Alqalam Journal of Medical and Applied Sciences. 2026;9(11):3674-3686
https://doi.org/10.54361/ajmas.261118

Original article

Libyan Society's Knowledge, Attitudes, and Practices on the Coronavirus Using a Non-Parametric Test

Akram Alabdali[1], Mohamed Shakandli[2], Nuri Badi[2]

[1]*General Department, Faculty of Biomedical Science, University of Benghazi, Benghazi, Libya*
[2]*Statistics Department, Faculty of Science, University of Benghazi, Benghazi, Libya*
Email. *Akram.alabdali@uob.edu.ly*

Abstract
The COVID-19 pandemic appeared in most countries worldwide. Libya is one of these countries that faced this disease without a protection and prevention plan. Since the COVID-19 pandemic started suddenly, we need to study knowledge, attitudes, and practices (KAP) to suggest recommendations that may help us discover weak points in KAP in the future. However, this issue remains under-researched. This study aimed to assess KAP for the protection and prevention of coronavirus in Libya, considering people's behavior and lifestyle in efforts to fight illness transmission. A cross-sectional technique was employed. Online questionnaire was used to collect data depended on Google Form via social media between 01/06/2020 and 15/07/2020, the sample selected randomly with 909 participations. Descriptive statistics (frequency, percentage, and total score) were used. To achieve the study aims and test assumption employed Binomial, chi-square analysis Mann-Whitney test and Kruskal-Wallis utilized. This study assessed Knowledge, Attitudes, and Practices (or KAP) related to COVID-19 among 909 participants. While high agreement was observed regarding basic preventive measures like social distancing (95%), significant knowledge gaps persisted concerning specific aspects such as animal transmission (26%). Overall practice adherence was low (37.73%). Age, marital status, educational level, and income were significantly associated with attitudes and practices, but not consistently with knowledge. These findings underscore the need for targeted interventions to address misinformation, promote behavior change, and reduce socioeconomic disparities in COVID-19 responses.
Keywords. COVID-19**,** Coronavirus, Pandemic, KAP, Nonparametric Tests.

Introduction

Coronavirus disease was discovered in Wuhan, China, around the end of 2019. It has since spread to 200 countries, prompting the World Health Organization to designate it a global pandemic [1,2]. In Libyan country first case of COVID-19 was detected on 24/3/2020, and after about two months the number of reported COVID-19 cases began to increase markedly were epidemic emerged in the southern region of Sabha and then spread to the western and eastern regions and various parts of Libya. By 24/12/2020, the total number of reported deaths by 24/12/2020 had reached 1,415, reflecting the rapid spread of the disease [3]. There are significant knowledge gaps, such as the transmission of COVID-19 before symptom onset or in asymptomatic cases. These gaps complicate efforts to control the spread of the virus. Understanding these factors is essential for developing effective public health strategies. On the other hand, the long-term effects of COVID-19 on different populations remain unclear, highlighting the need for further research [4,5]. This, in turn, prompted decision-makers to implement precautionary measures aimed at preventing the spread of the pandemic [6, 7].

It is practically known that health education or asking someone to change their behavior requires our understanding of that person's culture, relationships, interactions, and activities in society, so that we can identify the speech that suits them in order to apply the targeted program of protection and prevention of any epidemic or disease (health promotion is defined as "the process of empowering people to increase control over and improve their health [8]. The promotion of health focuses on the completeness of physical, mental, and social integrity and not merely the absence of disease or disability, in line with the definition of health enshrined in the WHO Constitution [9,10].

Applying the concept of health promotion and health education requires actions specific to behavioral risk factors and risk factors associated with the public's living conditions [11]. The higher people's health culture, the more they can protect their health. In order to take effective control measures, acquire knowledge about the basic principles and methods of disease transmission, and know the appropriate measures in Libya to achieve final success against the ongoing confrontation with COVID-19 in Libya or against any other future epidemic, it must be known whether people adhere to control measures according to knowledge, skills, and practice. This generally affects their knowledge, attitudes, and practices (KAP) regarding COVID-19 [12,13].

Research Problem

The year 2020 began with a pandemic called COVID-19. Doctors, scientists and researchers were reminded of the painful memories of the Spanish pandemic in 1918 and left at least 50 million deaths in Europe and the entire world [14]. And in order not to repeat that tragedy, the world began to take a package of difficult decisions that people did not get used to, including social distancing, the closure of cities, and the lack of movement, along with other precautionary measures that had a negative psychological and social impact on the individual and society. Therefore, there must be thoughtful

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received*: 02-09-2026 -* ***Accepted****: 31-10-2026 -* ***Published****: 08-11-2026*

scientific plans by sociologists, health educators, social psychologists, economists, and educators to minimize the negative consequences of these policies. Therefore, it was necessary to conduct exploratory scientific studies on various subjects and fields that assess the knowledge, trends, and practices of coronavirus protection and prevention behavior in Libyan society; in other words, how people have dealt with the coronavirus pandemic and subsequent harsh policies on members of society and its institutions with minimal harm. Was it due to knowledge and awareness of the measures to confront the coronavirus pandemic?

Scope of the Study

The backlog of deaths as of 21 April 2022 (6430). This figure is considered significant in a country with a population of not more than 7 million[1]. Hence, the importance of the study is that it comes to light and underscores the importance of scientific research in building policies and strategies to confront any future epidemic, which can be based on knowledge of the knowledge of members of society, their type, attitudes, and practice. Here we review Scientific significance and Practical relevance:

Scientific significance

1. Find out whether members of the community resort to searching for Any Information from Their Sources
2. Find out what this information is and its sources.
3. Know the extent to which members of the community adhere to precautionary measures.
4. Try to know the consequences of applying or not applying precautionary measures and their reasons.
5. Know the level of morality and social responsibility towards protecting oneself and other women and preventing them from the epidemic.

Practical relevance

Trying to leverage data and information to develop future plans and strategies to confront any epidemic, God forbid.

Objectives of the study

1. Identify the level of knowledge, attitudes, and practices of Libyan society members regarding the coronavirus protection and prevention program for COVID-19.
2. Recognize the things that have been taken from members of the community in trying to find out about this epidemic and the resulting diseases and precautionary measures that are difficult to implement.
3. The study seeks to reveal the behavior of members of the community in the face of the coronavirus pandemic.
4. Establishing a database on the behavior of Libyan society members in the face of epidemics and health crises.
5. Finding research results that can build policies and strategies to cope with any future pandemic
6. To reveal the sensitivity of individuals in cases of compliance or refusal to apply precautionary measures and their level of conviction in the efforts of the competent authorities to achieve protection and prevention of the epidemic.
7. Recognize the motivations of members of society towards contributing to social activities and their social responsibility towards ourselves and others to confront the epidemic.

Materials

Study design and weight

The online questionnaire was used from June 1, 2020 to July 15, 2020. A community-based cross-sectional survey was conducted. Because of the pandemic's circumstances, Google Form used to send online questionnaire to participation via available social media sites, and to ensure that the questionnaire reaches as many Libyans as possible in all Libyan cities the researchers used a paid advertisement on Libya's most prominent social networking site (Facebook). As a result, the sample is random since it allows all members of society to choose, implying that the sample represents Libyan society.

The study's sample was created in the same way as the COVID-19 pandemic survey, so that the findings could be applied to all regions of Libya. However, there was a shortage in some districts and genders after the data was collected, necessitating the correction of the shortage in these districts by using weights to correct the defects in the samples, which may lead to bias and other differences between the sample and the reference population [6].

Study Instrument

The closed survey questionnaire is based on the findings of a study on Libyan citizens' knowledge, attitudes, and Practice (KAP) concerning COVID-19 in Libya [12]. The questionnaire was designed to assess the KAP, and the items developed by researchers were divided into four categories. Gender, age, marital status, educational level, and income were all measured in the first part. The second section had 18 questions that tested the participants' knowledge of COVID-19. The third section included 15 items and asked respondents about their attitudes related to COVID-19, and the fourth section

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received: *02-09-2026 -* ***Accepted:*** *31-10-2026 -* ***Published:*** *08-11-2026*

contained 16 questions about participants' COVID-19 practices; the items were formulated in a clear and accurate manner in accordance with the study's objectives using the Likert scale.

Population and sample

Before any study can be conducted, the community must be precisely and accurately identified in order to ensure that the sample chosen can accurately represent this group**.** The study community in this study is made up of all members of Libyan society from around the country. There were 915 replies received, however only 902 questionnaire was completed by response rate 98.5% of responded.

Variables: The study covered the following variables:

- Independent variable: age, type, level of education, marital status, type of work or employment, and income.
- Dependent variable: knowledge, attitudes, and practice.

Statistical Analysis

The data for this study were analyzed using the Statistical Package for the Social Sciences (SPSS) version 28. Descriptive analysis focused on frequencies and percentages, whereas binomial and chi-square tests were employed to measure attitude participation. The Mann-Whitney Test and the Kruskal-Wallis Test were used to determine the significant differences between groups for certain demographic factors. 5% was used as the statistical significance level.

Research Hypotheses

The following assumptions were developed to attain research goals and answer these questions:

First hypothesis: There is no association between demographic characteristics and knowledge, attitudes, and practices of the coronavirus protection and prevention program COVID-19.

Second hypothesis: The relative importance of COVID-19 for knowledge, attitudes, and practices differs.

The first sub-hypothesis includes the following sub-hypotheses.

- In terms of knowledge regarding coronavirus protection and prevention programs, more than 70 %.
- In terms of attitudes regarding coronavirus protection and prevention programs, more than 70 %.
- In terms of practice of coronavirus protection and prevention programs, more than 70 %.

Third hypothesis: There is no significant difference between demographic characteristics and (knowledge, attitudes, and practices) of the coronavirus protection and prevention program for COVID-19.

Results

Data collected from the pilot survey were analyzed using the Statistical Package for the Social Sciences (SPSS), version 29, as mentioned above.

Reliability test

To test the internal consistency of the questionnaire, Cronbach's alpha coefficient. The Cronbach's alpha value for the closed questions of the KAP scale was 0.75, 0.94, and 0.94, respectively, for knowledge, attitudes, and practice. The values of Cronbach's alpha are greater than 70%, which is acceptable and confirms confidence in the scale's results, indicating that the results of the questionnaire form may be relied on.

Normality test

It is important to verify the Normality of data before acknowledging that a particular statistical test should be used, and to test the normal distribution of data using the Kolmogorov-Smirnov test, which assumes that data is not naturally distributed at level of significance 5%, and (Table 1) shows the test of Normality of the data sample of the study**.**

Table 1. Normality test of the data sample

Variables	Kolmogorov-Smirnova		
	Statistic	df	P-value
Knowledge	0.176*	909	0.000
Attitudes	0.177*		0.000
Practice	0.143*		0.000
KAP	0.175*		0.000

**Significant at level of significant 1%, **significant at level of significant 5%*

Descriptive and hypothesis test

The Kolmogorov-Smirnov test results in (Table 1) show that they are statistically significant because the P-value for the three dimensions (knowledge, attitudes, and practices) is less than 5%; this means the data are not distributed in a bell shape (normal distribution), which is a requirement for parametric tests, necessitating the use of non-parametric tests to test study hypotheses. (Figure 1) demonstrate that the three dimensions do not have a bell shape.

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received*: 02-09-2026 -* ***Accepted****: 31-10-2026 -* ***Published****: 08-11-2026*

The study sample included (909) participants who completed the questionnaire. In terms of gender, more than half of the respondent's sample was female 57.7% and, it is found a association between gender and knowledge ($p < 0.001$). Regarding the age, 85.5% of the sample aged between 30 and 60 years It is an excellent indicator to correctly answer the questionnaire's, which helps to confidence in the study outcomes and it is found statistical Significance association between age and (KAP) were ($p < 0.001$). More than half sample are graduate from university or equivalent were the result show statistically Significance association between educational level and (KAP). With regard to income, half of the sample with low income was and the result shown is found there is no association between income and (KAP). This indicate low quality of living caused by political situations as well as the pandemic's effects.

Table 2. Represents general characteristics and the Chi-square test.

Attribute		(N=909)	(%)	Sig.		
				Knowledge	Attitude	Practice
Sex	Male	394	43.3	0.04**	0.52	0.62
	Female	515	57.7			
Age	< 20	15	1.7	0.00*	0.00*	0.00*
	20- 29	117	12.9			
	30- 39	264	29			
	40- 49	246	27.1			
	50- 59	185	20.4			
	60 +	82	9			
Marital status	Single	374	41.1	0.03*	0.00*	0.00*
	Married	487	53.6			
	Widower	26	2.9			
	Divorced	22	2.4			
Educational level	Primary	12	1.3	0.00*	0.00*	0.00*
	Secondary	41	4.5			
	High school	134	14.7			
	University	476	52.4			
	Master's degree and above	246	27.1			
Income	Low	447	49.2	0.82	0.17	0.01**
	Moderate	22	35			
	High	28	7.9			
	There's no	72	7.9			
*Significant at level of significant 1%, **significant at level of significant 5%						

Knowledge of Participants on COVID-19 in Libyan population

In (Table 4) the result shown knowledge percentage between (26%and 95%) having an. Overall, 97% of respondents demonstrated knowledge about COVID-19, as indicated by the total agreement percentage.

Table 3. Displays knowledge percentages and the binomial test

Knowledge	(N=909)	%	Sig	Rank
Coronavirus is a dangerous and fast-spreading virus.	829	0.91**	0.000	5
Coronavirus spreads to infected people through respiratory spray.	826	0.91**	0.000	5
Coronavirus is spread by eating or touching animal meat or wild birds.	235	0.26	1.000	12
person infected with coronavirus does not infect others if they do not show symptoms of the disease	257	0.28	1.000	11
Children and young people are less likely to be infected with coronavirus if they follow healthy habits	729	0.80**	0.000	7
The symptoms of coronavirus are fever, fatigue, dry cough, muscle pain, and difficulty breathing.	841	0.93**	0.000	2
A person with coronavirus may show no symptoms of disease	729	0.80**	0.000	7
Older people with chronic illnesses are more vulnerable to the virus	837	0.92**	0.000	3
Wearing protective masks and washing hands with soap and water for 20 seconds prevents transmission of the virus	799	0.88**	0.000	6
To avoid contracting an infection, one should avoid crowded places.	867	0.95**	0.000	1
Social distancing and staying at home reduce Covied-19 infection	863	0.95**	0.000	1
Health lockdowns and treatment for people infected with coronavirus	839	0.92**	0.000	4

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received: *02-09-2026 -* ***Accepted:*** *31-10-2026 -* ***Published:*** *08-11-2026*

are an effective way to reduce the spread of the virus.				
Information and announcements on local radio and television were sufficient for learning about coronavirus infection and prevention.	652	0.72	0.135	10
Social Media, TV & Radio, Friends & Relatives	824	0.91**	0.000	5
Immediately reporting a suspected infected case reduces the seriousness of the spread of the virus.	832	0.92**	0.000	3
Coronavirus-infected people's contacts must be isolated in secluded locations.	824	0.91**	0.000	5
There is no effective treatment to eliminate coronavirus yet	710	0.78**	0.000	8
Coronavirus has been found in Libya.	703	0.77**	0.000	9
Total	879	0.97**	0.000	

The levels of agreement and disagreement regarding knowledge of COVID-19. The highest percentage of agreement was 95%; the statements "To avoid contracting an infection, one should avoid crowded places" and "Social distancing and staying at home reduces COVID-19 infection" received the highest agreement, with 95% of respondents answering "Yes." The next highest agreement (93%) was observed for the statement "The symptoms of coronavirus are fever, fatigue, dry cough, muscle pain, and difficulty breathing." In contrast, the lowest agreement (26%) was for the statement "Coronavirus is spread by eating or touching animal meat or wild birds." Additionally, a binomial test was conducted to determine whether the participants' knowledge exceeded 70%. The results were significant for all items except for the following: "Coronavirus is spread by eating or touching animal meat or wild birds," "A person infected with coronavirus does not infect others if they do not show symptoms of the disease," and "Information and announcements on local radio and television were sufficient for learning about coronavirus infection and prevention." Detailed results are provided in (Figure 1).

Attitude of Participants on COVID-19 in Libyan population

For the 15 questions in the attitude questionnaire, the correct answer rate ranged from 23% to 52%, with an overall percentage of 45% (Table 2 and Figure 2).

Table 4. Displays attitude percentages and the binomial test

Attitude	Correct		Sig	Rank
	(N=909)	%		
I'm afraid of coronavirus.	267	0.29	1.00	10
I feel safe wearing a mask and gloves.	255	0.28	1.00	11
I prefer to stay home with my family during the health lockdown	431	0.47	1.00	2
I am willing to abandon my usual (daily) activities to protect myself from the spread of the coronavirus	475	0.52	1.00	1
I'd better stay away from crowded places and gatherings to prevent transmission of the virus	387	0.43	1.00	5
I think social distancing is a preventive way to avoid the risk of contracting the virus.	395	0.43	1.00	5
I think standing at a distance of one and a half meters reduces the spread of the virus.	346	0.38	1.00	6
I am convinced that preventive measures help control the spread of the virus	402	0.44	1.00	4
I think the preventive measures taken by the competent authorities are effective.	313	0.34	1.00	7
Some people refuse to follow coronavirus preventive measures because they don't know the scale and gravity of the problem.	405	0.45	1.00	3
It's hard to decide which information is real, false, or rumored about the spread of the coronavirus.	210	0.23	1.00	12
solving the problem of the spread of the coronavirus is in cooperation between citizens and the government	388	0.43	1.00	5
I think a vaccine or an effective treatment will be discovered to eliminate the coronavirus.	276	0.30	1.00	9
I think the coronavirus will be successfully brought under control.	286	0.31	1.00	8
Locking down cities and confining infected people to their areas is a good idea.	393	0.43	1.00	5

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received*: 02-09-2026 -* ***Accepted****: 31-10-2026 -* ***Published****: 08-11-2026*

Nearly half of the participants (52%) agreed with the statement, "I am willing to abandon my usual (daily) activities to protect myself from the spread of the coronavirus." Additionally, 47.41% of participants expressed a preference to stay home with their family during the health lockdown. Only 45% of respondents answered "Yes" to the statement, "Some people refuse to follow coronavirus preventive measures because they don't know the scale and gravity of the problem." The lowest agreement rate (23%) was observed for the statement, "It's hard to decide which information is real, false, or rumored about the spread of the coronavirus. "On the other hand, the Binomial Test indicated that none of the items were significant, meaning that the percentage of correct responses for each item, as well as the overall percentage, was less than 70%. This suggests that the participants' attitudes toward these items did not reach the expected threshold of 70% agreement or correctness.

Practice of Participants on COVID-19 in the Libyan population

The practice level subscales illustrate the respondents' practice toward COVID-19, with the percentage of agreement ranging between 31% and 47%. The overall percentage of respondents in terms of practice was 37.73%. Nearly 47% of respondents agreed with the statement, "I will notify the appropriate authorities if I suspect someone has the infection." The second-highest agreement (46%) was for the statement, "If I have coronavirus symptoms, I will attend to the screening procedure right away." This was followed by the statement, "Using paper wipes when sneezing reduces the spread of the virus," with 45% agreement. The lowest agreement (31%) was observed for the statement, "Wear a mask and gloves when getting out of the house. "Furthermore, the Binomial Test indicated that all items in the practice dimension were significant. This means that, overall, the percentage of agreement for the practice-related items was less than 70%, reflecting a relatively low level of adherence to recommended practices among respondents.

Table 5. displays practice percentages and Binomial Test

Practice	Correct		Sig	Rank
	(N=909)	%		
Wear a mask and gloves when getting out of the house	283	0.31	1.00	11
I don't go to crowded places and social events.	380	0.42	1.00	5
During curfew hours, I'm almost always at home.	388	0.43	1.00	4
In-house disinfectants are increasingly used to prevent the virus	292	0.32	1.00	9
When I go home, I wash my hands for 20 seconds with soap and water.	374	0.41	1.00	6
I don't get out of the house unless it's necessary.	379	0.42	1.00	5
I avoid shaking hands with coworkers, friends, and relatives.	291	0.32	1.00	9
In public places, I adhere to the unique indications of separation..	379	0.42	1.00	5
Using paper wipes when sneezing reduces the spread of the virus	410	0.45	1.00	3
My inability to provide preventive measures was one of the challenges I experienced when implementing coronavirus prevention measures.	268	0.29	1.00	10
The lack of cleaning materials, masks, and gloves has contributed to my exposure to the illness.	305	0.34	1.00	8
I will notify the appropriate authorities if I suspect someone has the infection.	431	0.47	1.00	1
When I'm not at home, don't touch my face, nose, or eyes.	366	0.40	1.00	7
When I'm not at home, I always avoid touching surfaces.	370	0.41	1.00	6
Good nutrition reduces the chance of contracting the virus	395	0.43	1.00	4
If I have coronavirus symptoms, I will attend to the screening procedure right away.	422	0.46	1.00	2

The Mann-Whitney U test, a non-parametric equivalent to the independent two-sample t-test, was used to compare the distributions of two populations when the dependent variable was continuous (scale) but not normally distributed. This test was applied to evaluate the following hypothesis: First Hypothesis: There is no difference between the distributions of two populations (i.e., there are no statistically significant differences in the total score of knowledge, attitude, and practice (KAP) between the mean ranks of males and females).

Table 6. represents the results (KAP) of the Mann-Whitney U test with gender

Attribute		knowledge		attitude		Practice	
		Mean Rank	p-value	Mean Rank	p-value	Mean Rank	p-value
Sex	male	435.42	0.05	462.41	0.46	463.27	0.41
	female	469.98		449.33		448.67	

**significant at level of significant 1%, **significant at level of significant 5%*

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received: *02-09-2026 -* ***Accepted:*** *31-10-2026 -* ***Published:*** *08-11-2026*

The results of the Mann-Whitney U test, as shown in (Table 1), revealed that the mean rank of males (462.41) was slightly higher than the mean rank of females (449.33). Additionally, the mean rank for practice among males (463.27) was higher than that of females (448.67). In contrast, the mean rank for knowledge among females (469.98) was higher than that of males (435.42). However, the test indicated that there was no significant difference between males and females in knowledge (U = 93,742, p = 0.05), attitude (U = 98,536, p = 0.46), and practice (U = 98,195, p = 0.46). Since the p-values for all three dimensions were greater than the significance level of 5% (p > 0.05), the null hypothesis cannot be rejected. This means there is no statistically significant difference in the dimension and total KAP scores between males and females. Although there were slight variations in the mean ranks, these differences are not statistically meaningful.

The Kruskal-Wallis test

The Kruskal-Wallis test, a non-parametric equivalent to one-way ANOVA, was used to test the second hypothesis: There are no statistically significant differences between the mean ranks of knowledge, attitude, and practice (KAP) scores across age, marital status, and educational leve**l.** This test was conducted because the dependent variable (KAP scores) was continuous (scale) but not normally distributed. The Kruskal-Wallis test was applied to determine whether there were significant differences in the mean ranks of KAP scores based on age, marital status, and educational level. If the p-value is less than the significance level (e.g., 0.05), the null hypothesis will be rejected, indicating significant differences in KAP scores across these categories. Conversely, if the p-value is greater than 0.05, the null hypothesis will not be rejected, suggesting no statistically significant differences in KAP scores based on age, marital status, or educational level.

Table 7. Results of the Kruskal-Wallis Test for total score with age, Marital status and educational level

Attribute		knowledge		attitude		Practice	
		Mean Rank	p-value	Mean Rank	p-value	Mean Rank	p-value
Age	< 20	197.10	0.001*	491.90	0.000*	476.83	0.000*
	20- 29	457.13		520.53		517.13	
	30- 39	440.26		405.34		424.31	
	40- 49	473.70		506.22		501.23	
	50- 59	445.99		437.11		427.02	
	60 +	510.84		401.33		385.60	
Marital status	single	437.63	0.133	408.88	0.000*	405.61	0.000*
	married	462.21		492.51		494.44	
	Widower	548.60		464.19		483.40	
	divorced	480.11		397.89		388.00	
Educational level	primary	469.13	0.170	247.71	0.000*	263.25	0.000*
	secondary	373.43		392.07		357.73	
	High school	444.73		337.36		335.58	
	University	452.15		408.68		415.47	
	Master's or above	479.01		629.32		622.11	
Level of Income	Low	467.97	0.969	635.00	0.000*	654.05	0.000*
	Moderate	455.48		425.99		436.15	
	high	452.96		443.75		424.85	
	There's not	448.02		504.81		506.13	

**Significant at level of significant 1%, **significant at level of significant 5%*

Kruskal-Wallis H test according to Age categories

(Table 7) presents the results of the Kruskal-Wallis H test, which revealed statistically significant differences across age categories in terms of knowledge, attitude, and practice. The test statistics were as follows: for knowledge, H=20.833 with p=0.001; for attitude, H=30.757 with p=0.001; and for practice, H=25.760 with p=0.001. These results indicate that age significantly influences knowledge, attitude, and practice among the respondents. To identify which specific groups differed, Pairwise Comparisons were conducted as follows:

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received*: 02-09-2026 -* ***Accepted****: 31-10-2026 -* ***Published****: 08-11-2026*

https://doi.org/10.54361/ajmas.261118

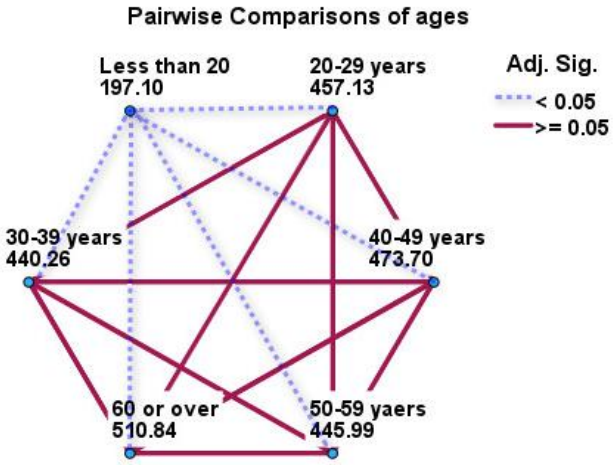


Figure 1.: Dunn's Pairwise Comparisons of Knowledge by Age

Dotted line = significant difference between pairs

Table 1 indicates a significant difference in knowledge levels across the five age categories. Specifically, respondents aged less than 20 years showed a significant difference in knowledge compared to the other age groups: (20-29), (30-39), (40-49), (50-59), and (60 or more). This suggests that participants in the under-20 category differed significantly from those in the other age groups. However, there was no evidence of significant differences between the other pairs of age categories.

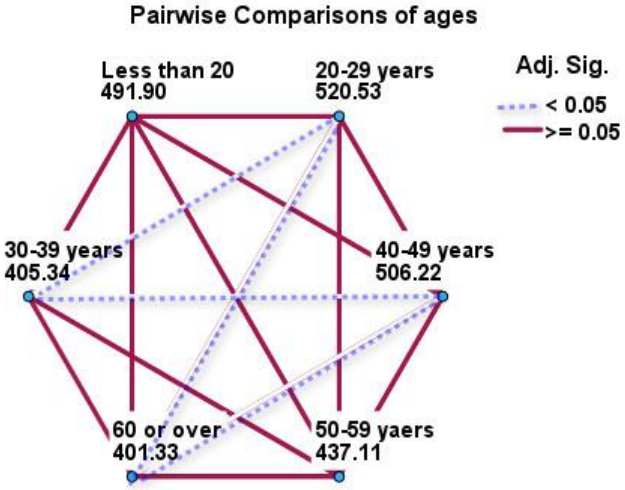


Figure 2: Dunn's Pairwise Comparisons of attitude by Age

On the other hand, Table 2 shows significant differences in attitude across age categories. Specifically, respondents aged 20-29 years showed a significant difference in attitude compared to the 30-39 and 60 or more age groups. Additionally, respondents aged 40-49 years demonstrated significant differences in attitude compared to the 30-39, 50-59, and 60 or more age groups. This suggests that participants in the 20-29 and 40-49 age categories differed significantly from the other specified groups. However, there was no evidence of significant differences between the remaining pairs of age categories

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received*: 02-09-2026 -* ***Accepted****: 31-10-2026 -* ***Published****: 08-11-2026*

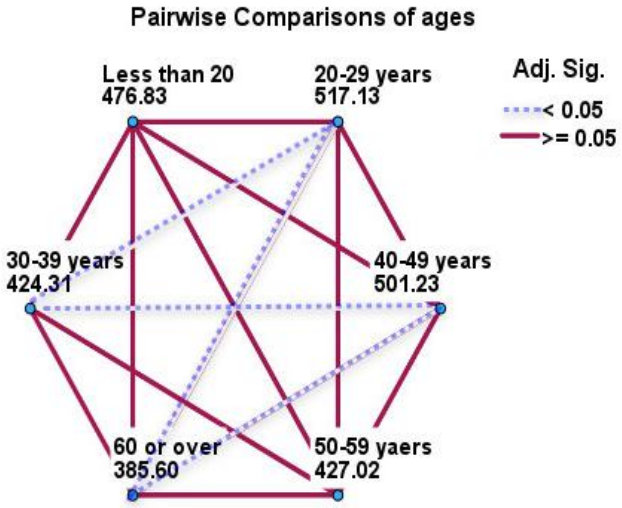


Figure 3. Dunn's Pairwise Comparisons of practice by Age

The results reveal significant differences in practice across various age categories. Specifically, participants aged 20-29 years exhibited a significant difference in practice when compared to those in the 30-39 and 60 or more age groups. Similarly, respondents aged 40-49 years showed significant differences in practice relative to the 30-39, 50-59, and 60 or more age groups. These findings suggest that the 20-29 and 40-49 age groups differed significantly from the other specified categories. However, no significant differences were observed between the remaining pairs of age groups.

Kruskal-Wallis H test according to Marital Status Categories

Regarding marital status, the Kruskal-Wallis test indicated that there was no statistically significant difference in knowledge across marital status groups (H=5.602, p=0.133>0.05). However, there were statistically significant differences in attitude and practice across marital status groups, with H=22.615, p=0.001 for attitude, and H=26.01, p=0.001 for practice. Since p<0.001, these results are highly significant. To identify which specific groups differed, Pairwise Comparisons were conducted as follows:

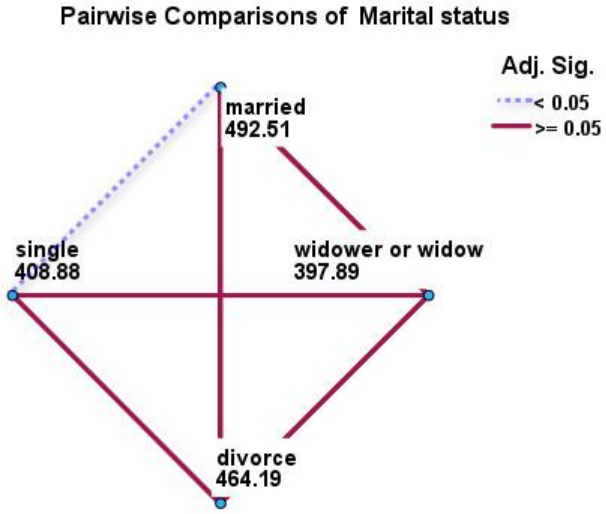


Figure 4: Pairwise comparison of attitude by marital status category

The results indicate significant differences in attitude across marital status categories. Specifically, there was a significant difference in attitudes toward COVID-19 between married and single individuals. On the other hand, there was no evidence of significant differences between the remaining pairs of marital status categories

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received: *02-09-2026 -* ***Accepted:*** *31-10-2026 -* ***Published:*** *08-11-2026*

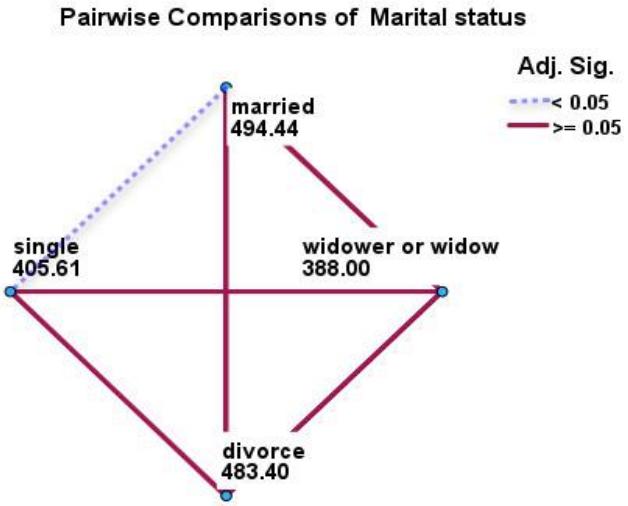


Figure 5. Dunn's Pairwise Comparisons of practice by marital status category

The results indicate significant differences in practice across marital status categories. Specifically, there was a significant difference in attitudes toward COVID-19 between married and single individuals. On the other hand, there was no evidence of significant differences between the remaining pairs of marital status categories

Kruskal-Wallis H test according to Level of Education

In terms of educational level, the Kruskal-Walli's test revealed that there was no statistically significant difference in knowledge across educational levels (H=6.418, p=0.170). However, there were statistically significant differences in attitude and practice across educational levels, with H=160.432, p=0.001 for attitude, and H=150.434, p=0.001 for practice. Since p<0.001, these results are highly significant. To examine the differences between specific groups, Pairwise Comparisons were conducted, as shown below.

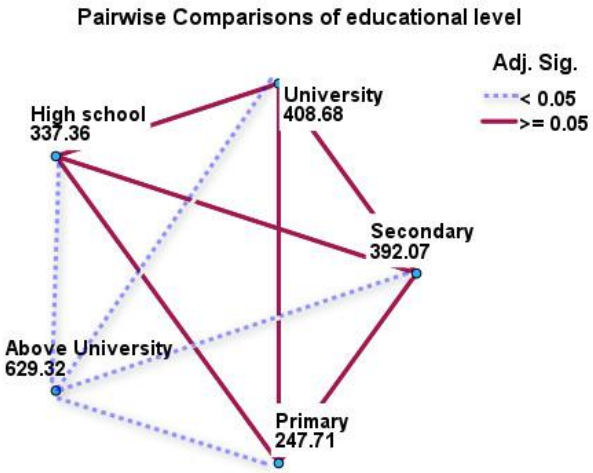


Figure 6: Dunn's Pairwise Comparisons of attitude by level of education

Regarding level of education, Dunn's Pairwise Comparisons of attitude across educational levels indicate significant differences between four categories. Specifically, the group of respondents with above-university education showed significant differences in attitude compared to those with primary, secondary, high school, and university education. However, there was no evidence of significant differences between the remaining pairs of educational categories

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received*: 02-09-2026 -* ***Accepted****: 31-10-2026 -* ***Published****: 08-11-2026*

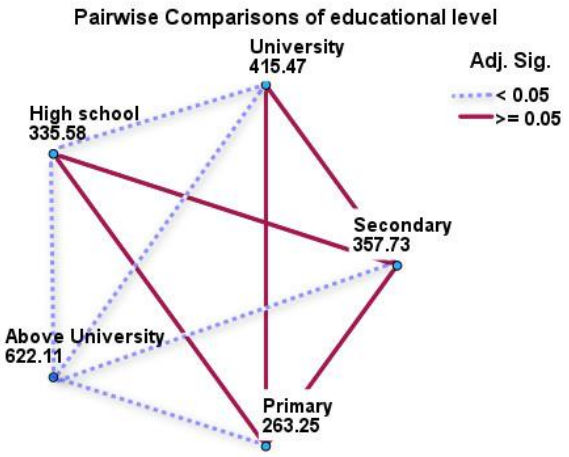


Figure 7: Dunn's Pairwise Comparisons of practice by level of education

Regarding level of education, Dunn's Pairwise Comparisons of practice across educational levels indicate significant differences between five categories. Specifically, the group of respondents with above university education showed significant differences in practice compared to those with primary, secondary, high school, and university education. Furthermore, the high school group demonstrated significant differences in practice compared to the university and above university groups.

Kruskal-Wallis H Test According to Level of Income

Regarding level of income, the Kruskal-Wallis test revealed that there was no statistically significant difference in knowledge across income levels (H=0.251, p=0.969). However, there were statistically significant differences in attitude and practice across income levels, with H=42.590, p=0.001 for attitude, and H=50.691, p=0.001 for practice. Since p<0.001, these results are highly significant. Pairwise Comparisons were conducted as follows:

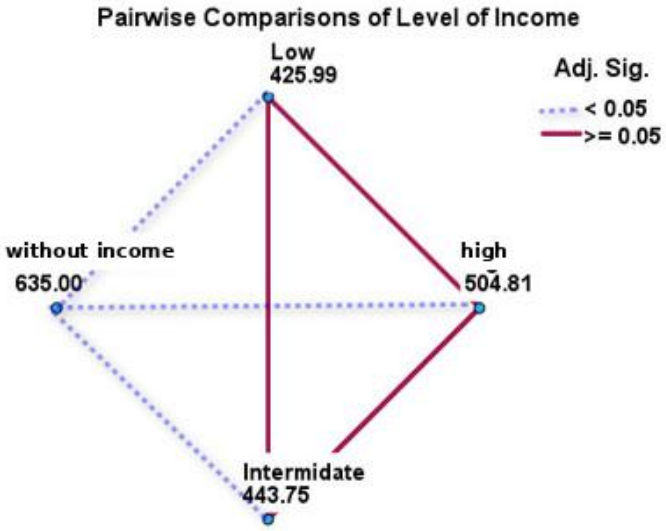


Figure 8: Dunn's Pairwise Comparisons of attitude by level of income

In terms of level of income, Dunn's Pairwise Comparisons of attitude across income levels indicate significant differences between three categories. Specifically, the group of respondents without income showed significant differences in attitude compared to those with low, intermediate, and high-income levels

In terms of level of income**,** Dunn's Pairwise Comparisons of practice across income levels indicate significant differences between three categories. Specifically, the group of respondents without income showed significant differences in practice compared to those with low**,** intermediate, and high-income levels.

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received*: 02-09-2026 -* ***Accepted****: 31-10-2026 -* ***Published****: 08-11-2026*

https://doi.org/10.54361/ajmas.261118

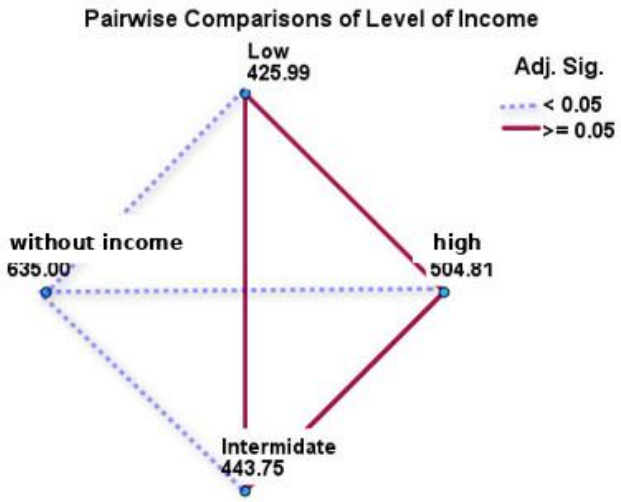


Figure 9: Dunn's Pairwise Comparisons of practice by level of income

Results and Discussion

This study assessed knowledge, attitudes, and practices (KAP) related to COVID-19 among 909 participants. The sample consisted of 57.7% females, with a majority (85.5%) aged between 30 and 60 years. The Kolmogorov-Smirnov test indicated that the data were not normally distributed ($p < 0.05$) for all three dimensions (knowledge, attitudes, and practices), necessitating the use of non-parametric tests.

In knowledge: The highest agreement was observed for the statements "To avoid contracting an infection, one should avoid crowded places" and "Social distancing and staying at home reduces COVID-19 infection," with 95% agreement. The lowest agreement was for the statement "Coronavirus is spread by eating or touching animal meat or wild birds" (26% agreement). Binomial tests revealed that participants' knowledge exceeded 70% for most items, except those related to animal transmission, asymptomatic transmission, and the sufficiency of local media information. Persistent misconceptions about transmission (e.g., animal sources, asymptomatic spread) can undermine effective prevention, as also noted in studies from Malaysia, Turkey, and Iran [15,13,12].

Attitudes: Approximately 52% agreed with the statement "I am willing to abandon my usual (daily) activities to protect myself from the spread of the coronavirus." The lowest agreement (23%) was for the statement "It's hard to decide which information is real, false, or rumored about the spread of the coronavirus." Binomial tests indicated that agreement percentages for all attitude items were below the 70% threshold. Even with positive attitudes, actual practice may lag due to practical barriers, risk perception, or misinformation. For example, willingness to abandon daily activities or consistently wear masks was not universal [16,17].

Practices: The percentage of agreement for practice-related items ranged from 31% to 47%, with an overall agreement of 37.73%. Nearly 47% agreed with the statement "I will notify the appropriate authorities if I suspect someone has the infection." The lowest agreement (31%) was observed for the statement "Wear a mask and gloves when getting out of the house." Binomial tests indicated that all practice-related items were significant, with agreement percentages below 70%.

Mann-Whitney U test**:** The Mann-Whitney U test revealed no significant differences between males and females in knowledge ($U = 93{,}742$, $p = 0.05$), attitude ($U = 98{,}536$, $p = 0.46$), or practice ($U = 98{,}195$, $p = 0.46$)

Kruskal-Wallis test: The Kruskal-Wallis test revealed statistically significant differences across age categories in terms of knowledge ($H = 20.833$, $p = 0.001$), attitude ($H = 30.757$, $p = 0.001$), and practice ($H = 25.760$, $p = 0.001$). Pairwise comparisons indicated significant differences in knowledge levels between respondents aged less than 20 years and other age groups. Significant differences in attitude and practice were observed between respondents aged 20-29 and 40-49 years compared to the 30-39, 50-59, and 60 or more age groups.

Regarding marital status, significant differences were found in attitude ($H = 22.615$, $p = 0.001$) and practice ($H = 26.01$, $p = 0.001$), but not in knowledge ($H = 5.602$, $p = 0.133$). Pairwise comparisons indicated significant differences in attitudes and practices between married and single individuals. In terms of educational level, significant differences were found in attitude ($H = 160.432$, $p = 0.001$) and practice ($H = 150.434$, $p = 0.001$), but not in knowledge ($H = 6.418$, $p = 0.170$). Pairwise comparisons indicated significant differences in attitude and practice between respondents with above university education and those with primary, secondary, high school, and university education. Regarding income, significant differences were found in attitude ($H = 42.590$, $p = 0.001$) and practice ($H = 50.691$, $p = 0.001$), but not in knowledge ($H = 0.251$, $p = 0.969$). Pairwise comparisons indicated significant differences in attitude and practice between respondents without income and those with low, intermediate, and high-income levels. Age, education, marital status, and income significantly affect attitudes and practices, suggesting that tailored health promotion strategies are needed for different subgroups [12,17,18].

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received: *02-09-2026 -* ***Accepted:*** *31-10-2026 -* ***Published:*** *08-11-2026*

Conclusion

This study provides valuable insights into the knowledge, attitudes, and practices related to COVID-19 among a sample. The findings underscore the importance of targeted educational interventions to address misinformation and promote adherence to recommended practices. They also highlight the role of age, marital status, education, and income in shaping health-related behaviors. Future research should explore the complex interplay of these factors and develop interventions that address behavioral barriers and promote health equity.

To improve public health responses, interventions should be tailored to address specific knowledge gaps, behavioral barriers, and socioeconomic disparities. Additionally, future studies should employ longitudinal designs and explore the role of other factors, such as political views and the reliance on traditional media and social media, as potential sources of information that may affect attitudes and practices related to preventive behaviors.

Recommendation

Develop targeted public health campaigns addressing misinformation regarding COVID-19 transmission, particularly concerning animal transmission and asymptomatic spread.

1. Implement policies and programs that mitigate socioeconomic disparities affecting COVID-19 -related attitudes and practices, especially for low-income individuals.
2. Enhance educational interventions to promote health literacy and improve understanding of preventive measures, targeting those with lower educational attainment.
3. Conduct longitudinal studies to monitor the evolution of knowledge, attitudes, and practices related to COVID-19.

Acknowledgement

First of all, we'd like to thank the Research and Consulting Centre (RCC), University of Benghazi, Libya, for providing us with raw data. Secondly, thank you to all of the study participants for their participation and support.

Conflict of interest. Nil

References

1. Abd Rahim IS, et al. Knowledge, attitudes and practices towards COVID-19 among medical students in International Islamic University Malaysia: an online cross-sectional study. 2021;20(2).
2. Al-Abed AA, et al. Knowledge, attitudes and practices regarding COVID-19 among the Turkish and Malaysian general populations during lockdown: A cross-sectional online survey. 2020;34(4).
3. Sulayman F, et al. Seroprevalence of Antibodies to SARS-CoV-2, at Four Sites in Al-Jabal Al Akhdar, Libya. 2022;5(1):1-5.
4. Alhazmi A, et al. Knowledge, attitudes and practices among people in Saudi Arabia regarding COVID-19 : A cross-sectional study. 2020;9(3).
5. Manarte-Monteiro P, et al. Knowledge of and Attitudes Toward Erosive Tooth Wear Among Students of a Portuguese University: Pilot Survey. 2025;13(3):120.
6. Elgimati Y, et al. Effect of a COVID-19 on social, psychological, economic and health conditions in Libya. 2021;3(2):160-170.
7. Zegarra-Valdivia J, Vilca BNC, Guerrero RJA. Knowledge, perception and attitudes in Regard to COVID-19 Pandemic in Peruvian Population. 2020.
8. Hweissa NAB, et al. Knowledge, attitude and practice (KAP) for preventing the coronavirus (COVID-19) pandemic among libyan health care workers. 2020;4(3):109.
9. Lee M, Kang BA, You MJ. Knowledge, attitudes, and practices (KAP) toward COVID-19 : a cross-sectional study in South Korea. BMC Public Health. 2021;21(1):1-10.
10. Hawary NUM, et al. Knowledge, attitude and practices associated with COVID-19 among undergraduate students from Malaysian public universities during the endemic phase: a cross-sectional study. 2025;25(1):119.
11. Kamate SK, et al. Assessing Knowledge, Attitudes and Practices of dental practitioners regarding the COVID-19 pandemic: A multinational study. 2020;57(1):11-17.
12. Azlan AA, et al. Public knowledge, attitudes and practices towards COVID-19 : A cross-sectional study in Malaysia. PLoS One. 2020;15(5):e0233668.
13. Zhou S, et al. Risk factors for mortality in 220 patients with COVID-19 in Wuhan, China: a single-center, retrospective study. 2021;100(2 Suppl):140S-147S.
14. Gavrilova NS, Gavrilov LA. Patterns of mortality during pandemic: An example of Spanish flu pandemic of 1918. Popul Econ. 2020;4(2):56-64.
15. Erfani A, et al. Knowledge, attitude and practice toward the novel coronavirus (COVID-19) outbreak: a population-based survey in Iran. 2020;30.
16. Fatima M, et al. Knowledge, Attitude, Practice, Behavior and Risk Perception of COVID-19 Pandemic among Medical and non-Medical University Students. Disaster Med Public Health Prep. 2022;17:e101.
17. Marudachalam J, et al. Peak months of pandemic's first-wave in India: a cross-sectional assessment of knowledge, attitudes and practice towards COVID-19 among internet-savvy individuals. 2022;38(2):93-102.
18. Nehara HR, et al. Knowledge, attitude, and practice regarding COVID-19 among COVID-19 patients and their correlation with the outcomes: A cross-sectional study. 2021;10(4):155-161.

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received*: 02-09-2026 -* ***Accepted****: 31-10-2026 -* ***Published****: 08-11-2026*