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COVID-19 Related Knowledge, Attitude and Practice of Students of Adeleke University, Ede Osun State, Nigeria

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ABSTRACT

The world recently faced a serious pandemic caused by a novel coronavirus (severe acute respiratory syndrome coronavirus 2) discovered on December 21, 2019. Public's knowledge and attitudes toward COVID-19 are likely to influence adherence to preventive practices. This study seeks to determine the COVID-19 related knowledge, attitude and practice of students of Adeleke University, Ede, Nigeria
This was a cross-sectional study which was conducted between June 9 and July 5, 2022 among students of Adeleke University in Ede, Osun State Nigeria. Data was collected using a structured self-administered questionnaire.
Correct COVID-19 related knowledge score ranged between 0 and 13 with a mean score of 7.11 and standard deviation ± 2.6. Bulk (63.1%) of respondents had a high level of COVID-19 related knowledge while 36.9% had low level of COVID-19 related knowledge. Score of COVID-19 attitude ranged between 7 and 35 with a mean score of 24.4 and standard deviation ±6.9. Seventy-Two percent of respondents have good COVID-19 related Attitude while 28% had poor COVID-19 related Attitude. Score of COVID-19 Related practice ranged between 0 and 6 with a mean score of 4.1 and standard deviation ± 1.37. Most (69.2%) respondents have good COVID-19 related practice while 30.8% had Poor COVID-19 related practice. There is statistically significant difference between Knowledge scores among different age groups (P-value 0.03). Respondents with high of COVID 19 related knowledge are 5 times likely to have good COVID-19 related Attitude
Awareness and sensitization efforts therefore should be intensified to close the gap in COVID-19 related knowledge, attitude and practice. This will assist to reduce the spread, morbidity and mortality of COVID-19 and help to mitigate the impact of future Coronavirus pandemics.

Keywords: COVID-19, Knowledge, Attitude, Practice, Adeleke University

INTRODUCTION

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is responsible for coronavirus disease 2019 (COVID-19) known as a novel coronavirus (Abdelhafiz et al., 2020 & Shrikrushna et al., 2020). The outbreak of COVID-19 in Wuhan, China, resulted in the closure of public places, the suspension of public transportation, the isolation and management of infected people, all in an effort to halt the spread of SARS-CoV-2 (Zhong, 2020)

The world recently faced a serious pandemic caused by a novel coronavirus discovered on December 21, 2019. (Zhu, 2019) The WHO reports that the inhalation of contaminated droplets with viral particles or touching the nose, mouth, and eyes after a person's hands come into contact with contaminated surfaces causes Coronavirus disease 2019 (COVID-19), which is caused by SARS-CoV-2 (Liu, 2020 & WHO, 2019).

Fever, cough, sore throat, shortness of breath, pneumonia, fatigue, malaise, and gastrointestinal symptoms are among the most commonly reported COVID-19 symptoms. At the same time, SARSCoV-2 infection can be asymptomatic (WHO, 2020). It can cause pneumonia, respiratory failure, cardiac arrest, and death in severe cases (Chen, 2020). However, it is estimated that 30% to 70% of patients in some studies may have the virus without showing symptoms of the disease (Wong, 2020).

Currently, the most effective methods for reducing the spread of the virus and its subsequent morbidity and mortality are social distancing, regular hand sanitization, regularly wiping surfaces, quarantining, and wearing face masks (Pradhan, 2020).

Despite the widespread distribution of vaccines, the third wave of the pandemic appears to be more devastating than anticipated, and some countries have reverted to total lockdown as the only intervention to reduce virus spread.

According to the WHO, approximately 12,130,881,147 doses of COVID-19 vaccines have been administered globally to eligible populations as of July 12, 2022, but equity between countries and regional balance remain major challenges in achieving global success (WHO, 2022).

A study in Africa discovered a vast difference in knowledge, attitude, and practice regarding the virus (Elnadi, 2021). In order to control and reduce the spread of COVID-19, people must have adequate knowledge of the disease, adopt a positive attitude, and employ appropriate preventive practices.

The public's knowledge and attitudes toward COVID-19 are likely to influence adherence. Evidence suggests that public awareness is critical in the fight against pandemics (Chirwa, 2020). The pandemic has significantly decreased since the discovery of vaccines, and people can be seen moving around and going about their daily lives, despite the fact that there have been few cases reported.

Deeper insights into existing public perception and practices can be gained by assessing the student's knowledge and attitude toward the coronavirus, thereby assisting in the identification of attributes that influence the public in embracing healthy behaviors and responsive behavior (Podder, 2019).

It is also necessary to assess public knowledge in order to identify gaps and strengthen ongoing prevention efforts. Therefore, this study seeks to determine the COVID-19 related knowledge, attitude and practice of students of Adeleke University, Ede, Nigeria.

METHODS

Study design and data collection

This was a cross-sectional study which was conducted between June 9 and July 5, 2022 among students of Adeleke University in Ede, Osun State Nigeria. Adeleke University is a private university and a faith based institution situated in Ede Osun State, located in south-west of the Nigeria. Adeleke University has been in existence since 2011.

An estimated sample size was calculated using Cochran formula with a prevalence of 8.4% (Altman *et al.*, 2021) based on 95% confidence level and 2.73% precision resulting to a total sample size of 396. Data was collected using a structured self-administered questionnaire. The questionnaire went through face validity by some experts. The tool (questionnaire) contains 40 variables, 7 on social-demographic variables, 7 on prevalence, 12 on knowledge, 8 on attitude and 6 on practice. The questionnaire was distributed to the students on campus using simple random sampling.

The data collected was properly checked for errors and completeness. Each of the questionnaires was coded and entered for analysis using SPSS software version 23.0. Descriptive analysis was carried out and Chi Square test and Analysis of Variance (ANOVA) test were utilized to determine the association between Dependent and

explanatory variables at 95% confidence level. The final result of the study was summarized using tables, figures and narratives.

Permission was obtained from the school in order to conduct the study. The participants were fully informed about the study and confidentiality about the information obtained was well kept. Verbal consent was taken from the participants and they were informed that no financial benefits and harm was involved in the study. The participants were also informed about the right to discontinued anytime they want.

RESULT

Table 1: Distribution of Respondents by Sociodemographic Characteristics

Variable	Category	Frequency	Percent
Age	15-20 years	245	61.9%
	21-26 years	122	30.8%
	27-32 years	21	5.3%
	33-38 years	8	2.0%
	Total	396	100%
Gender	Male	165	41.7%
	Female	231	58.3%
	Total	396	100%
Marital Status	Single	371	93.7%
	Married	25	6.3%
	Total	396	100%
Ethnicity	Yoruba	299	75.5%
	Hausa	25	6.3%
	Igbo	63	15.9%
	Others	9	2.3%
	Total	396	100%
Religion	Christian	317	80.1%
	Muslim	76	19.2%
	Traditional	1	0.3%
	Others	2	0.5%
	Total	396	100%
Level	100	116	29.3%
	200	129	32.6%
	300	94	23.7%
	400	46	11.6%
	500	11	2.8%
	Total	396	100%

Total number of respondents was 396. Majority (61.9%) of respondent were in the age group 15-20 years, followed by 30.8% in the age group 21-26 years, 5.3% in the age group 27-32 years and 2% in the age group 33-38 years. Greater proportions (58.3%) of respondent were females while 41.7% were males. Bulk (93.7%) of respondent was single while only 6.3% were married. Majority (75.5%) of respondent were Yorubas followed by 15.9% Igbos, 6.3% Hausa and 2.3% from other ethnic groups Majority (80.1%) of respondents are Christians while 19.2% were Muslims, 0.3% practiced Traditional Religion and 0.5% practiced other religion. More (32.6%) respondents are in 200 Level while 29.3% are in 100 Level, 23.7% in 300 Level, 11.6% in 400 Level and 2.8% in 500 Level. (Table 1)

Table 2: Descriptive Statistics of Correct COVID-19 Related Knowledge Score

N	Minimum	Maximum	Mean	Standard Deviation
396	0	13	7.1	+2.6

Correct COVID-19 related knowledge ranged between 0 and 13 with a mean score of 7.11 and standard deviation $\pm$ 2.6 (Table 2)

Table 3: Level of COVID-19 Related Knowledge

Knowledge Level	Frequency	Percent
Low Knowledge (0-6)	146	36.9%
High Knowledge (7-13)	250	63.1%
Total	396	100%

Bulk (63.1%) of respondents had a high level of COVID-19 Related knowledge while 36.9% had low level of COVID-19 Related knowledge (Table 3).

Majority (72.5%) of respondents correctly responded that people who have contact with someone infected with the COVID-19 virus should be immediately isolated in a proper place. In general, the observation period is 14 days. Most (74.5%) respondents correctly answered that to prevent the infection by COVID-19, individuals should avoid going to crowded places such as train stations and avoid taking public transportations. Few (29.6%) respondents answered incorrectly that it is not necessary for children and young adults to take measures to prevent the infection by the COVID-19 virus. A moderate proportion (68.2%) of respondent confirmed correctly that ordinary residents can wear general medical masks to prevent the infection by the COVID-19 virus. Up to 72.2% of respondents correctly responded that the COVID-19 virus spreads via respiratory droplets of infected individuals.

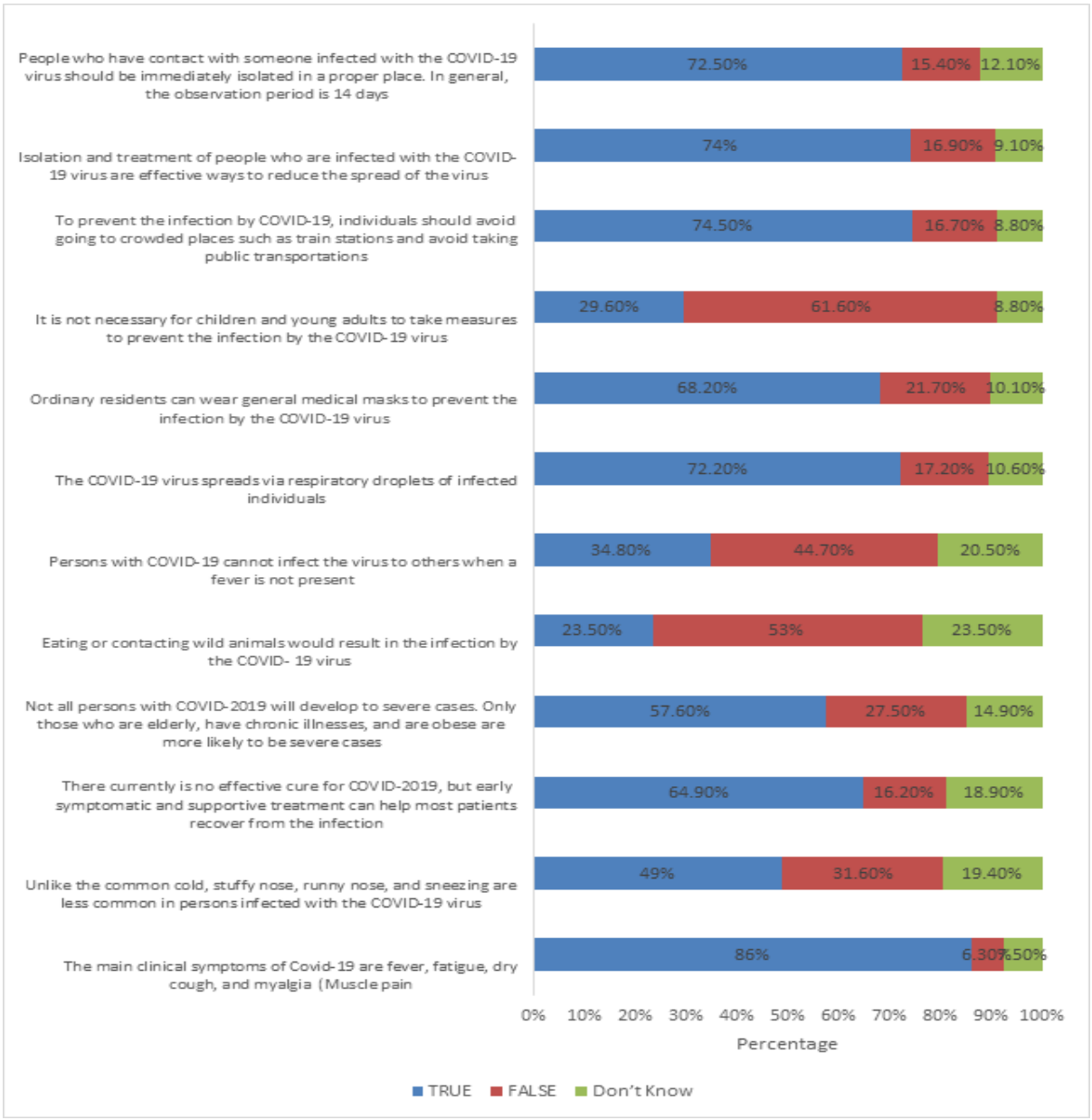


Figure 1: COVID-19 Related Knowledge Variables

More (74%) respondents correctly answered that isolation and treatment of people who are infected with the COVID-19 virus are effective ways to reduce the spread of the virus. Only 34.8% of respondents incorrectly answered that persons with COVID-19 cannot infect the virus to others when a fever is not present. Few (23.5%) respondents incorrectly responded that eating or contacting wild animals would result in the infection by the COVID- 19 virus. Greater than half (57.6%) of respondents correctly responded that not all persons with COVID-2019 will develop to severe cases. Only those who are elderly, have chronic illnesses, and are obese are more likely to be severe cases. Bulk (64.9%) of respondents correctly answered that there currently is no effective cure for COVID-2019, but early symptomatic and supportive treatment can help most patients recover from the infection. Slightly less than half (49%) of respondents correctly answered that unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with the COVID-19 virus. Majority (86%) of respondents had correct acknowledged that the main clinical symptoms of Covid-19 are fever, fatigue, dry cough and myalgia

(Figure 1).

Table 4: Descriptive Statistics of COVID-19 Related Attitude Score

Sample Size	Minimum	Maximum	Mean	Standard. Deviation
396	7	35	24.4	±6.9

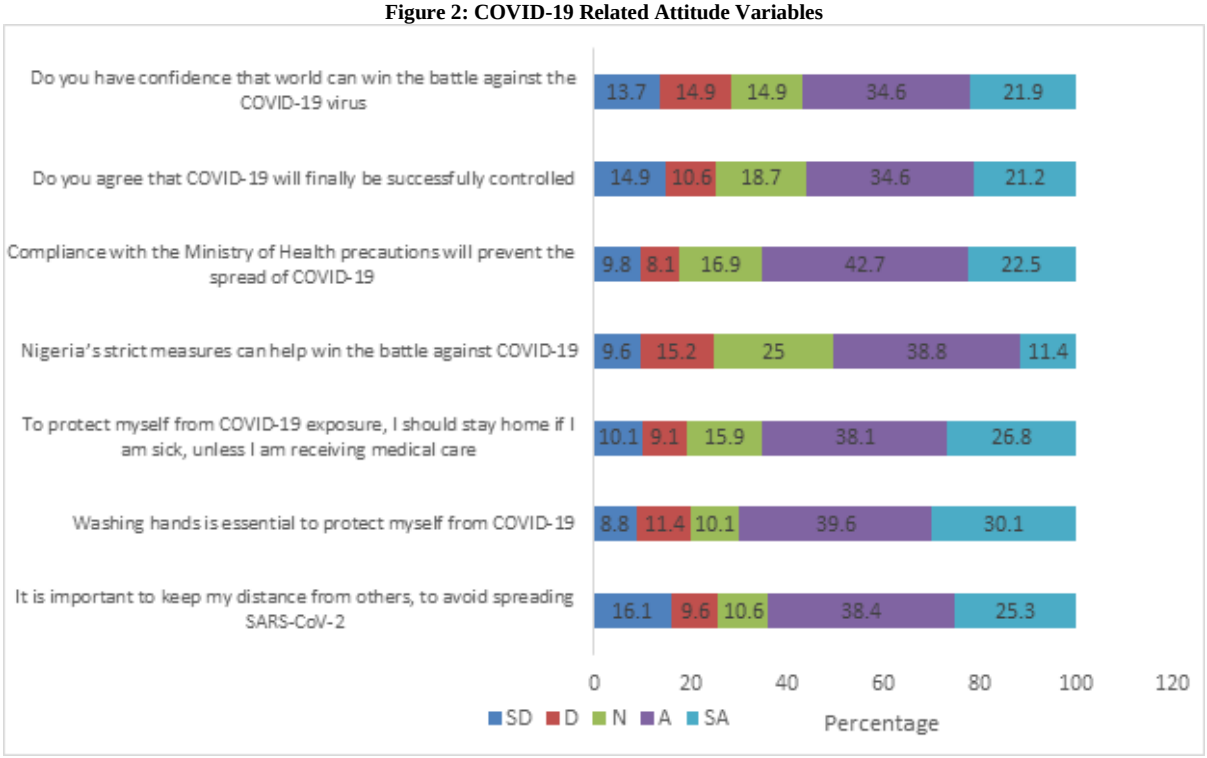
Score of COVID-19 attitude ranged between 7 and 35 with a mean score of 24.4 and standard deviation ±6.9 (Table 4)

Table 5: Level of COVID-19 Related Attitude

Level	Frequency	Percent
Poor Attitude (7-21)	111	28%
Good Attitude (22-35)	285	72%
Total	396	100%

Seventy-Two percent of respondents have good COVID-19 related attitude while 28% had poor COVID-19 related attitude (Table 5)

Figure 2: COVID-19 Related Attitude Variables



Greater than half (56.5%) of respondents strongly agreed and agreed that they have confidence that the world can win the battle against the COVID-19 virus. Less than half (45.8%) of respondents strongly agreed and agreed that COVID-19 will finally be successfully controlled

Bulk (65.2%) of respondents strongly agreed and agreed that compliance with the Ministry of Health precautions will prevent the spread of COVID-19. About half (50.2%) of respondents strongly agreed and agreed that Nigeria's strict measures can help win the battle against COVID-19. Up to 57.5% of respondents strongly agreed and agreed that COVID-19 will eventually be successfully controlled. More (64.9%) respondents strongly agreed and 38.1% agreed that to protect myself from COVID-19 exposure, I should stay home if I am sick, unless I am receiving medical care. A moderate proportion (69.7%) of respondents strongly agreed and 39.6% agreed that washing hands is essential to protect myself from COVID-19 (Figure 2)

Table 6: Descriptive Statistics of COVID-19 Related Practices

Sample Size	Minimum	Maximum	Mean	Standard Deviation
396	0	6	4.1	±1.4

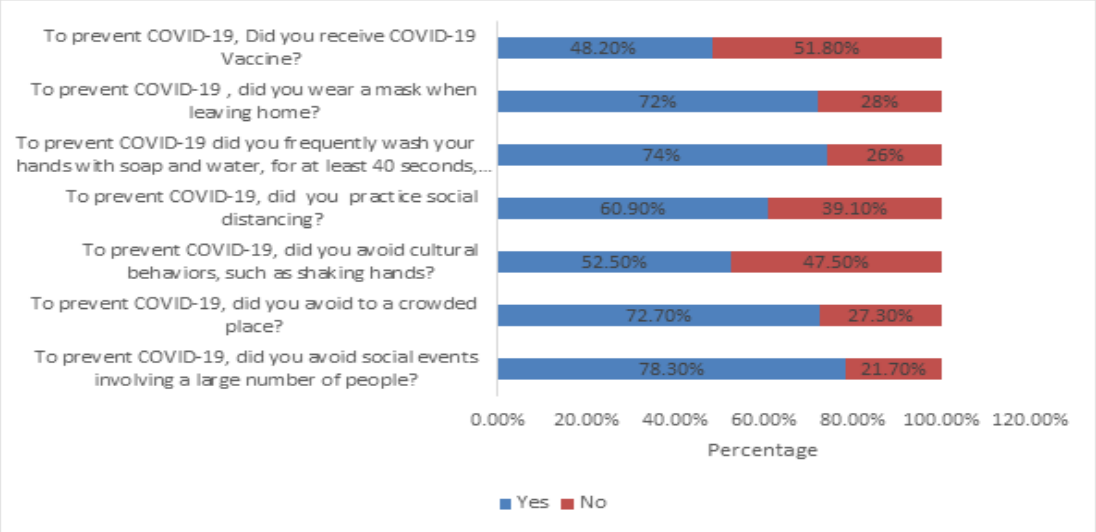
Score of COVID-19 related practice ranged between 0 and 6 with a mean score of 4.1 and standard deviation ± 1.37 (Table 6)

Table 7: Level of COVID-19 related practice

Level	Frequency	Percent
Poor Practice (0-3)	122	30.8%
Good Practice (4-6)	274	69.2%
Total	396	100%

69.2% of respondents have a good COVID-19 related practice while 30.8% had Poor COVID-19 related Practice (Table 7)

Figure 3: COVID-19 Related Practice Variables



Less than half (48.2%) of respondents have received COVID-19 vaccine. Bulk (72%) of respondents practiced wearing a mask when leaving home. Most (74%) respondents practiced frequently wash hands with soap and water, for at least 40 seconds, especially after going to a public place, or after nose-blowing, coughing, or sneezing. Up to 60.9% of respondents practiced social distancing. Greater than half (52.5%) of respondents practiced the avoidance of cultural behaviors such as shaking of hands. Majority (72.7%) of respondents practiced avoidance of crowded places. A high proportion (78.3%) of respondents practiced avoidance of social events involving a large number of people (Figure 3)

Table 8: ANOVA (Knowledge, Attitude & Practice Score vs Age, Gender & Academic Level

Independent Variable	Dependent Variable		Sum of Squares	df	Mean Square	F	Sig.
Age	Knowledge Score	Between Groups	60.15	3	20.053	3.09	0.03
		Within Groups	2538.95	392	6.477		
		Total	2599.11	395			
	Practice Score	Between Groups	2.66	3	0.888	0.48	0.70
		Within Groups	733.22	392	1.870		
		Total	735.88	395			
	Attitude Score	Between Groups	249.093	3	83.031	1.73	0.16
		Within Groups	18786.06	392	47.924		
		Total	19035.15	395			
Gender	Knowledge Score	Between Groups	0.018	1	0.018	0.003	0.96
		Within Groups	2599.09	394	6.597		
		Total	2599.11	395			
	Practice Score	Between Groups	0.032	1	0.032	0.02	0.89
		Within Groups	735.85	394	1.868		
		Total	735.88	395			
	Attitude Score	Between Groups	71.144	1	71.144	1.48	0.23
		Within Groups	18964.01	394	48.132		
		Total	19035.15	395			
Academic Level	Knowledge Score	Between Groups	15.202	4	3.801	0.57	0.68
		Within Groups	2583.90	391	6.608		
		Total	2599.11	395			
	Practice Score	Between Groups	12.142	4	3.036	1.64	0.16
		Within Groups	723.74	391	1.851		
		Total	735.88	395			
	Attitude Score	Between Groups	308.855	4	77.214	1.61	0.17
		Within Groups	18726.30	391	47.893		
		Total	19035.15	395			

Table 9: Descriptive Statistics (Knowledge Score vs Age)

Dependent Variable	Age Group	N	Mean
Knowledge	15-20	245	7.05
	21-26	122	7.00
	27-32	21	7.43
	33-38	8	9.75
	Total	396	7.11

There is statistically significant difference between Knowledge scores among different age groups (P-value 0.03). Knowledge score of 9.75 among 33-38 years is statistically significantly higher than knowledge score of 7.43 among 27-32 years, knowledge score of 7.05 among 15-20 years and knowledge score of 7.0 21-26 years. There is no statistically significant difference between Attitude scores among males and females (P value 0.70). There is statistically significant difference between Attitude scores among different Academic Levels (p value 0.16). There is no statistically significant difference between Attitude scores among different age groups (P value-0.96). There is no statistically significant difference between Attitude scores among males and females (p value 0.89). There is statistically significant difference between Attitude scores among Academic Levels (p value 0.23). There is no statistically significant difference between Practice scores among different age groups (p value 0.68). There is no statistically significant difference between Practice scores among different Males and Females (p value 0.16). There is no statistically significant difference between Practice scores among Academic Levels (p value 0.17) (Table 8 & 9)

Table 10: Chi Square: Association between Practice and Sociodemographic Characteristics

Chi Square	Low Knowledge	High Knowledge	Total	X^2	P Value
Poor Attitude	70	41	111	45.5	0.00
Good Attitude	76	209	285		
Total	146	250	396		

Respondents with high of COVID 19 related knowledge are 5 times likely to have good COVID-19 related Attitude (Table 10)

DISCUSSION

The range of score for correct COVID-19 related knowledge ranged between 0 and 13 with a mean score of 7.11 and standard deviation $\pm$2.6. Utilizing correct knowledge score of 0-6 as low level of knowledge and correct knowledge score of 7-13 as high level of knowledge, this translated to 63.1% of respondents having high COVID-19 related knowledge and 36.9% having low COVID-19 related knowledge. Out of 12 questions measuring level of knowledge, a moderate to high proportion (57.6%-86%) of respondents answered 9 questions correctly while only a low proportion (23.5%-49%) of respondents answered 3 questions incorrectly

This means there is high level of COVID-19 related knowledge among students of Adeleke University, Ede, Nigeria. The finding of high (63.1%) COVID-19 related knowledge in this study is similar to 66% reported by Singh *et al.,* (2020) and 78.7% reported by Adesegun *et al.,* (2020)

Most (72.5%) respondents correctly answered that people who have contact with someone infected with the COVID-19 virus should immediately be isolated in a proper place with the observation period of 14 days. This result is similar to 95% reported by Isah et al (2021) and 92.7% reported by Maheshwari *et al.,* (2020). Bulk (74.5%) of respondents correctly responded that to prevent the infection by COVID-19, individuals should avoid going to crowded places such as train stations and avoid taking public transportations. This finding is similar to 93% reported by Isah *et al.,* (2021) and 96.9% reported by Maheshwari *et al.,* (2020). Few (29.6%) respondents incorrectly answered that it is not necessary for children and young adults to take

measures to prevent the infection by the COVID-19 virus. This finding is in contrast to 71% reported by Isah *et al.,* (2021) and 94.9% reported by Maheshwari *et al.,* (2020). A moderate proportion (68.2%) of respondents correctly responded that ordinary residents can wear general medical masks to prevent the infection by the COVID-19 virus. This finding is similar to 86% reported by Isah *et al.,* (2021) and 50.3% reported by Maheshwari *et al.,* (2020). Most (72.2%) respondents correctly answered that COVID-19 virus spread via respiratory droplets of infected individuals. This finding is similar to 87% reported by Isah *et al.,* (2020) and 92.7% reported by Maheshwari *et al.,* (2020). A high (74%) proportion of respondents correctly confirmed that isolation and treatment of people who are infected with the COVID-19 virus are effective ways to reduce the spread of the virus. This finding is similar to 96% reported by Isah *et al.,* (2021) and 96.6% reported by Maheshwari *et al.,* (2020). Only 34.8% of respondents incorrectly answered that persons with COVID-19 cannot infect the virus to others when a fever is not present. This finding is in contrast to 62% reported by Isah *et al.,* (2021) and 88.1% reported by Maheshwari *et al.,* (2020). Few (23.5%) respondents incorrectly responded that eating or contacting wild animals would result in the infection by the COVID- 19 virus. This finding is in similar to 42% reported by Isah *et al.,* (2021) but in contrast to 55.9% reported by Maheshwari *et al.,* (2020). A moderate (57.6%) proportion of respondents correctly responded that not all persons with COVID-19 will develop severe cases, only those who are elderly, have chronic illnesses and are obese are more likely to have severe cases. This finding is in similar to 82% reported by Isah et al (2021) and in contrast to 85.9% reported by Maheshwari *et al.,* (2020). Many (64.9%) respondents correctly answered that there currently is no effective cure for COVID-2019, but early symptomatic and supportive treatment can help most patients recover from the infection. This finding is in similar to 90% reported by Isah *et al.,* (2021) and 92.4% reported by Maheshwari *et al.,* (2020). Up to 49% of respondents correctly responded that unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with the COVID-19 virus. This finding is similar to 61% reported by Isah et al (2021). Most (86%) respondents correctly confirmed that the main clinical symptoms of Covid-19 are fever, fatigue, dry cough and myalgia. This finding is in similar to 91% reported by Isah et al (2021) and 86.7% reported by Maheshwari *et al.,* (2020)

The range of COVID-19 related Attitude ranged between 7 and 35 with a mean score of 24.4 and standard deviation $\pm$6.9. Utilizing attitude score of 7-21 as poor attitude and attitude score of 22-23 as good attitude this translated to 72% of respondents have a good attitude of COVID-19 pandemic while 28% had poor attitude of COVID-19 pandemic. Between 50.2% and 69.7% of respondents strongly agree and agree with the 7 questions utilized to measure good COVID-19 related attitudes. This means there is good COVID-19 related attitude among students of Adeleke University. The result of high (72%) COVID-19 related Attitude is similar to 66% reported by Adesegun *et al.,* (2020).

More than half (56.5%) of respondents strongly agree and agree that the world can win the battle against the COVID-19 virus. This finding is similar to73.2% reported by Maheshwari *et al.,* (2020) and 94.4% reported by Adesegun *et al.,* (2020). About less than half (45.8%) of respondents strongly agree and agree that COVID-19 will finally be successfully controlled. This finding is similar to 85% reported by Isah *et al.,* (2021). Most (65.2%) respondents strongly agree and agree that compliance with the Ministry of Health precautions will prevent the spread of COVID-19. This finding is similar to 78.8% reported by Adesegun *et al.,* (2020). About half (50.2%) of respondents strongly agree and agree that Nigeria's strict measures can help win the battle against COVID-19. This finding is

similar to 71% reported by Isah *et al.,* (2020). Greater than half (57.5%) of respondents strongly agree and agree that COVID-19 will eventually be successfully controlled. Bulk (64.9%) of respondents strongly agree and agree that to protect themselves from COVID-19 exposure, they should stay home if I sick, unless receiving medical care. More (69.7%) respondents strongly agree and agree that washing hands is essential to protect myself from COVID-19.

The range of COVID-19 related practices ranged between 0 and 6 with a mean score of 4.1 and standard deviation of $\pm$1.37. Utilizing practice score of 0-3 as poor attitude and attitude score of 4-6 as good attitude this translated to 69.2% of respondents having a good attitude of COVID-19 pandemic while 30.8% having poor attitude of COVID-19 pandemic. Out of 7 questions measuring COVID-19 related practices, a high (60.9% & to 78.3%) proportion of respondents answered 5 questions positively while a moderate proportion 48.2% and 52.5% answered 2 questions positively. This means there is good COVID-19 related practices among students of Adeleke University. The discovery (69.2%) of high COVID-19 related Practice is similar to 75.6% reported by Adesegun *et al.,* (2020).

Less than half (48.2%) of respondents have received COVID-19 Vaccine. Most (72%) respondents practiced wearing a mask when leaving home. This finding is similar to 76.3% reported by Fang *et al.,* (2021), 65% reported by Isah *et al.,* (2021) and 22.5% reported by Adesegun *et al.,* (2020). Up to 74% of respondents practiced frequently wash hands with soap and water, for at least 40 seconds, especially after going to a public place, or after nose-blowing, coughing, or sneezing. This finding is similar to 56.7% reported by Fang *et al.,* (2021), 89% reported by Isah, M. B et al (2021), 96.6% reported by Maheshwari S. et al (2020) and 90% reported by Adesegun *et al.,* (2020). It was reported that 60.9% of respondents practiced social distancing. This finding is similar to 98.3% reported by Adesegun *et al.,* (2020). Greater than half (52.5%) of respondents practiced avoidance of cultural behaviors, such as shaking hands. From the study 72.7% of respondents practiced avoidance of crowded places. This finding is similar to 72.7% reported by Fang *et al.,* (2021) and 40% reported by Isah, (2021). Majority (78.3%) of respondents practiced avoidance of social events involving a large number of people. This finding is similar to 98.6% observed by Isah *et al.,* (2021).

There is statistically significant difference between Knowledge scores among different age groups (P-value 0.03) with highest Knowledge score of 9.75 among respondent in the age group of 33-38 years. There is no statistically significant difference between Attitude and Practice scores among different Age Groups, Gender and Academic Level. These findings are in contrast to observations reported by Iloanusi *et al.,* (2020) that gender variations in knowledge and practice with males recording higher knowledge scores than females. Fang *et al.,* (2021) also reported association between knowledge, high level education and medical related occupation.

Respondents with high level of COVID 19 related knowledge are 5 times likely to have good COVID-19 related Attitude higher, an association that is statistically significant (p value 0.00).

A limitation of the study is the use of purposive sampling method meaning that generalization of findings to other study population should be done with caution

CONCLUSION

This study revealed high COVID-19 related knowledge, good COVID-19 related attitude and good COVID-19 related practices among students of Adeleke University. Older age group had higher knowledge scores compared to younger age groups. Respondents with high COVID 19 related knowledge are 5 times likely to have good COVID-19 related Attitude.

Awareness and sensitization efforts therefore should be intensified to close the gap in COVID-19 related knowledge, attitude and practice. This will assist to reduce the spread, morbidity and mortality of COVID-19 and help to mitigate the impact of future Coronavirus pandemics.

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