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Original article

Oral Cancer Public Awareness: A Population-Based Study in Libya

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Abstract
This paper focuses on assessing the level of oral cancer awareness in Libya and the population's interest in learning about this disease, as well as determining the participants' ability to detect oral cancer at an early stage and seek help. In this cross-sectional study, 504 participants were selected from a random sample of Libyan citizens for the community overview. Both paper and Google Forms® adaptations of the overview were made based on prior inquiries about surveys. We found that one-third of the population lacks awareness about oral cancer signs, while more than half of them underestimate the actual prevalence of the disease. In addition, about 72 % were not aware of how to check their mouths for signs of oral tumor, while the majority of them 93 % are seeking to learn about the way to self-check. The results show a high level of unawareness concerning the need for enhanced public education and outreach efforts. Spreading awareness could empower individuals to perform self-checks, contributing to earlier detection and better outcomes.
Keywords. Oral Cancer, Awareness, Libya.

Introduction

Oral cancer is among the most common types of cancer in the world [1]. Using the WHO International Statistical Classification of Diseases (ICD-10) [2]. Cancers of the oral and oropharyngeal part of the mouth are grouped by site and include cancers of the tongue, the lower jaw, the tonsils, the hard and soft palate, the oropharynx, the lips, the buccal mucosa, the alveolar ridge, and the gingiva. An estimated 500,000 people die from oral cancer each year, making it a major global health concern [3,4]. Despite improvements in treatment over the last 50 years, the survival rate for oral cancer has not improved significantly, most likely due to delayed detection. One important risk factor for advanced disease and mortality was the time between the onset of symptoms and referral to a definitive diagnosis. This gap can be longer due to delays on the part of the medical or patient community, the first being the time between the patient's awareness of symptoms and first consultation, which is influenced by the early detection of symptoms and signs [5,6]. The general public's awareness of oral cancer and its risk factors has been demonstrated in several studies [7–9]; however, the public's intention to increase their knowledge has not been evaluated.

Through awareness campaigns, we can change the ability of patients to seek help and to detect the disease early. In order to target these campaigns, we need to know the level of public awareness and, more importantly, curiosity about the disease. This study aimed to assess Libyans' awareness and knowledge of oral cancer and their interest in learning more about this malignant disease.

Methods

Study sampling and setting

Participants were drawn from a random sample of Libyan citizens for the community survey. Respondents were not offered any incentives to participate, and their consent was required. Both paper and Google Forms® versions of the survey were created based on earlier research questionnaires. The questionnaire was straightforward for laypeople to comprehend and complete. Thirteen Arabic-language questions made up the test, along with four demographic questions, eight oral cancer knowledge questions, and one self-education interest question. Out of the approximately 504 Libyan citizens who volunteered to take part in the community survey. Due to data security concerns, the results have not been released to the public.

Statistical analysis

A variety of statistical techniques were employed to analyze the collected data and address the research questions. Descriptive statistics, including frequency tables, percentages, and graphical representations, were used to summarize and illustrate the characteristics of the data. To explore relationships between nominal variables, correlation analysis was conducted using both the K-squared and Chi-square Goodness-of-Fit tests. These methods provided insights into the strength and significance of associations among the categorical variables under investigation.

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Results

Out total of 506 volunteers were enrolled in the study, females constitute the overwhelming majority, accounting for 376 individuals (74.31%), while males represent only 130 participants (25.69%). This significant skew toward female participation—approximately three females for every male—suggests that the data may reflect that the current health issues are more prevalent for women than men (e.g., oral cancer).
Figure (1) shows age distribution of participants reveals a strong concentration in younger participants, with the majority falling within the 20 to 29 years old category (53.4%, n=269), suggesting that many respondents are likely university or high school students This is followed by the under 20 years old group (25.6%, n=129), indicating that nearly 80% of participants are below the age of 30. In contrast, older age groups are significantly underrepresented: 30 to 39 years old (10.7%, n=54), 40 to 49 years old (4.4%, n=22), and 50 years and above (6%, n=30) collectively make up only 21.1% of the sample. This may indicate that the effect of digital surveys or social media outreach tends to engage younger individuals more effectively.

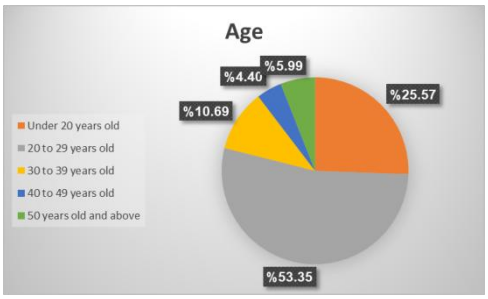

Figure 1. Age distribution

The data presented in Table 1 provides a comprehensive overview of the distribution of awareness regarding different types of cancer, with a specific focus on oral cancer. Among the various types listed, breast cancer emerged as the most recognized, accounting for 16.07% of the total responses. This is followed by leukemia (10.51%), lung cancer (9.61%), and liver cancer (6.46%), which are also relatively well-known among respondents. Notably, oral cancer (mouth cancer) accounted for only 6.31% of responses, placing it behind several other types of cancer in terms of public awareness, including colon and gastric cancers. This relatively modest awareness of oral cancer is concerning given its public health importance and potential for early detection and prevention. The data further shows a long tail of less commonly recognized cancers, with over 30 types individually contributing less than 1% each to the total, such as thyroid cancer, laryngeal cancer, and a variety of rare cancers like ameloblastoma, sarcoma, and neuroblastoma, each reported by only a single respondent (0.15%).

Table 1. Distribution of Cancer Type Awareness

Cancer Type	Frequency	Percent
Breast Cancer	107	16.07%
Leukemia	70	10.51%
Lung Cancer	64	9.61%
Liver Cancer	43	6.46%
Oral Cancer (Mouth Cancer)	42	6.31%
Colon Cancer	41	6.16%
Stomach (Gastric) Cancer	35	5.26%
Skin Cancer	28	4.20%
Bone Cancer	25	3.75%
Pancreatic Cancer	24	3.60%
Brain Cancer	20	3.00%
Uterine Cancer	20	3.00%
Prostate Cancer	19	2.85%
Lymphoma	13	1.95%
Cervical Cancer	11	1.65%
Ovarian Cancer	10	1.50%
Intestinal Cancer (Bowel Cancer)	10	1.50%
Kidney (Renal) Cancer	8	1.20%
Bladder Cancer	8	1.20%
Thyroid Cancer	8	1.20%
Laryngeal Cancer (Throat Cancer)	7	1.05%
Rectal Cancer	6	0.90%
Spinal Cord Cancer	4	0.60%
Esophageal Cancer	4	0.60%
Cancer of the Glands (General)	3	0.45%

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Gum (Gingival) Cancer	3	0.45%
Neck Cancer	2	0.30%
Eye (Ocular) Cancer	2	0.30%
Vulvar Cancer	2	0.30%
Nasopharyngeal Cancer	2	0.30%
Bile Duct Cancer (Cholangiocarcinoma)	2	0.30%
Head Cancer	2	0.30%
Spleen Cancer (Splenic Cancer)	1	0.15%
Nasal Cancer	1	0.15%
Tongue Cancer	1	0.15%
Sinus Cancer (Paranasal Sinus)	1	0.15%
Jaw Cancer	1	0.15%
Ear Cancer	1	0.15%
Shoulder Cancer	1	0.15%
Teratoma	1	0.15%
Sarcoma	1	0.15%
Melanoma	1	0.15%
Squamous Cell Carcinoma (SCC)	1	0.15%
Basal Cell Carcinoma (BCC)	1	0.15%
Neuroblastoma	1	0.15%
Osteosarcoma	1	0.15%
Ameloblastoma	1	0.15%
Odontoma	1	0.15%
Warthin's Tumor	1	0.15%
Pleomorphic Adenoma	1	0.15%
Angiosarcoma	1	0.15%
Cylindroma	1	0.15%
Lymphadenoma	1	0.15%
Total	666	100%

Figure 2 provides insight into the general awareness of oral cancer among the study respondents. Out of a total of 504 participants, 315 individuals (62.5%) reported being aware of oral cancer, while 189 individuals (37.5%) indicated a lack of awareness. This finding suggests that although a majority of the sample is familiar with the concept of oral cancer, a significant proportion—over one-third—remains unaware of this important health issue. Given the preventable nature and the benefits of early detection of oral cancer, this level of unawareness is concerning and highlights the need for enhanced public education and outreach efforts.

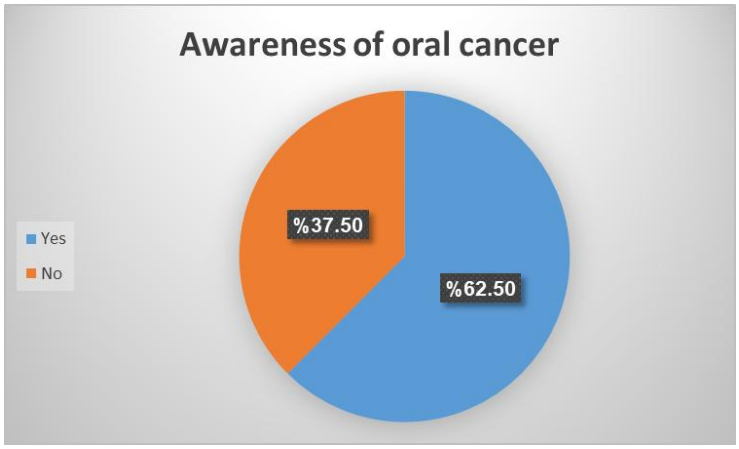

Figure 2. Awareness of Oral Cancer

Table 2 explores public perception regarding the estimated number of oral cancer cases diagnosed annually in Libya. The majority of respondents (52%) believe that fewer than 500 cases occur each year, indicating a perception that oral cancer is relatively rare in the country. An additional 30% estimate the annual cases to be between 500 and 2,500, while 10.3% believe the number falls between 2,500 and 5,000 cases. Only 7.7% of participants think that there are more than 5,000 cases diagnosed annually.

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Table 2. Estimated Cases/Year

Question	Frequency	Percent
Fewer than 500 cases	262	52%
Between 500 and 2,500 cases	151	30%
Between 2,500 and 5,000 cases	52	10.3%
More than 5,000 cases	39	7.7%
Total	504	100%

Table (3) presents respondents' perceptions of risk factors associated with developing oral cancer, based on multiple responses (total responses = 1109). The most frequently identified risk factor was smoking, cited by 320 responses (28.85%), followed by alcohol consumption, with 270 responses (24.35%). These findings align with well-established medical evidence linking tobacco and alcohol use to a significantly higher risk of oral cancer.

Other commonly perceived risk factors included poor oral hygiene (8.12%), genetic or hereditary factors (5.41%), and a weak immune system (4.51%). Lesser-known or less frequently identified risks, such as gum disease, tooth decay, HPV infection, and excessive sun exposure, accounted for smaller proportions. Notably, 4.87% of participants indicated they did not know the risk factors, highlighting a potential gap in public knowledge. This distribution of responses indicates a moderate level of awareness regarding the major risk factors, particularly behavioural factors like smoking and alcohol. However, there is limited recognition of other medically relevant factors, including HPV, sun exposure, and poor nutrition, which may contribute to delayed prevention efforts or misconceptions. These results underscore the need for comprehensive educational campaigns to broaden public understanding of the diverse causes of oral cancer and to promote preventive health behaviours across a wider range of risk dimensions.

Table 3. Risk Factors

Risk Factor	Frequency	Percent
Smoking	320	28.85%
Alcohol consumption	270	24.35%
Poor oral hygiene	90	8.12%
Genetics / Hereditary factors	60	5.41%
Weak immune system	50	4.51%
Gum disease (including gingivitis and periodontal disease)	45	4.06%
Tooth decay (dental caries)	35	3.16%
Human Papillomavirus (HPV) infection	30	2.71%
Excessive sun exposure (especially for lip cancer)	25	2.25%
Exposure to radiation	15	1.35%
Drug abuse	20	1.80%
Poor nutrition / Unhealthy diet	40	3.61%
Bacterial or other infections	30	2.71%
Medical errors / Misuse of medications	10	0.90%
Other factors (e.g., non-sterile instruments, tooth extraction, persistent ulcers)	15	1.35%
Don't know	54	4.87%
Total	1109	100%

Cancer detection and help-seeking

Based on the figure (3), early symptoms of oral cancer can vary in frequency. The most commonly reported symptom is the presence of a lump or mass, accounting for 38.36% of cases. This is followed by white patches (leukoplakia), observed in 22.09% of cases, and burning sensations in the mouth, which occur in 20.43% of cases. Red patches (erythroplakia) are slightly less common but still significant, appearing in 19.12% of cases. Recognizing these symptoms early is crucial for timely diagnosis and treatment, as they are potential indicators of oral cancer's initial stages.

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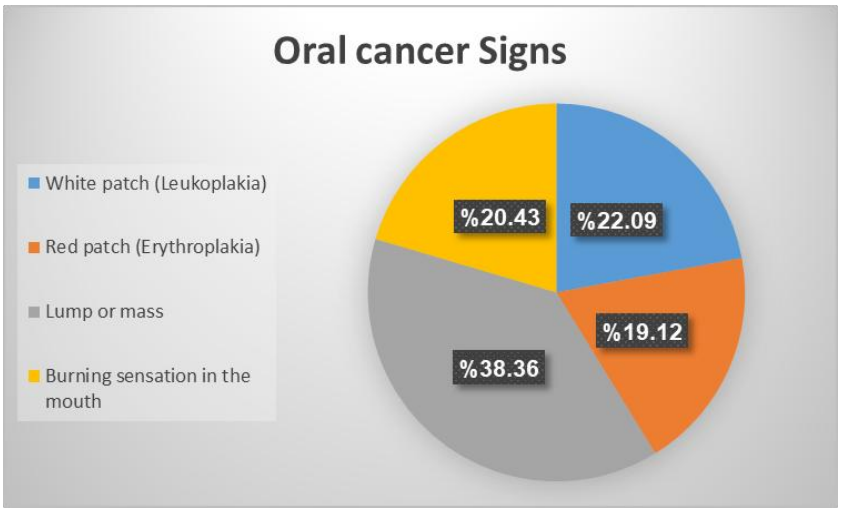

Figure 3. Oral Cancer Signs

The data in Figure 4 highlights the importance of timely medical consultation for a sore on the tongue. A significant majority—82.88%—of individuals consult a doctor within two weeks, which aligns with recommended guidelines for addressing potential health concerns promptly. Waiting two months is less common, at 12.84%, and only 4.28% of individuals delay consultation for four months. These statistics emphasize the critical role of early intervention in identifying and addressing possible health issues effectively. If you notice a persistent sore, seeking medical advice within two weeks is generally the most prudent course of action.

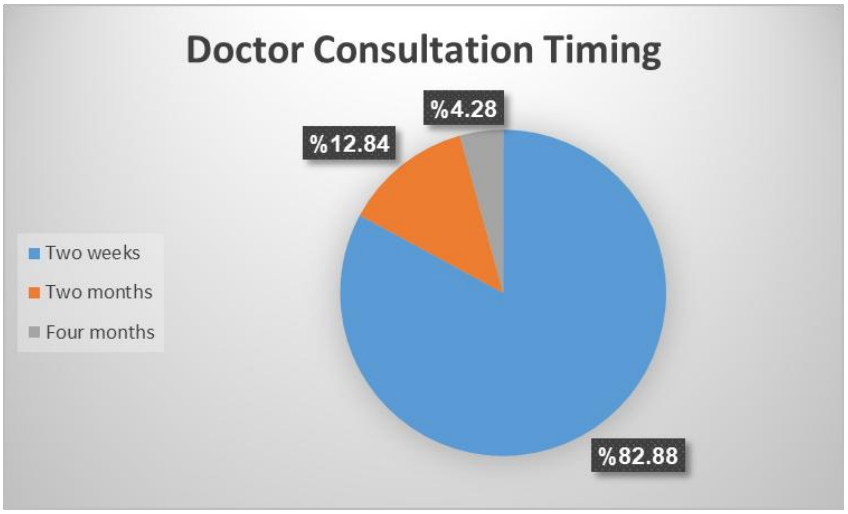

Figure 4. Doctor Consultation Timing

The data in Figure 5 reveals that the majority of individuals, 60.14%, prefer to consult a dentist when dealing with concerns such as a sore on the tongue or related oral issues. Otolaryngologists (ENT specialists) are the next most sought-after professionals, accounting for 20.65% of consultations. Primary care physicians are chosen by 10.41% of individuals, while 8.80% opt to visit an emergency physician. These figures highlight the specialized role of dentists in addressing oral health concerns and the tendency to seek their expertise for such matters.

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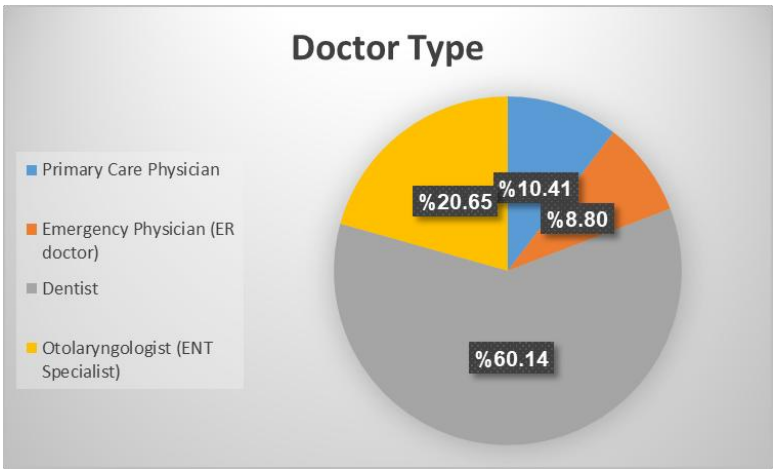

Figure 5. Doctor Type

Table 4 illustrates that a significant majority of individuals—72.22%—are not aware of how to check their mouth for signs of oral cancer. Only 27.78% of people are knowledgeable about performing such self-checks. This highlights a substantial gap in awareness, underscoring the need for educational campaigns to inform the public about detecting early signs of oral cancer through simple self-examination techniques. Increasing awareness could play a critical role in early detection and potentially save lives.

Table 4. Mouth Cancer Self-Check

Mouth cancer self-check	Frequency	Percent
Yes	140	27.78%
No	364	72.22%
Total	504	100%

Figure 6 shows that an overwhelming majority, 93.45%, are eager to learn about how to check their mouths for signs of oral cancer. Only a small portion, 6.55%, have expressed no interest. This highlights a strong public willingness to gain knowledge about oral health, presenting an excellent opportunity for educational initiatives. Spreading awareness could empower individuals to perform self-checks, contributing to earlier detection and better outcomes.

Figure 6. Learn Interest

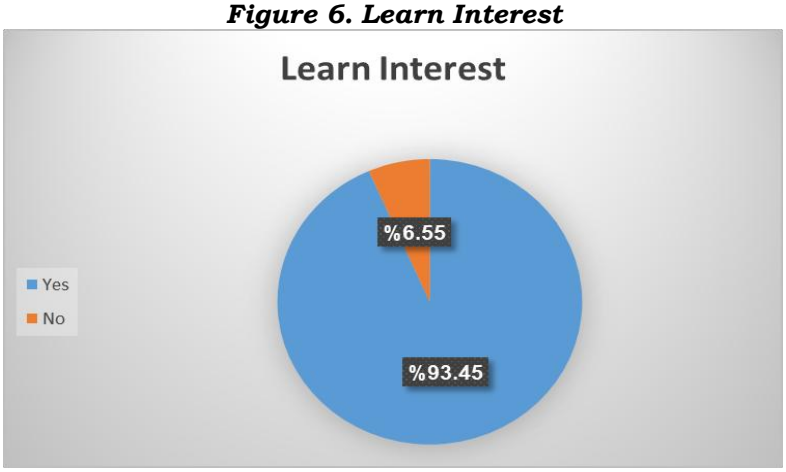

Figure 6. Learn Interest

The data in Table 5 and chi-square test results indicate a significant association between gender and awareness of oral cancer, with a p-value of < 0.05. Females exhibit substantially higher awareness levels (65.2% aware) compared to males (54.7% aware). The chi-square value of 4.54 exceeds the critical value of 3.841 at $\alpha = 0.05$, confirming that the difference in awareness levels between genders is statistically significant. These findings suggest a need for targeted awareness campaigns, particularly aimed at increasing awareness among males to bridge the gap in understanding oral cancer and its implications.

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Table 5. Chi-square Test of the gender and awareness of oral cancer

Gender	Aware (Yes)	Not Aware (No)	Total
Male	70	58	128
Female	244	130	374
Total	314	188	502

The findings of Table 6 showcase an interesting relationship between age groups and their awareness of oral cancer. The chi-square test value of 10.28, with a p-value of 0.036, indicates a statistically significant association between age and awareness of oral cancer ($p < 0.05$). As the chi-square value exceeds the critical value (9.488) at $\alpha = 0.05$.

Awareness Trends Across Age Group, as the highest Awareness is shown in people aged 40–49 years, exhibit the highest awareness rate at 72.7%. However, awareness among those under 20 years old has the lowest awareness rate at 51.2%. Other age groups, like 50+ years old (63.3%) and 30–39 years old (63.0%), also show relatively high awareness levels, while the 20–29 age group has a notable awareness rate of 66.9%. thus, there is a significant variation in awareness rates among different age groups, highlighting the importance of targeted education and outreach programs for specific demographics, particularly younger age groups.

Table 6. Chi-square Test of the age and awareness of oral cancer

Age Group	Aware (Yes)	Not Aware (No)	Total
Under 20 years old	66	63	129
20 to 29 years old	180	89	269
30 to 39 years old	34	20	54
40 to 49 years old	16	6	22
50 years old and above	19	11	30
Total	315	189	504

Associating the Gender and Mouth Cancer Self-Check

Table 7 suggests that there is no statistically significant association between gender and awareness of mouth cancer self-checks. The chi-square value ($x^2 = 0.61$) with 1 degree of freedom and a p-value greater than 0.05 supports the decision not to reject the null hypothesis. In simpler terms, based on this test, gender does not appear to have a significant influence on whether an individual is aware of how to perform a mouth cancer self-check.

Table 7. Chi-square Test of the gender and mouth cancer self-check

Gender	Yes (Aware of How-to Self-Check)	No (Not Aware)	Row Total
Male	32	96	128
Female	107	267	374
Column Total	139	363	502

Based on the findings of Table 8 and the Chi-square test, it has been shown that there are significant differences in the distribution of reported oral cancer signs/symptoms ($x^2(3) = 83.50$, $p < 0.001$). Lump or mass was the most frequently recognized symptom (38.36%), while red patches (erythroplakia) were the least reported (19.12%). These findings suggest that public awareness campaigns should emphasize lesser-known symptoms like erythroplakia.

Table 8. Chi-square Test of the prevalence of Oral Cancer Signs/Symptoms

Sign/Symptom	Observed Frequency (O)	Expected Frequency (E)	$(O - E)^2 / E$
White patch (Leukoplakia)	186	210.5	2.83
Red patch (Erythroplakia)	161	210.5	11.90
Lump or mass	323	210.5	61.67
Burning sensation in the mouth	172	210.5	7.10
Total	842	842	83.50

The findings of table (9) indicate that the Chi-square goodness-of-fit test revealed significant disparities in perceived risk factors for oral cancer ($x^2(15) = 1785.43$, $p < 0.001$). Smoking (28.85%) and alcohol consumption (24.35%) were overwhelmingly identified as primary risks, while factors like medical errors (0.90%) and radiation exposure (1.35%) were poorly recognized. These findings highlight the need for targeted educational interventions to address knowledge gaps.

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Table 9. Chi-square Test of the prevalence of Perceived Risk Factors of Oral Cancer

Risk Factor	Observed (O)	Expected (E)	$(O - E)^2 / E$
Smoking	320	69.31	906.95
Alcohol consumption	270	69.31	581.00
Poor oral hygiene	90	69.31	6.18
Genetics / Hereditary factors	60	69.31	1.25
Weak immune system	50	69.31	5.38
Gum disease	45	69.31	8.53
Tooth decay	35	69.31	16.98
Human Papillomavirus (HPV) infection	30	69.31	22.30
Excessive sun exposure	25	69.31	28.33
Exposure to radiation	15	69.31	42.56
Drug abuse	20	69.31	35.08
Poor nutrition / Unhealthy diet	40	69.31	12.40
Bacterial or other infections	30	69.31	22.30
Medical errors / Misuse of medications	10	69.31	50.75
Other factors	15	69.31	42.56
Don't know	54	69.31	3.38
Total	1109	1109	$x^2 \approx 1785.43$

It can be noted in Table 10 that Breast Cancer (198.68), Leukemia (58.14), Lung Cancer (44.78) —had the largest contributions to the chi-square value, meaning their observed awareness is much higher than expected. However, less recognized types such as Rectal Cancer (22.48), Laryngeal Cancer (18.04), Thyroid, Bladder, and Kidney Cancers (each ~15) had lower-than-expected awareness and also contributed significantly to the deviation. Other Cancer Types" (11.47) also suggests a collective under-recognition of less common cancers. Finally, the observed frequency (42) is significantly higher than the expected (28.96), suggesting that mouth cancer is relatively well-known among respondents.

Table 10. Chi-square Test of Prevalence of Cancer Type Awareness

Cancer Type	Observed Frequency (O)	Expected Frequency (E)	((O - E)^2 / E) Contribution
Breast Cancer	107	28.96	198.68
Leukemia	70	28.96	58.14
Lung Cancer	64	28.96	44.78
Liver Cancer	43	28.96	6.99
Oral Cancer (Mouth Cancer)	42	28.96	6.63
Colon Cancer	41	28.96	5.94
Stomach (Gastric) Cancer	35	28.96	1.26
Skin Cancer	28	28.96	0.03
Bone Cancer	25	28.96	0.54
Pancreatic Cancer	24	28.96	1.55
Brain Cancer	20	28.96	3.12
Uterine Cancer	20	28.96	3.12
Prostate Cancer	19	28.96	3.40
Lymphoma	13	28.96	9.58
Cervical Cancer	11	28.96	11.06
Ovarian Cancer	10	28.96	12.43
Intestinal Cancer (Bowel Cancer)	10	28.96	12.43
Kidney (Renal) Cancer	8	28.96	15.03
Bladder Cancer	8	28.96	15.03
Thyroid Cancer	8	28.96	15.03
Laryngeal Cancer (Throat Cancer)	7	28.96	18.04
Rectal Cancer	6	28.96	22.48
Other Cancer Types	47	28.96	11.47

Discussion

The results of this study showed that participants did not know enough about the characteristics of the first signs of oral cancer or the risk factors that are frequently linked to it.

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In our study, only 6.31 % of the respondents have been aware or heard about oral cancer previously (Table 1), which is lower than a study made in of Ariyawardana et al in 2005[10]and study of Saleh A and Yang Y [11]. Moreover, a cross-sectional study was conducted on dental patients during the academic year 2018-2019 at Faculty of Dentistry, University of Benghazi showed that 77.1% of participant have been aware or heard about oral cancer previously. Table (2) shows that the majority of respondents about 52% may underestimate the actual prevalence of oral cancer, which could reflect limited access to accurate epidemiological data or low general awareness about the disease's burden in Libya. The perception gap could hinder public support for screening and early detection initiatives. Therefore, this finding emphasizes the importance of disseminating factual cancer statistics and strengthening public education to align community perceptions with epidemiological realities. Accurate knowledge about disease prevalence is critical for fostering preventive behaviors and encouraging timely medical consultation.

More than 28 percent of respondents agreed that smoking is linked to oral cancer (Table 3) , according to the current study. among those who took part. The impact of graphic health warnings on all cigarette packages sold in Libya may be the cause of this. increased awareness of tobacco-associated diseases for conditions listed on packaging, including oral cancer. according to a cross-sectional study of Australian smokers interviewed before and after implementation[12]. This finding might also be the result of specific health advice given to smokers by medical professionals. More than 41% of clinicians target oral cancer screening to high-risk patients, according to a recent survey of dentists in Libya[13]. This may lead to a conversation about oral cancer risk. But according to surveys, only 3% of patients receive oral cancer education from their dentists; the vast majority learn about the disease from the media or their general practitioners[14]. This could indicate a communication breakdown between dentists and patients during soft tissue examination.

in this study, more than one-third of participants believed that a lump or mass is an early sign of oral cancer (Figure 3), which conflicts with previous studies [5,15,16] identifying ulcer as the most frequent oral cancer lesion, but it is curious to note that white patch has been reported by 22.09% despite of being a symptom usually linked to candida infection. This may be due to the impact of the definition of cancer as a new mass (tumor)

Considering that the period between the patient noticing a symptom and their first consultation is the most significant contributor to total delay, patients should be instructed in identifying potential lesions (Gigliotti et al., 2019). Concerning this interval of time, 82.8% of the respondents would wait 2 weeks to consult about a non-healing tongue ulcer (Figure 4), a similar percentage to that found by Nocini et al., (2020) in Italy (84.95%), which considers the importance of seeking medical advice at early stage.

More than 72 % of participant in this study were not aware of how to check their mouth for signs of oral cancer (Table 4), while about 93 % were interested in knowing more about the procedures to check their oral cavity for oral cancer signs (Figure 6). This conflicts with Nocini et al. (2020), who stated that about 11% of the population is knowledgeable about doing self-inspections, with nearly half of this demographic being professionals in the medical or dentistry fields. This underscores a significant deficiency in awareness, emphasizing the necessity for educational initiatives to enlighten the public about identifying early indicators of oral cancer by straightforward self-examination methods.

Our research has certain constraints. The data we gathered were anonymous, which may have enabled some participants to respond multiple times to the survey, potentially introducing bias. Nonetheless, this anonymity can foster more candid responses. The findings of this survey revealed a concerning deficiency in awareness and understanding of oral cancer among the residents of Tobruk, Libya.. However, the enthusiasm expressed for enhancing their knowledge provides us with optimism regarding the effectiveness of future awareness initiatives.

Conclusion

This survey revealed a concerning deficiency in awareness and understanding of oral cancer within the population of Libya. The eagerness demonstrated for enhancing their knowledge provides us with optimism regarding the effectiveness of upcoming awareness initiatives.

Conflicts of Interest. Nil

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