisition? The respondents' answers to this question state that 60 % agree that studying translation becomes easy according to certain English language skills, 20% strongly agree, and 20%are neutral. From the percentages of the above answers, it is clear that a translation trainee needs to study translation theories as

synchronic knowledge to English language skills acquisition. It is also obvious that English language skills acquisition is very crucial for students in terms of translation. 3- Do you believe that reading the original text two or more times allows you to understand the content to translate? The respondents' answers to this question refer to 80 % of them strongly agreeing that reading the original text two or more times allows them to understand the content to translate, whereas 20 % of them strongly agree. The different percentages of the answers prove that reading the original text two or more times is a very important method in the translation process as the first thing a translator must start with when translating. 4- Do you find that your translation performance can be developed gradually once you are skilful in English? The respondents' answers to this question indicate that 60 % of them strongly agree that their translation performance can be developed gradually once they are skilful in English, 20% of them agree, 10 of them disagree and 10 of them are neutral. The above percentages of the answers show that when a translator is skilful in English, that will beneficially step to develop translation performance gradually starting from the beginner to the advanced level. 5- Do you find that English-Arabic translation is difficult to learn? The respondents' answers to this question demonstrate that 60 % of them agree that English-Arabic translation is difficult to learn, 20% of them disagree, 10% of them strongly agree and 10 % strongly disagree. The answers of different percentages argue that English-Arabic translation as a subject field needs to be taught in-depth based on the translation studies in terms of theories and application, especially in the departments of translation at the undergraduate level. 6- Do you believe that integrated English skills can lead to devolving your performance in translation? The respondents' answers to this question demonstrate that 30% of them agree that integrated English skills can lead to developing their performance in translation, 30% of them disagree, 20% of them strongly disagree and 20 % of them are neutral. The answers of different percentages show that students should be convinced that integrated English skills are an absolute must because they can lead to devolving performance in translation. 7- Do you think that writing is a skill that is required to improve your performance in English-Arabic translation? The respondents' answers to this question indicate that 70% of them strongly disagree that writing is a skill required in improving their performance in English-Arabic translation, 30% of them agree, 10% of them disagree and 10% are neutral. From the percentages of the above question, it is so clear that translators are quite aware that translation training involves learning English writing as a linguistic skill in translation. 8- Do you find that giving the meaning of some difficult words to the teacher helps you overcome the translation difficulties? The respondents' answers to this question state that 60 % agree that giving the meaning of some difficult words to the teacher helps them overcome translation difficulties, 20% of them strongly disagree, and 20% are neutral. The above percentages of the answers show that translation teachers should explain the ambiguous and unclear meanings of new words to their students to overcome the translation difficulties that they might face in translation class. 9- Do you find learning English skills in the first semester useful for your study of translation? The respondents' answers to this question indicate that 44.4% of them disagree that learning English skills in the first semester was useful for them for studying translation, 22.2% of them agree, 22.2% of them disagree and 11.1% of them strongly disagree. The above

percentages of the answers demonstrate that the departments of translation at the undergraduate level should draw attention to learning English skills in the first semester, which will be useful for students studying English-Arabic translation. 10- Do you think that the skimming technique in reading the text will give you an overview of the text? The respondents' answers to this question indicate that 50% of them agree that the skimming technique in reading the text will give them an overview of the text, 30% of them are neutral and 20% of them strongly disagree. The answers of different percentages prove that the skimming technique in reading the text will give the translator an overview of the text, so it is a very important aspect of the translation process. 11- Do you think that enhancement of English-Arabic translation has a relationship with fluency in English? The respondents' answers to this question reveal that 70% of them agree that enhancement of English-Arabic translation has a relationship with fluency in English, 20 % of them are neutral and 10% of them strongly agree. From the percentages of the above question, it is so obvious that enhancement of English-Arabic translation has a relationship with fluency in English. 12- Is there any difference between students' translation performance training and English skills acquisition? The respondents' answers to this question indicate that 30% of them agree that there are some differences between students' translation performance training and English skills acquisition, 30% are neutral, 20% of them strongly disagree and 20% of them disagree. The above percentages of the answers show that translation as a subject field should be organized as an independent discipline based on its rules of conduct and methods of practice to achieve the quality of training in translation.

Concerning enhancing English language competence and performance through translation, the study found that students were able to realize the role of translation in enhancing English language competence and performance as a second language.

The findings of this study are corresponding to those results of the previous studies conducted by researchers and EFL students Alshamiry (2020), Hussein &Al-Talqani (2019) (Groups) 2013, Mbotake (2013) Dagiliene (2012). All these studies have shown that Translation plays an important role in enhancing English language skills and its impact on the language strategy in understanding and assimilation. In addition, translation is a useful tool in English courses that tailor students' foreign language skills, as well as translation, plays a major role in raising teaching and learning by enhancing English skills competency and performance.

CONCLUSION AND RECOMMENDATIONS

This study aims to investigate the role of translation in enhancing English language competence and performance. It also aims to explore the difficulties and obstacles that prevent the role of the translation process in enhancing English language competence and performance as a second language. As well as to measure the extent to which translation can enhance the English language competence and performance as a second language. The results revealed that the translator who uses his cognitive tools plays several roles in enhancing efficiency and performance in the English language. However, good language competence in the English language may be a positive predictive variable on the performance of students in translation.

Translation plays a key role in raising teaching and learning by enhancing English skills competency and performance.

The researcher recommends all the translation instructors and translation students focus on improving their English language skills to enhance the students' performance in translation.

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The Impact of Using Educational Pictures on Students' Retention of Medical Terms

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Abstract:
It's an obvious that teaching medical terms is not an easy task to be carried out. However, it's one of the most important challenges that teachers face during the process of teaching new medical terms. In addition, many studies have proven that using pictures in teaching medical terms attract students' attention as well as motivate them in learning new vocabularies. The present study investigates the impact of using pictures on teaching medical terms. Furthermore, the participants of this study were a group of 60 students chosen randomly, divided into two groups (Visual Group 30) & (Paper Group 30) studying at the university of Sabratha faculty of dentistry in the pre-dental year. The results of this study have shown that students of (Visual Group) remember medical terms better than (Paper Group) as visual techniques can act as cues for remembering words. The results of this study are also expected to be useful for all teachers who are willing to expand and develop their students' medical vocabularies.

Keywords: *Medical terms, teaching, visual aids, pictures, vocabularies.*

Introduction

We all know that learning new words or vocabularies is an important part of learning new language. Moreover, educational pictures are considered as a valuable device to motivate and develop student's creativity. However, there is no single doubt that the educational pictures today occupy an important place within the pedagogical media used in educational programs of all levels all over the world. Further, the educational image is one of the modern tools used in teaching new words, based on three main elements: the sender – the discourse – and the receiver. The sender is the teacher who improves the selection of the educational technology that he uses as an educational method to direct his cognitive discourse and make it interesting. The receiver is the student who responds to the educational program viewed and gets excited by it. That's to say that the teacher should create gaps in the presentation until he/she moves the viewer's experience, so he/she mentally participates in formulating the picture by deducing and

completing the gap which speeds up the process of communicating knowledge, as long as the viewer participates in crafting it. [1]

The interest in using images in higher education level has increased recently in Libya, due to the position that the visual image has occupied as a means of communication between the teacher and the student. Researchers believe that the importance of the educational image lies in its effective function and its close proximity to the student who is interested in shapes and colors, which attract his attention and give him the idea. Pictures are able to motivate and courage students to study the attached text; they can increase attention or encourage more detailed processing of textual data which included in illustrations, also they can explain and make clear content that is not easy to understand, or they can aid to create nonverbal codes in addition to verbal ones, which leads to increase the recovery potential for the picture text content that is presented. [2]

Research questions:

The researcher is trying to answer the following questions:

1. What is the impact of using pictures on students' retention of medical terms?
2. To what extend does this impact beneficial for the students?
3. Does the employment of educational pictures in classrooms have an impact on the development of learners' cognitive output?

Purpose of the study:

The purpose of this study is to highlight the dominant role that the educational pictures play within the educational systems, also to develop awareness of some of learners' psychological behaviors and learning styles, as well as shedding light on knowing the function and the effectiveness of the educational pictures in understanding the unknown medical vocabularies.

Research problem:

In the process of learning and teaching, there are some EFL teachers still use the traditional language teaching techniques for teaching new medical vocabularies, which makes it difficult for some students to memorize the medical words or recall them when they are presented in the classroom.

Participants of the study:

Participants of this study were a group of 60 students, divided into two groups (Visual Group 30) & (Paper Group 30) studying at the university of Sabratha faculty of dentistry in the pre-dental year. The participants were chosen randomly by using Oxford Placement Test (OPT) to select the students with an intermediate level of English proficiency.

Teaching Medical Terms:

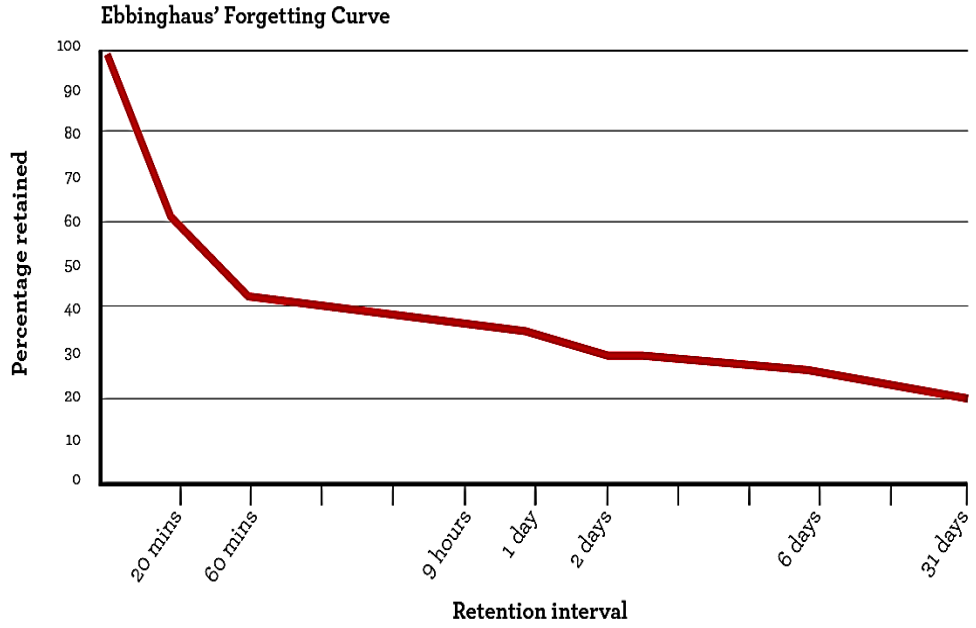
Nowadays, educational pictures have become one of the most important aids that have preserved an important place in the process of education. However, the educational pictures are one of the basics of communication in the educational process, and to read it, it is necessary to know how to access the underlying revelations [1]. It enables the teacher to create a link between the verbal component, the lexicon, and the perceived one, as it effectively helps the teacher to

connect the learner with his world of choice, and thus acquire linguistic knowledge and acquire linguistic skill. [3]

The interest of using educational pictures in higher education has increased recently, regarding to the position that has occupied as a means of communication, and for the spread of globalization, especially in view of what the image has in terms of meaning, color and richness in forms [4]. Many researchers believe that the importance of the educational pictures lies in its effective function and its close proximity to the student who is indifferent to shapes and colors, which attracts his attention and gives him the new term with a different style. Pictures also provide a time frame and give chance to the students to make decision and utilize their imagination to guess and elaborate what will happen. [1]

Ebbinghaus' Forgetting Curve:

One of the first researches related to the memorization and forgetting of words was the research of the German scientist called "Hermann Ebbinghaus" in 1885. His research showed that forgetting curve indicates the speed at which we lose the information that we do not try to remember, and his experiments proved that the human mind after an hour forget about at least 25% of the information he/she has received (that is, we often lose information quickly at the beginning of learning) and also at least 25% after passing 24 hours, and also 25% after a week. He added that after a month, only less than 5% of the amount of information we receive remains in our memory.



SOURCE: *Memory; A Contribution to Experimental Psychology by Ebbinghaus*

On this regard, Ebbinghaus has presented some solutions by simply making four reviews to the lectures per month as the following:

1- First revision:

It comes before an hour passes and immediately after the end of the explanation, we only need 3 to 5 minutes to review, because the focus will be on the main points.

2- Second revision:

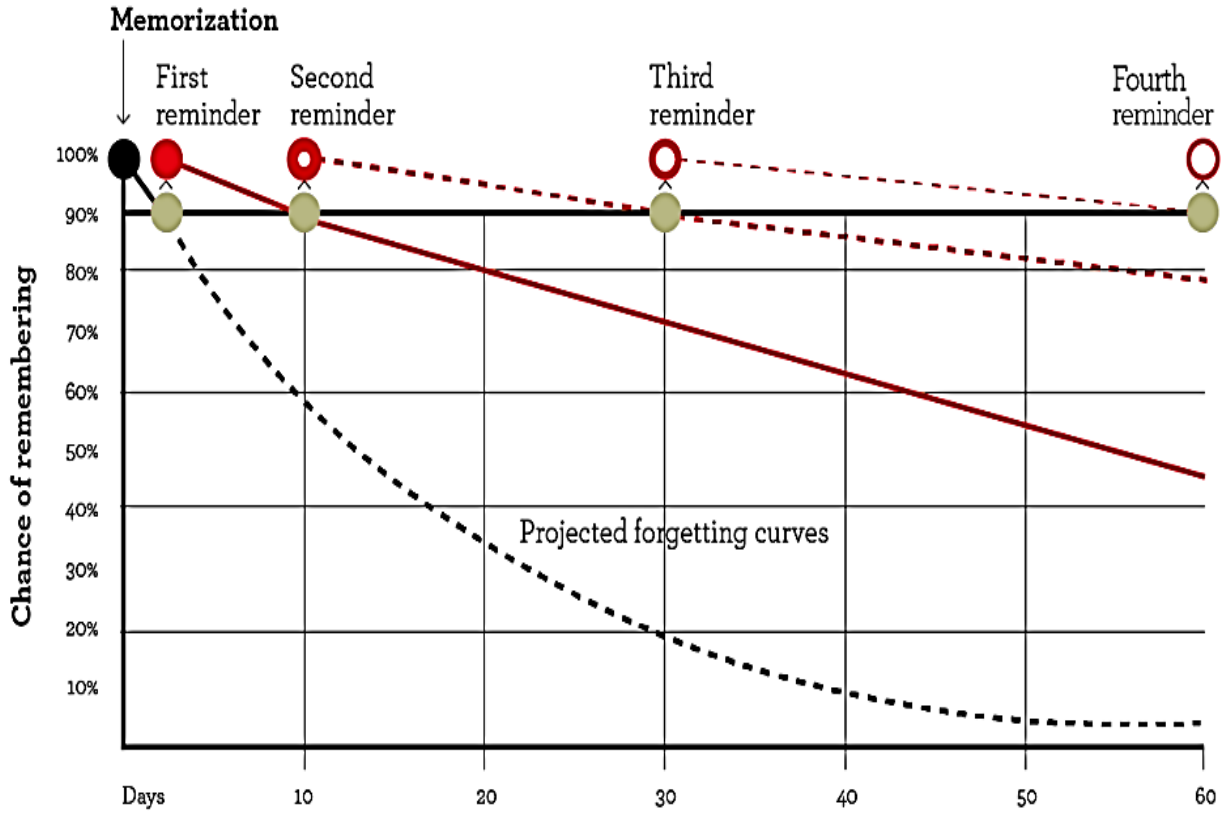
Before 24 hours, by studying the lessons and applying them, and by solving some exercises on the same day the explanation was received in the class or lecture.

3- Third revision:

A week before, and a quick review before the new lesson or the new lecture of the same material, which needs 3 to 5 minutes, because it also focuses on the basics of the lesson and re-establishes the important points in it.

4- Fourth revision:

A month ago, and a quick review of the lessons studied in the material during a month, it takes 3 to 5 minutes, and the reason of the short period of time provided, that the information in this review is stable.



SOURCE: *Memory; A Contribution to Experimental Psychology by Ebbinghaus*

The Use of Pictures in classrooms:

Visual pictures presented in classrooms are particularly effective in a certain circumstance. [5] However, there are numerous debates about the role and effectiveness of visual graphics as a learning aid in educational systems. Furthermore, some researchers have shown that visuals in learning materials are seen as appealing and enjoyable aspects of learning new vocabularies [2]. That's to say that, a good educational picture can unleash student's brains from common and traditional activities to diversified thinking, by making the chance to share ideas with others. [6]

Many researchers discovered that the selection of pictures used in the classroom have an effect on students' motivation. Further, good visual pictures can liberate students' minds from routine scientific activity and lead them to more diverse thinking [6]. In other words, educational pictures are used for a variety of purposes, including entertainment, attention, reinforcing or telling a tale, teaching a topic, and promoting enjoyment and consciousness among students. In

this regard teachers can enhance students' creativity by encouragement and reward, or by choosing interesting materials. [7]

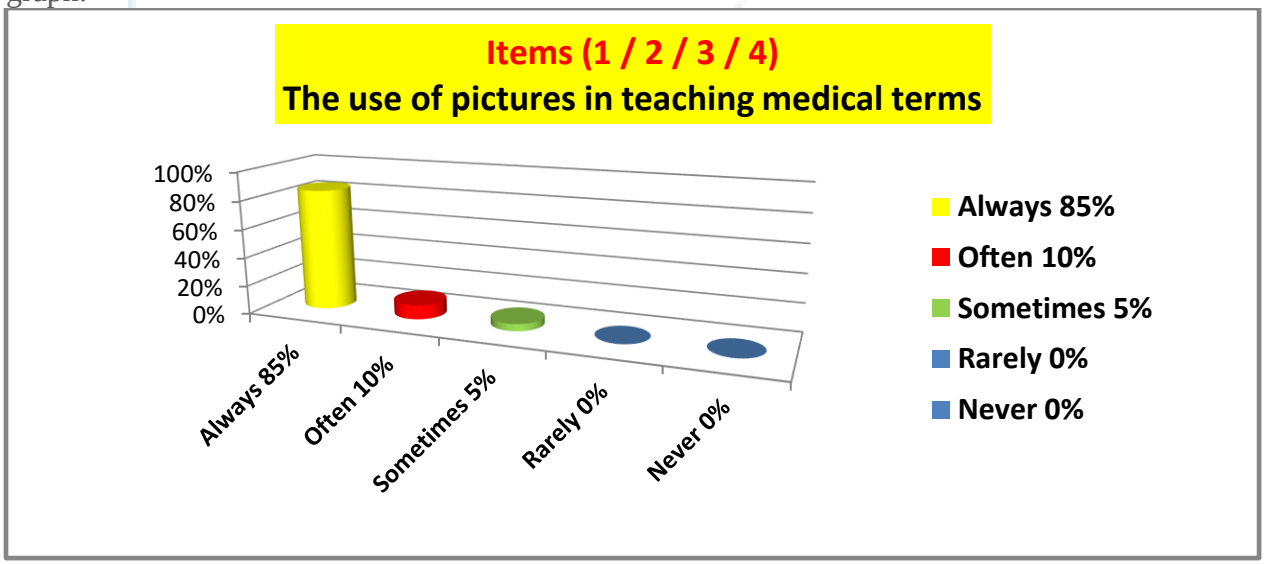
Research Method:

A two-group quasi-experimental approach has been used in this research. The first group was designated as the visual group, while the second group was designated as the paper group. This study employed a pre-test and post-test design. The pretest was given before the experiment to investigate the students' comprehension of the medical words presented, and the posttest was given after the experiment to investigate the impact of using educational pictures on learners' vocabulary retention. The results of the two tests were compared to see if the integration of pictures had any effect.

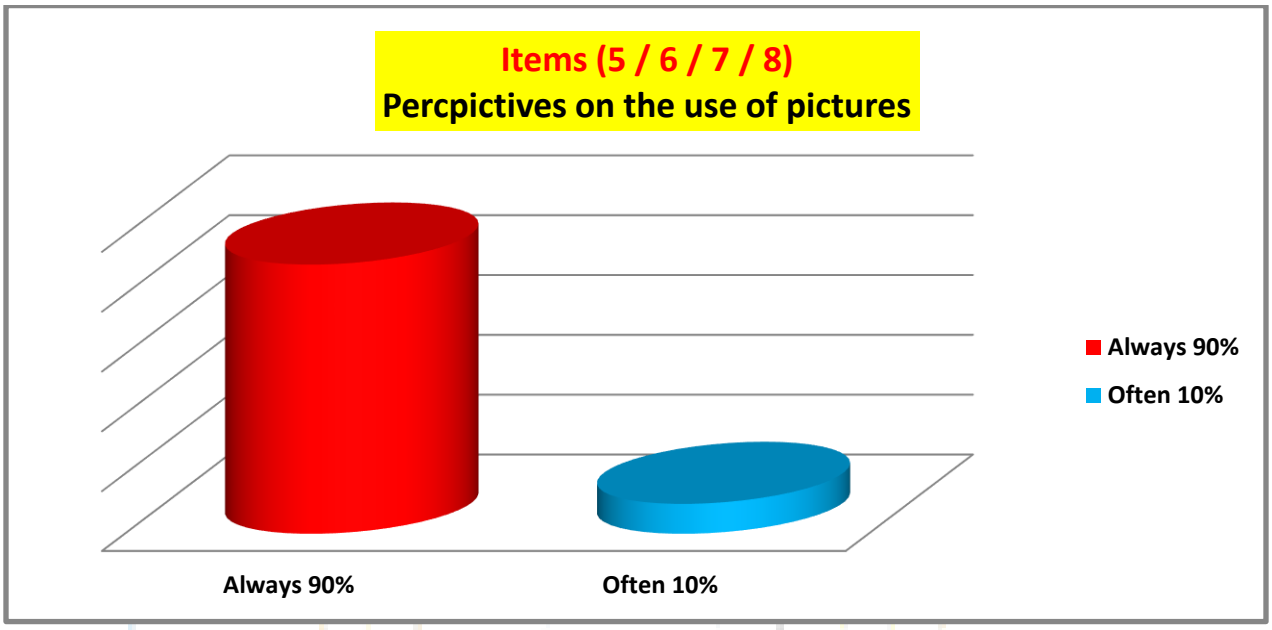
Findings:

The results of this study showed that most teachers and students are not aware of the importance of using pictures in classroom. The questionnaire was categorized according to different levels and each group of items were analyzed individually depends on the impact that is being examined. The findings revealed that the impact of using pictures by teachers in this study is as the following:

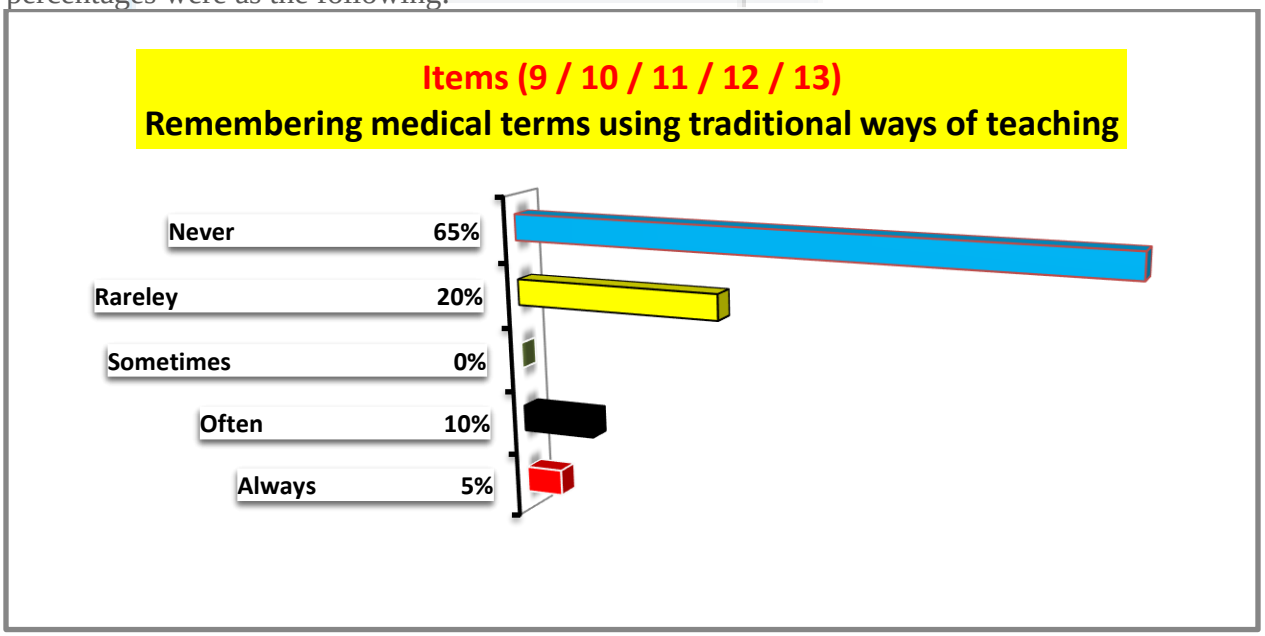
In the analysis of the first four items (1/2/3/4), it is an obvious that most of the participants like the use of pictures to help them remember medical terms. The results showed that 85% of students strongly like using pictures to gain more vocabularies. Whereas 10% goes to the second option 'Often' and the last 5% goes to the third option 'Sometimes' as given in the following graph:



The analysis of the two items (5/6/7/8) revealed that most teachers have used the same teaching method such as using English texts to present new medical vocabularies to students. The graph below summarizes and shows the percentages:



In the analysis of the items (9/10/11/12/13) that are examining the extend of remembering medical terms by using traditional techniques; it was clearly that students don't remember what they have learnt. The results showed that the participants only write down words that have mentioned in class and they couldn't find any other sources to learn those unknown words. The percentages were as the following:



Discussion:

The study attempted to highlight the importance of using educational pictures as a teaching aid tool by investigating the impact of them on students' retention of medical terms. Results are clearly approving that attention in classroom is very important aspect since it represents the contact line between the student and the teacher.

As a limitation of this study, and due to the small number of samples being examined, it is necessary to mention that it's not possible to generalize the final results of this research. The researcher believes that this kind of research needs more samples in order to uncover the real reason why some students forget medical terms easily.

For instance, future researches could be done to investigate the impact of using flashcards, videos, or any other tools that may help learners to learn and remember terms better. Such research could contribute positively in the learning process as well as clarify the real impact of those aids in medical terminology classes.

Conclusion:

The purpose of this study was to find out the impact of using pictures on pre-dental year students at Sabratha University, faculty of dentistry. The findings of this study have proven that pictures are useful in helping students generate ideas to remember medical terms using the target language. An advantage of this study is that it will increase students' awareness on the importance of learning as well as assist language teachers to improve their teaching methods in second language learning and teaching. Data has been analyzed using frequency count and the findings are presented in tables and charts.

Future studies on using pictures for medical terms retention can be done from two viewpoints. One is on the individuals' differences of language learners from primary to university level can be conducted both in qualitative and quantitative approaches. Also, studying the effect of culture, home environment, peer groups, effective teaching methods and classroom atmosphere on vocabulary learning strategies could be very helpful to get better understanding of the relevant strategies.

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Optimized Link State Routing Protocol for Flying Ad Hoc Networks

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Abstract
The network connectivity is often lost during some situations such as in war zones, battle fields or in regard to natural disasters like floods or earthquakes. Therefore, the connection becomes difficult for rescuing teams to locate people. At the same time, mobile nodes are difficult to be tracked/located. Therefore, flying ad-hoc networks (FANETs) is the solution which provides a way to tackle this situation without the need for any central infrastructure with the use of flying objects (nodes). FANTEs are frequently formed of tiny unmanned aerial vehicles (UAVs) which are flexible, affordable, and rapid to deploy. UAV as a router and without complex hardware deployment, provides an effective real-time communication solution for multiple UAV systems. FANETs can also be used to provide connectivity in such areas in which flying nodes are utilized. In this paper, we discuss the importance of the FANETs and present a routing protocol comparison that depends on the link budget to identify the optimized packet route for the data to be transmitted. The simulation design results show that a throughput enhancement of 0.62Gbps is achieved in comparison to the distance-based routing protocol. The results also confirm the efficiency of the optimized link state routing (OSLR) protocol over the other. The performance of FANETs can be optimized further by using the OLSR protocol.

Keywords. flying ad-hoc networks, UAV systems, OSLR protocol

I. INTRODUCTION
A wireless ad-hoc network or Mobile Ad-Hoc Network (MANET) is composed of devices that communicate without any predetermined infrastructure. Flying ad hoc network is a sub class of MANET. Whereby wireless multi hop network representing by a set of self organizing mobile nodes without relying on infrastructure [6-14]. The basic idea behind FANET is that a group of homogeneous flying agents communicate with each other locally to get some information needed. FANET does not support central control. In the situations of emergency as flooding or military battle field it is not feasible to deploy mobile node in the communication area. So, by using unmanned aerial vehicles (UAVs) network to have high mobility, scalability for different scenarios and robustness to deal with communication failures. In FANET, the network topology changes quickly and the nodes movement is very high which means a low network mobility. Therefore, it is very challenging to propose an efficient data routing technique able to update routing tables dynamically whenever networks topology change. Flying ad hoc network have been studied extensively to come up with an effective routing protocol to solve for the mentioned challenges.

In [1], the authors proposed a geolocation based routing protocol for flying Ad hoc networks and tested it in different environments. The performance results show the robustness and the resilience of the dynamic multi-hop network topology.
The authors of [2] introduced an adaptive hybrid communication protocol including a novel position prediction based directional media access control (MAC) protocol and self learning routing protocol based on reinforcement learning. As a result, PPMAC over comes the directional deafness problem with directional antennas, and the Parallel Link State Routing (PLSR) provides an automatically evolving and more effective routing scheme.

The efficient routing in Vehicular ad hoc network have been discussed in [3].The authors proposed idea of receiver based forwarding scheme, making use of the feedback avoiding the multiple path formation by enabling the winning node to send a confirmation message back to the previous forwarder. The result shows that the usage of confirmation and winner declaration messages scheme might have significant impact on network performance in terms of delay.

The authors of [4] analysed the network performance in terms of response time, packet loss rate and network bandwidth capacity and tested the performance of the wireless multi-hop ad-hoc network, the result shows that the multi-hops bandwidth decay faster and both the delay and the packet loss rate are higher than the simulated multi hops system.

The authors of [5] analysed the mobility impact models performance of MANET configured with dynamic source routing (DSR) Protocol using optimized network engineering tool (OPNET) simulation, random waypoint (RWP) and manet down left (MDL) were the mobility models used. RWP have better performance than MDL in terms of throughput which is higher by 59%, lower delay of 41%, and 60% of routing traffic delivered. On the other hand, the MDL DSR 2 performed better than RWP DSR by having 54% of routing traffic delivered, 56% of throughput, and lower delay of 47%. The simulation results proved that the performance of MANET varies across different mobility models, different speed and pause time.

The destination sequenced distance vector routing (DSDV) protocol experiment performance analysis achived by [15] in terms of certain parameters like throughput and the packet ratio of the nodes. The results show that out of many routing protocols, DSDV considered selecting the best path between the sender and receiver for the data transmission by considering the throughput, surety value of nodes and the packet delivery ratio.

An ad hoc network scheme in hybrid networks for emergency communications is proposed in [16]. By collecting the damage assessment information quickly in a disaster conditions, they built a route by monitoring neighbors' communications instead of broadcasting a route request packet. The results show that the network is feasible of the operation in short delay, 90% of the network nodes are capable of reaching the base station within three hops by multi hopping even if only 20% of the nodes can access the base station directly.

In topology based routing protocols, routing of the packets can be done by using information about the existing links in the network [17]. These protocols are further divided into three subcategories: proactive, reactive, and hybrid protocols. In proactive routing protocol, each and every node in the network shares its routing information from its routing table which is used by the other nodes to identify the path for destination nodes and make the map of whole network. The authors of [18] compared between three different routing protocol, Ad hoc on-demand distance vector routing (AODV), DSDV and OLSR in terms of End to End-Delay.

Average throughput and packet delivery ratio with respect to speed of mobile node. The results concluded that the performance of FANET can be optimized by choosing OSLR routing protocol.

The FANET routing protocol has to adapt to frequent changes in the network topology caused by the high-speed movement of nodes. Compared to MANET, nodes have higher moving speed and this affects the protocol in terms of the number of packets received at the destination and the time delay[19]. In this paper, we compare a routing protocol that depends on the link budget to identify the optimised packets route. We also compare our results with the pervious study in [18] to get similar results for the performance of FANET.

The remainder of this paper is organised as follows: section II describes the system modeling, the proposal approach is explained in section III. Section IV presents the results and discussion. Finally, Section V is the conclusion for this paper.

II. DESIGN MODELLING

In this paper, we consider a network that consists of number of nodes and devices connected randomly together using LTE (Long Term Evolution) wireless connection and located within an area of 5.0 square Kilometer of the network coverage. 2.6 GHz spectrum is considered in this design because of the large coverage and channel model availability for this frequency. The designed network elements and the notations used in this paper are expressed below:

- Set of Nodes $N = [1,2,..,|n|,N]$
- Set of Devices $D = [1,2,..,|d|,D]$
- Received power Prx
- Transmitted power Ptx
- Path loss Pl
- Time t
- End to End delay $E2E$
- Distance d

When there is no dominant line of sight propagation between the transmitter and receiver, Rayleigh model is the most applicable. It is also a reasonable model when there are many objects in the environment.

In wireless networking, the link budget is a description of all the losses and gains from the transmitter to the receiver during the active state. In this case finding the link budget is the first milestone, as it consists of two basic parameters to be calculated, data rate and received power. The link budget can be calculated using the following equations:

$$\text{Link bugdet} = Prx + \text{Throughput} + \text{Delay} \quad (1)$$

$$Prx(dB) = Ptx\ (dB) + G\ (dB) - PL\ (dB) \quad (2)$$

Whereby *Prx* is the received power between all the nodes in this model. *Ptx* is the transmitted power adding by G gain which representing 0 dB in this design.

$$Ptx = 10 \log \log 10\ 0.1 \quad dBm \quad (3)$$

The Path loss *PL* for all the connections calculated using the model channel equation depending on the distance between each node and device in the network by using the following equation:

$$PL = 128.1 + 37.6 * \log10dis \quad (4)$$

A. *Performance Analysis*

The total amount of packets moved successfully from the transmitter to the receiver is the throughput measured in bits per seconds, then the throughput calculated using the following equation:

$$\text{Throughput} = \text{packet size time} \quad (5)$$

In the network each packet takes time to be transmitted across the network from one place to the destination. In this design the time calculated using End to End delay as follows,

$$E2E = \text{arrive time-send time } L \quad (6)$$

Whereby *E2E* is the End to End Delay. The average time taken by a packet to arrive at the destination, and *L* represents the number of links from devices passing with the nodes to reach the packet to its destination in the network.

In this paper, the goal is to look into how the data will take the best path in term of the link budget, which includes throughput and the end to end delay to travel from transmitter to the receiver. A sample routing table is shown in Table I:

I. ROUTING TABLE

Destination	Next hop	Metric	Des.Seq.No.
1	2	1	123
2	3	0	212
3	1	2	312

III. PROPOSAL APPROACH

about the existing links in the network [8]. In this paper two scenarios are considered, and we simulated to test the path that the packet takes to deliver from the source to the destination. The simulation parameters are presented in Table II :

TABLE II. TYPE STYLES

Parameters	Value
No of nodes	4
Area covered	5 Km2
Frequency	2.6GHz
Packet size	500*10^6 bytes

In this design, the router connects the network. And all the nodes are connecting together to the router.

In the first scenario, the packet finds the best path for the data passing through the set of connected network (nodes). In this case, the packet delivered based on distance, by using the shortest path.

Minimum Distance Algorithm

```
For i=1: N active nodes
      Obtain dis
       For j=1: J active devic
         For i≠j
        Obtain dij
         End for
       End for
 End for
      Server distance minimum = min (dis)
      Device distance minimum = min (dij)
        For i=N active nodes
           If dis == server distance minimum
            Connect i-s
        Else
            Break
        End if
  For j=1: J active devices
       If dij  == server distance minimum
          Connect i-j
        End if
   End for
End for
```

The second scenario, the packet takes the best performance path in term of the link budget, received power, end to end delay and the Throughput. Algorithm 1 and 2 describes the flow of the proposed design, respectively.

IV. RESULTS AND DISCUSSION

In this section, the simulation results are represented. When the data is transferred from one device to another on network. it is broken into smaller units called packets. The packets are free to take any path of transmission in any order to get to their destination.

When the packet reaches a router, the router look at the destination address to determine where to send the packet and where the packet should go to reach the receiver. In this case the packet have two ways choose to take.

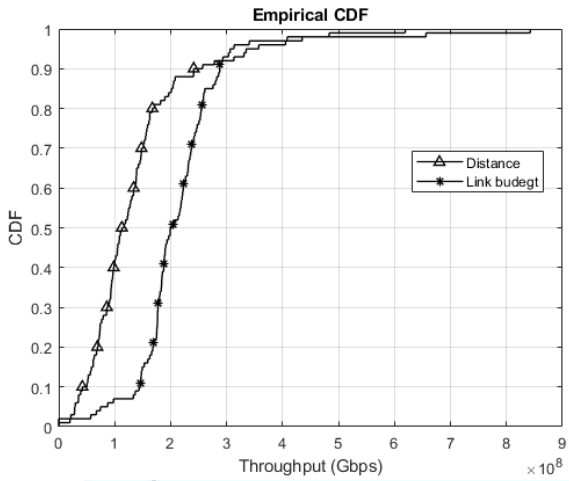
1. Based on minimum distance

The packet is forwarded to the nearest minimum distance node reaching the server node and to the router. Different packets may travel via different network paths depending to its distance.

2. Based on link budget

In this case, when the packet are transmitted from any devices, it take the best link budget path to chose in order to reach the destination.

The results show the comparison of the protocol performance between Distance and Link budget based using the term throughput and end to end delay.

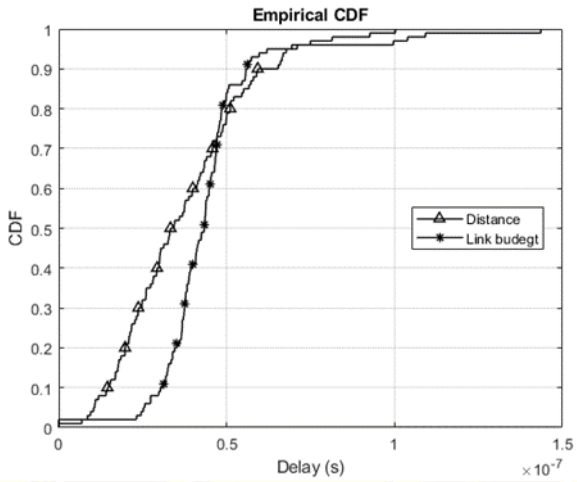


1. Total network Throughput

In Fig.1 the simulation results show that the network performance of link budget packet performs better than the minimum distance packets path in terms of of total throughput.

In this design, the maximum throughput = 0.9 Gbps.

The link budget path shows best throughput starting from 0.5 Gbps and increasing compared to the minimum distance path.



2. End to End delay comparison

Fig.2. shows the average time taken by a packet to reach the destination after it has started from the source considring any traffic or queueing. The maximum End to End delay have been shown = 0.15 μs.

From the graph, the network have higher delay when the number of packet increases for the link budget protocol between 0.5 μs to 1 μs. On the other hand, the distance perform slightly less delay than link budget path.

V. CONCLUSION

This paper discussed how the routing protocol can be defined in which many parameters were used to find the efficient route for data transmission between sender and receiver in comparison to the shortest distance routing protocol. The results show that the link budget based approach performs better in term of throughput although the delay is relatively more. Based on this, the performance of FANET can be optimized by choosing OSLR routing protocol.

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