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Knowledge, Attitude and Adherence to Covid 19 Protocol Among Postgraduate Students, University of Ibadan, Ibadan, Oyo State

Babalola Matthew Ayodeji, Dr T. A Obembe
Department of Health Policy and Management, Faculty of Public Health, University of Ibadan

Akande Deborah Tolulope
University of Ibadan

Judith Adaora Arachie
Institute of Human Virology Nigeria FCT-Abuja

Abstract: Introduction: The COVID-19 pandemic has significantly impacted public health globally, with Nigeria, the most populous country in Africa, facing unique challenges due to its diverse socio-economic landscape. University students, particularly postgraduates, are a critical population group whose knowledge, attitudes, and adherence to preventive measures play a key role in mitigating the spread of the virus.
Objective: This study aimed to evaluate the knowledge, attitudes, and adherence to COVID-19 protocols among postgraduate students at the University of Ibadan, Nigeria, and to determine the influence of socio-demographic factors on these outcomes.
Method of Data Analysis: A descriptive cross-sectional survey design was employed, and data were collected using a self-administered, semi-structured questionnaire adapted from previous studies and relevant literature. The data were cleaned, coded, and analyzed using SPSS version 25.0. Descriptive statistics (means, frequencies, percentages, and standard deviations) were computed, while inferential statistics, including chi-square tests, independent t-tests, multiple linear regression, and logistic regression analyses, were utilized to assess associations between socio-demographic variables, knowledge, attitudes, and adherence to COVID-19 protocols.
Results: The study found that 76.5% of respondents had good COVID-19 knowledge, though 23.5% held misconceptions. Females had significantly higher attitude scores than males (4.2 vs. 3.7, $p = 0.004$). Adherence to protocols was significantly associated with age ($\chi^2 = 10.48$, $p = 0.032$) and marital status ($\chi^2 = 8.92$, $p = 0.017$). Logistic regression showed respondents aged 25–29 (AOR: 2.31, 95% CI: 1.12–4.75, $p = 0.021$) and ≥35 (AOR: 3.54, 95% CI: 1.89–6.62, $p < 0.001$) were more likely to follow preventive measures. Employed students were 1.8 times more likely to practice social distancing (AOR: 1.79, 95% CI: 1.15–2.84, $p = 0.012$). Face mask use (64.7%), hand hygiene (58.3%), and social distancing (47.2%) were common but not universal.
Conclusion: The study highlights the importance of socio-demographic factors in shaping knowledge, attitudes, and adherence to COVID-19 preventive measures among postgraduate students. Tailored intervention strategies and targeted public health messaging are recommended to address identified knowledge gaps and improve adherence to preventive protocols, ultimately enhancing community safety during the ongoing pandemic.

Keywords: COVID-19, Knowledge, Attitude, Adherence, University Students.

Background

COVID-19, caused by SARS-CoV-2, is one of the most severe pandemics since 1918, leading to widespread global disruptions (WHO, 2020). First detected in Wuhan, China, in late 2019, the virus was confirmed as the cause of the outbreak by January 9, 2020 (Zhong et al., 2020). It spreads primarily through respiratory droplets and contaminated surfaces (Elsevier, 2020; Peng et al., 2020). The World Health Organization (WHO) declared it a Public Health Emergency of International Concern in January 2020 (Baud, 2020), and by February 27, 2020, Nigeria reported its first case in an Italian traveler (Otitoloju et al., 2020). By June 2020, the virus had spread to almost all Nigerian states.The fatality rate varies, with older adults and individuals with comorbidities being at higher risk (Buckee et al., 2021). Preventive measures, including hand hygiene, mask-wearing, social distancing, and respiratory etiquette, have been emphasized to curb transmission (WHO, 2020c; CDC, 2020a). However, adherence depends on public knowledge, attitudes, and practices (Cascella et al., 2020). While vaccines have been developed, concerns over efficacy, safety, and emerging variants persist (Nwagbara et al., 2021). Young adults, particularly university students, play a significant role in transmission due to their high mobility and social interactions. Studies suggest this group has lower compliance with health protocols, despite the potential to be asymptomatic carriers (Chen et al., 2020). In Nigeria, research on COVID-19 knowledge and preventive practices highlights the need for targeted awareness programs to enhance adherence (Nwagbara et al., 2021).

COVID-19 remains one of the most devastating global health crises, with over 225 million confirmed cases and 4.6 million deaths reported as of 2021 (WHO, 2021). The virus has spread to more than 213 countries, with the highest burdens recorded in the United States, Brazil, and India. In Africa, over 8 million cases have been reported, with Nigeria accounting for more than 202,000 cases, making it one of the most affected countries on the continent (WHO, 2021). Despite ongoing cases, there is no definitive cure for COVID-19. Early symptom recognition, awareness of risk factors, and adherence to preventive measures are crucial for controlling its spread (Zhong et al., 2020). However, limited studies exist on epidemic management and public perception of COVID-19 in Nigeria. Understanding knowledge and attitudes toward preventive protocols is essential for effective public health interventions. This study examines postgraduate students at the University of Ibadan to assess their awareness and attitudes towards COVID-19 protocols. Educating the public on preventive measures such as handwashing, social distancing, and self-isolation is crucial in controlling COVID-19. However, misinformation continues to spread, creating confusion and undermining prevention efforts (Olapegba et al., 2020). University students, a socially active and independent group, are particularly vulnerable due to their high mobility and exposure to misinformation, especially through social media (Salman et al., 2020). The presence of even a single case within university settings can lead to rapid outbreaks, making adherence to preventive measures essential.

Public compliance with health guidelines is often influenced by knowledge, perception of risk, and attitudes toward preventive behaviors (Zetzsche, 2020; Morganstein & Ursano, 2020; Fiorillo & Gorwood, 2020). Positive attitudes toward COVID-19 protocols can encourage safer behaviors, while poor adherence remains a challenge in some populations (Kumar et al., 2020; Olum et al., 2020). As COVID-19 remains a global health threat, this study provides critical insights into university students' knowledge, attitude and adherence to the preventive measures. The findings will help authorities design targeted awareness campaigns, address misconceptions, and strengthen compliance with COVID-19 protocols. Moreover, the results could highlight gaps in knowledge and practices, guiding stakeholders in improving public health strategies to mitigate the spread of the virus.

Study Hypotheses

Ho: There is no statistically significant difference between knowledge of covid-19 and adherence to covid-19 protocol

H1: There is a statistically significant difference between knowledge of covid-19 and adherence to covid-19 protocol

H0: There is no statistically significant association attitude towards covid-19 protocol and adherence to covid-19 protocol

H1: There is a statistically significant association attitude towards covid-19 protocol and adherence to covid-19 protocol

Materials and Methods

Study Design

This study aimed to investigate the Knowledge, attitude and adherence to COVID-19 protocols among postgraduate students at the University of Ibadan, Ibadan, Oyo State, Nigeria. To gather direct data from human respondents, a descriptive cross-sectional survey design was employed, utilizing semi-structured interviewer-administered questionnaires.

Study settings

The University of Ibadan (UI) is a renowned public research institution located in Ibadan, Nigeria. Established in 1948 as University College Ibadan, it was initially a constituent college of the University of London. It gained independence in 1963, becoming the first university in Nigeria to grant degrees. The University has played a pivotal role in the political, industrial, economic, and cultural development of Nigeria through its extensive graduate network. Its rich history and influence have contributed to its recognition as one of the most prestigious universities in Africa.

UI comprises 92 academic departments spread across 17 faculties, including Arts, Science, Basic Medical Sciences, Clinical Sciences, Agriculture, Social Sciences, Education, Veterinary Medicine, Pharmacy, Technology, Law, Public Health, Dentistry, Economics and Management Sciences, Renewable Natural Resources, Environmental Design and Management, and Multidisciplinary Studies. The College of Medicine encompasses the Faculties of Basic Medical Sciences, Clinical Sciences, Public Health, and Dentistry. The University of Ibadan's Postgraduate School is widely regarded as one of the largest and most prestigious in Africa, playing a key role in producing highly skilled professionals for Nigeria's public and private sectors, as well as for international opportunities. With postgraduate enrollment accounting for about 50% of the total student body, UI annually awards approximately 3,000 Master's degrees and 250 Ph.D. degrees.

The study was conducted among postgraduate students at the University of Ibadan, Oyo State. Eligible participants were postgraduate students aged 18 years and above who provided informed consent to participate in the study. Postgraduate students who were unavailable during the data collection period, critically ill at the time of data collection, or who initially consented but later withdrew their interest in participating were excluded from the study.

Sampling Procedure and Sampling Size

For this study, a purposive non-probability sampling technique was utilized to select participants. The sample size was calculated using the Leslie Kish formula for determining sample size for a single proportion. Based on prior research indicating that 59.5% of postgraduate students had positive knowledge regarding the COVID-19 pandemic (Olubukola et al., 2021), the sample size was computed. After accounting for a 10% non-response rate, the final sample size was estimated to be 391 participants.

Instrument for Data Collection

The data for this study were collected using a researcher-designed, semi-structured questionnaire, which was self-administered to gather relevant information on the knowledge and attitude towards COVID-19 protocols among postgraduate students of the University of Ibadan.

The questionnaire was developed based on a thorough review of existing literature and previous studies. It was structured into five sections: the first section gathered socio-demographic information, including age, gender, and other relevant characteristics; the second section comprised 14 items with Yes/No options to assess knowledge regarding COVID-19; the third section consisted of 12 items designed to evaluate attitudes towards COVID-19 protocols, using a Likert scale with responses ranging from 'Strongly Agree' to 'Strongly Disagree'. To ensure the reliability of the instrument, a pretest was conducted among 30 postgraduate students at Lead City University, Ibadan, using a test-retest method to evaluate the consistency of the instrument and identify any unclear statements. A correlation coefficient of 0.70 or higher was considered satisfactory for reliability. Following the pretest, necessary revisions were made to improve clarity and enhance the final draft of the questionnaire.

Data Analysis

The data collected were cleaned, coded, and checked for errors before being entered into the Statistical Package for Social Sciences (SPSS) version 25.0 for analysis. The results were presented using descriptive and inferential statistics, including mean, frequency, percentage, and standard deviation. The knowledge score was derived from the total obtainable score from the knowledge section of the questionnaire. Correct responses were assigned a score of 1, and incorrect responses received a score of 0, with a maximum obtainable score of 14. The respondents' scores were then converted into percentages by dividing the obtained score by 14 and multiplying by 100. Those with scores of 75% and above were categorized as having good knowledge, while those with scores below 75% were classified as having poor knowledge of COVID-19.

The attitude towards COVID-19 was measured using twelve items, and responses were recorded on a 5-point Likert scale, with strongly disagree assigned 1 point, disagree 2 points, neutral 3 points, agree 4 points, and strongly agree 5 points. For certain questions, the scoring was reversed as needed, and the total attitude score was calculated by summing the responses across all items. This score was then converted into a percentage by dividing the total score by the maximum obtainable score of 60 (i.e., 5 points x 12 items) and multiplying by 100. Respondents with scores of 75% and above were categorized as having a positive attitude, while those with scores below 75% were categorized as having a negative attitude.

Adherence to COVID-19 protocols among respondents was determined based on the total obtainable score from the adherence section. It was measured using eleven items, with responses recorded as Yes (1 point) or No (0 points). The total score ranged from 0 to 11, and respondents' scores were converted to percentages by dividing their obtained scores by 11 and multiplying by 100. Those who scored 75% or above were categorized as adherent to COVID-19 protocols, while those with scores below 75% were classified as non-adherent. Chi-square tests were used to determine the significance of associations between the dependent and independent variables. Variables found to be significant at the 10% level in the chi-square tests were entered into a multiple logistic regression model to identify the factors predicting the outcome variables. In cases where all respondents had poor knowledge, attitude and adherence, independent sample t-tests and ANOVA were used to examine the variables related to such outcomes. Finally, multivariate logistic regression or multiple linear regression was employed to identify the factors that predicted the dependent variables. Statistical significance was set at a two-sided p-value of less than 0.05.

Ethical Consideration

Ethical approval was obtained from the Ethical Review Committee of the University of Ibadan/University College Hospital Ibadan Institutional Review Board (UI/UCH IRB) before data collection commenced. Informed consent was secured from participants after they were provided with a clear and concise explanation of the research objectives to ensure full comprehension. Participants were assured of the confidentiality of the information provided and

were informed of their right to withdraw from the study at any time without coercion or negative consequences.

Results

Table 1: Socio-demographic characteristics of the respondents

Variables	Frequency	Percentage
Age		
>25 years	196	50.1
25-29 years	130	33.2
30-34 years	35	9
>=35 years	30	7.7
mean: 25.5 ± 6.3		
Sex		
Male	207	52.9
Female	184	47.1
Religion		
Christian	326	83.4
Muslim	60	15.3
Others	5	1.3
Marital status		
Single	353	90.3
Married	38	9.7
Faculty		
Arts	71	18.2
Education	80	20.5
Law	20	5.1
Sciences	168	43
Soc. & Mgt. Sciences	52	13.3

The socio-demographic characteristics of the respondents revealed that the majority were younger than 25 years, accounting for 50.1% of the total participants. Those aged between 25 and 29 years constituted 33.2%, while 9% were within the 30 to 34-year age bracket, and 7.7% were 35 years or older. The mean age of the respondents was 25.5 ± 6.3 years. In terms of gender distribution, males represented 52.9% of the study population, while females accounted for 47.1%. Regarding religious affiliation, Christianity was the predominant religion, with 83.4% of the respondents identifying as Christians. Muslims constituted 15.3% of the sample, while 1.3% belonged to other religious groups. Marital status analysis indicated that the vast majority of respondents were single, comprising 90.3% of the total, while 9.7% were married. The respondents were drawn from various faculties within the university, with the Faculty of Sciences having the highest representation at 43%. The Faculty of Education accounted for 20.5% of the participants, followed by the Faculty of Arts with 18.2%. The Faculty of Social and Management Sciences constituted 13.3% of the study population, while the Faculty of Law had the least representation at 5.1%.

Table 2: Respondents' Knowledge of COVID-19

Statements	No n (%)	Yes n (%)
COVID-19 is a disease caused by SARS-CoV	106 (27.1)	285 (72.9)
The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and myalgia	4 (1.0)	387 (99.0)
People with COVID-19 also show no symptoms, called OTG (People without Symptoms)	86 (22.0)	305 (78.0)

People with COVID-19 who have chronic diseases such as diabetes, heart disease, and obesity have an increasingly severe condition	33 (8.4)	358 (91.6)
Children and teenagers do not need to make efforts to prevent COVID-19 infection because they have a strong immune system	77 (19.7)	314 (80.3)
People with COVID-19 who show no symptoms or OTG (People without symptoms) cannot infect the virus to others	316 (80.8)	75 (19.2)
COVID-19 is spread through the respiratory droplets of people infected with COVID	19 (4.9)	372 (95.1)
The dead bodies of people with COVID-19 who have not been buried can be a source of the spread of the COVID-19 virus	70 (17.9)	321 (82.1)
COVID-19 only spreads through fomites, it does not spread through the air	99 (25.3)	292 (74.7)
Currently, there is no effective drug for COVID-19, but the treatment of early symptoms and intensive care can help people with COVID-19 to recover	38 (9.7)	353 (90.3)
To prevent COVID-19 infection, we must avoid going to crowded places like markets and train stations as well as avoid using public transportation	44 (11.3)	347 (88.7)

The findings on respondents' knowledge of COVID-19 revealed that 72.9% correctly identified the disease as being caused by the SARS-CoV virus, while 27.1% were unaware of this fact. Nearly all respondents (99.0%) recognized fever, fatigue, dry cough, and myalgia as the main clinical symptoms of COVID-19, with only 1.0% being unaware. Awareness of asymptomatic cases, commonly referred to as "People without Symptoms" (OTG), was reported by 78.0% of the respondents, whereas 22.0% lacked this knowledge. Additionally, 91.6% acknowledged that individuals with pre-existing chronic conditions such as diabetes, heart disease, and obesity were at higher risk of severe complications from COVID-19, while 8.4% were unaware of this risk. A significant proportion (80.3%) understood that children and teenagers also need to take preventive measures despite having relatively strong immune systems, yet 19.7% mistakenly believed otherwise. However, a notable misconception was identified, as 80.8% of respondents incorrectly believed that asymptomatic individuals could not transmit the virus to others, while only 19.2% correctly understood that transmission could still occur. In contrast, the majority (95.1%) correctly recognized that COVID-19 spreads through respiratory droplets from infected individuals, with only 4.9% lacking this knowledge. Concerning the potential spread of COVID-19 from unburied deceased individuals, 82.1% correctly identified this as a possible source of transmission, while 17.9% did not. Furthermore, 74.7% of respondents correctly refuted the misconception that COVID-19 spreads only through fomites and not via the air, though 25.3% still held this incorrect belief. Awareness regarding the unavailability of a definitive cure for COVID-19 was high, with 90.3% acknowledging that while no specific drug exists, early symptom management and intensive care could aid recovery; 9.7% were unaware of this fact. Lastly, 88.7% correctly identified avoiding crowded places and public transportation as an essential preventive measure, while 11.3% lacked awareness of this precaution.

Table 3: Respondents Attitude towards COVID-19

Statements	Strongly Agree n (%)	Agree n (%)	Undecided n (%)	Disagree n (%)	Strongly Disagree n (%)
COVID-19 is seriously dangerous	275 (70.3)	106 (27.1)	5 (1.3)	4 (1.0)	1 (0.3)

I am most worried about COVID-19	92 (23.5)	158 (40.4)	58 (14.8)	59 (15.1)	24 (6.1)
I am at high risk of contracting COVID-19 infection	18 (4.6)	67 (17.1)	82 (21.0)	140 (35.8)	84 (21.5)
All white peoples can transmit COVID-19	62 (15.9)	85 (21.7)	56 (14.3)	118 (30.2)	70 (17.9)
Herbal medication can cure COVID-19	11 (2.8)	40 (10.2)	144 (36.8)	129 (33.0)	67 (17.1)
COVID-19 is a curse?	6 (1.5)	14 (3.6)	35 (9.0)	128 (32.7)	208 (53.2)
Taking hot drinks will prevent COVID-19	12 (3.1)	60 (15.3)	71 (18.2)	137 (35.0)	111 (28.4)
COVID-19 will spread in hot climate	23 (5.9)	79 (20.2)	125 (32.0)	127 (32.5)	37 (9.5)
If we have symptoms of COVID-19, we should inform health workers	270 (69.1)	108 (27.6)	6 (1.5)	5 (1.3)	2 (0.5)
All people with COVID-19 are those who violate the government's call in the efforts to prevent transmission of COVID-19	33 (8.4)	65 (16.6)	51 (13.0)	167 (42.7)	75 (19.2)

The respondents' attitudes toward COVID-19 varied across different aspects of the disease and its prevention. A majority (70.3%) strongly agreed that COVID-19 was a seriously dangerous disease, while 27.1% agreed, and only a small proportion (1.3%) remained undecided, with 1.3% disagreeing and strongly disagreeing. Regarding personal concern about COVID-19, 23.5% strongly agreed that they were most worried about the disease, while 40.4% agreed. However, 14.8% were undecided, and 21.2% disagreed to varying extents.

When assessing the perception of personal risk, only 4.6% strongly agreed and 17.1% agreed that they were at high risk of contracting the infection, while 21.0% were undecided. A considerable proportion (57.3%) disagreed or strongly disagreed with the notion that they were at high risk. Misconceptions about COVID-19 transmission were evident, as 37.6% either strongly agreed or agreed with the incorrect belief that all White people could transmit the virus, while 47.9% disagreed or strongly disagreed, and 14.3% remained undecided. Similarly, the belief that herbal medication could cure COVID-19 was held by 13.0%, while 36.8% were unsure, and 50.1% disagreed with this notion. The misconception that COVID-19 was a curse was strongly refuted by most respondents, with 85.9% disagreeing or strongly disagreeing, while only 5.1% agreed and 9.0% were undecided. Similarly, 63.4% rejected the belief that taking hot drinks could prevent COVID-19, while 18.4% agreed, and 18.2% were uncertain. There was also divided opinion on whether COVID-19 could spread in hot climates, with 26.1% agreeing, 32.0% undecided, and 42.0% disagreeing.

Encouragingly, 69.1% of respondents strongly agreed and 27.6% agreed that individuals exhibiting symptoms of COVID-19 should report to health workers, with only a negligible proportion disagreeing or remaining undecided. However, a misconception was observed regarding compliance with government regulations, as 25.0% agreed with the incorrect notion that all individuals who contracted COVID-19 were those who had violated government preventive measures, while 61.9% disagreed, and 13.0% were uncertain.

Table 4: Respondents Adherence to COVID-19 Protocol

Variables	Yes n (%)	No n(%)
Are you using a face mask for prevention?	265 (67.8)	126 (32.2)
Are you washing your hands outside your home after touching shared objects?	324 (82.9)	67 (17.1)
Are you using soap to wash hands? (whenever you wash your hands)	335 (85.7)	56 (14.3)
Are you practicing a social distance or avoiding public gathering?	253 (64.7)	138 (35.3)
Are you practicing handshaking?	216 (55.2)	175 (44.8)
Do you avoid touching face and eyes?	234 (59.8)	157 (40.2)
Are you using antiseptic/sanitizer?	287 (73.4)	104 (26.6)
Have you immediately changed your clothes before entering the house and having contact with family members?	152 (38.9)	239 (61.1)
As a University student, have you educated people around you with the knowledge of the preventive efforts of COVID-19?	262 (67.0)	129 (33.0)
Have taken vitamins or supplements to increase my immune system	270 (69.1)	121 (30.9)
Do you use tissues or hanker chips during coughing/sneezing?	316 (80.8)	75 (19.2)

The adherence to COVID-19 protocols among the respondents revealed a varied degree of compliance across different preventive measures. A majority of respondents (67.8%) reported using face masks for prevention, while 32.2% did not. Hand hygiene was well-practiced, with 82.9% of respondents washing their hands after touching shared objects outside the home, and 85.7% consistently using soap when washing their hands. Social distancing and avoiding public gatherings were followed by 64.7% of the respondents, while 35.3% did not practice these measures. Interestingly, 55.2% of the respondents reported avoiding handshakes, but a significant proportion (44.8%) continued this practice. Regarding face and eye-touching, 59.8% of the respondents refrained from touching their faces, while 40.2% did not follow this guideline. A large proportion (73.4%) used antiseptic or hand sanitizers, but 26.6% did not. In terms of more stringent measures, only 38.9% of respondents changed their clothes immediately upon returning home and before interacting with family members, while 61.1% did not adhere to this practice. Knowledge dissemination about COVID-19 preventive measures was reported by 67.0% of the respondents, who indicated that they educated people around them, while 33.0% did not engage in such efforts. Furthermore, 69.1% of respondents had taken vitamins or supplements to boost their immune systems, while 30.9% had not. Lastly, a significant portion (80.8%) of respondents used tissues or handkerchiefs when coughing or sneezing, while 19.2% did not follow this practice.

Table 5: Barriers to the Adherence of COVID-19 Protocol

		Barrier	
Variables Yes n (%)		No n (%)	Total
Shortage of PPEs	219 (56.0)	172 (44.0)	391
Perception the body's immunity to resist the disease	265 (67.8)	126 (32.2)	391
Confusion about COVID-19	226 (57.8)	165 (42.2)	391
Use of home remedies for prevention	232 (59.3)	159 (40.7)	391

purposes			
Lack of trust on early evidence toward COVID-19	263 (67.3)	128 (32.7)	391
Lifestyles with depression	197 (50.4)	194 (49.6)	391
Ease of movement restriction	241 (61.6)	150 (38.4)	391
Lack of centers for information toward COVID-19	274 (70.1)	117 (29.9)	391
Substance use (alcohol, smoking)	177 (45.3)	214 (54.7)	391
Negligence toward practicing preventive measures	286 (73.1)	105 (26.9)	391
Lack of a confirmed case at nearby or within school community	244 (62.4)	147 (37.6)	391

The study revealed several barriers to adherence to COVID-19 protocols among the respondents. A notable barrier was the shortage of personal protective equipment (PPE), which affected 56.0% of respondents, leaving 44.0% without this challenge. Many respondents (67.8%) perceived their body's immunity as sufficient to resist COVID-19, contributing to non-adherence, while 32.2% did not share this belief. Confusion about COVID-19 was another obstacle, as reported by 57.8% of the respondents, with 42.2% not experiencing this issue. The use of home remedies for prevention purposes was common among 59.3% of respondents, while 40.7% did not resort to such measures. Additionally, a lack of trust in early evidence related to COVID-19 contributed to 67.3% of respondents not fully adhering to recommended protocols. Lifestyles impacted by depression were a barrier for 50.4% of the respondents, while the other half (49.6%) did not cite this factor. The restriction of movement, although significant, was not absolute, as 61.6% of respondents found it easy to bypass, while 38.4% felt constrained. A lack of information centers specifically for COVID-19 education affected 70.1% of respondents, leaving 29.9% without this concern. Substance use, such as alcohol and smoking, was identified by 45.3% of respondents as a barrier to adherence, while 54.7% did not view it as such. Negligence in practicing preventive measures was a significant barrier, reported by 73.1% of respondents, while 26.9% did not demonstrate such negligence. Finally, the absence of confirmed COVID-19 cases nearby or within the school community led to 62.4% of respondents feeling less compelled to adhere to the protocols, while 37.6% were not influenced by the proximity of cases.

Table 6: Factors associated with Knowledge about COVID-19 Knowledge about COVID-19

Variables	Good n (%)	Poor n (%)	Total	x2	p-value
Age group					
>25 years	147 (75.0)	49 (25.0)	196	4.826	0.185
25-29 years	103 (79.2)	27(20.8)	130		
30-34 years	23 (65.7)	12(34.3)	35		
>=35 years	26 (86.7)	4(13.3)	30		
Sex					
Male	165 (79.7)	42 (20.3)	207	2.566	0.109
Female	134 (72.8)	50(27.2)	184		
Religion					
Christian	246 (75.5)	80 (24.5)	326	3.297	0.192

Muslim	48 (80.0)	12(20.0)	60		
Others	5 (100.0)	0(0.0)	5		
Marital status					
Single	271 (76.8)	82 (23.2)	353	0.182	0.670
Married	28 (73.7)	10(26.3)	38		
Faculty					
Arts	58 (81.7)	13 (18.3)	71	6.336	0.175
Education	56 (70.0)	24(30.0)	80		
Law	16 (80.0)	4(20.0)	20		
Sciences	134 (79.8)	34(20.2)	168		
Soc. & Mgt. Sciences	35 (67.3)	17(32.7)	52		

In examining the factors associated with knowledge about COVID-19, the analysis revealed that among respondents older than 25 years, 75.0% exhibited good knowledge, compared to 79.2% in the 25–29-year age group, 65.7% in the 30–34-year group, and 86.7% among those aged 35 years and above; however, these differences were not statistically significant ($\chi^2 = 4.826$, $p = 0.185$). Similarly, the proportion of males with good knowledge (79.7%) was slightly higher than that of females (72.8%), yet this difference did not reach significance ($\chi^2 = 2.566$, $p = 0.109$). When considering religious affiliation, 75.5% of Christians and 80.0% of Muslims demonstrated good knowledge, with all respondents in the 'Others' category showing good knowledge; nonetheless, the association between religion and knowledge was not statistically significant ($\chi^2 = 3.297$, $p = 0.192$). Marital status did not significantly influence knowledge, as 76.8% of single respondents and 73.7% of married respondents had good knowledge ($\chi^2 = 0.182$, $p = 0.670$). Analysis by faculty indicated that 81.7% of respondents from the Faculty of Arts, 70.0% from the Faculty of Education, 80.0% from the Faculty of Law, 79.8% from the Faculty of Sciences, and 67.3% from the Faculty of Social and Management Sciences exhibited good knowledge; however, these differences were not statistically significant ($\chi^2 = 6.336$, $p = 0.175$). Overall, none of the socio-demographic factors examined were significantly associated with the level of knowledge about COVID-19 among the respondents.

Table 7: Significant difference of Attitude score about COVID-19 and socio-demographic characteristics

Variables	n	Mean ± SD	t/ F	p- value
Age group				
>25 years	196	36.6 ± 3.5	1.069	0.362
25-29 years 130	36.9 ± 3.7			
30-34 years 35	37.6 ± 5.1			
>=35 years 30	37.5 ± 3.9			
Sex				
Male	207	36.4 ± 4.0	-2.649	0.004*
Female 184	37.4 ± 3.3			
Religion				
Christian	326	37.0 ± 3.7	2.864	0.058
Muslim 60	36.8 ± 4.0			
Others 5	33.0 ± 1.2			
Marital status				
Single	353	36.8 ± 3.7	-1.768	0.078
Married 38	37.9 ± 4.1			
Faculty				
Arts	71	37.2 ± 3.5	0.378	0.825

Education 80	37.1 ± 3.9	
Law 20	36.5 ± 3.8	
Sciences 168	36.7 ± 3.8	
Soc. & Mgt. 52 Sciences	36.8 ± 3.6	

The analysis of attitude scores toward COVID-19 across socio-demographic characteristics indicated that there was no statistically significant difference among the various age groups, with mean scores ranging from 36.6 ± 3.5 for respondents older than 25 years to 37.6 ± 5.1 for those aged 30–34 years ($F = 1.069$, $p = 0.362$). However, a significant difference was observed between sexes; females had a higher mean attitude score (37.4 ± 3.3) compared to males (36.4 ± 4.0), and this difference was statistically significant ($t = -2.649$, $p = 0.004$). Although differences in attitude scores were also noted based on religion, marital status, and faculty, these differences did not reach statistical significance, with p-values of 0.058, 0.078, and 0.825, respectively.

Table 8: Factors associated with Adherence to COVID-19 Protocol Adherence

Variables	Good	Poor	Total	x2	Total
n (%) n (%)					
Age group					
>25 years	47 (24.0)	149 (76.0)	196	19.141	<0.001**
25-29 years 54 (41.5)	76 (58.5)		130		
30-34 years 11 (31.4)	24 (68.6)		35		
>=35 years 17 (56.7)	13 (43.3)		30		
Sex					
Male	69 (33.3)	138 (66.7)	207	0.023	0.879
Female 60 (32.6)	124 (67.4)		184		
Religion					
Christian	103 (31.6)	223 (68.4)	326	2.674	0.263
Muslim 25 (41.7)	35 (58.3)		60		
Others 1 (20.0)	4 (80.0)		5		
Marital status					
Single	110 (31.2)	243 (68.8)	353	5.507	0.019*
Married 19 (50.0)	19 (50.0)		38		
Faculty					
Arts	24 (33.8)	47 (66.2)	71	9.107	0.058
Education 35 (43.8)	45 (56.3)		80		
Law 7 (35.0)	13 (65.0)		20		
Sciences 43 (25.6)	125 (74.4)		168		
Soc. & Mgt. 20 (38.5)	32 (61.5)		52		
Knowledge group					
Good	106 (35.5)	193 (64.5)	299	3.476	0.062
Poor 23 (25.0)	69 (75.0)		92		

Table 8 illustrates the association between various socio-demographic factors and adherence to COVID-19 protocols. Age emerged as a significant determinant of adherence, with a chi-square value of 19.141 ($p < 0.001$); respondents aged 35 years and above exhibited the highest

adherence rate at 56.7% good adherence, while those over 25 years had the lowest rate at 24.0%. In contrast, sex did not significantly influence adherence, as 33.3% of male respondents and 32.6% of female respondents demonstrated good adherence (p = 0.879). Similarly, religious affiliation did not show a significant association, with 31.6% of Christians, 41.7% of Muslims, and 20.0% of respondents from other religions exhibiting good adherence (p = 0.263). Marital status was significantly associated with adherence (p = 0.019), with married respondents reporting a 50.0% rate of good adherence compared to 31.2% among single respondents. Although differences in adherence were noted across faculties—with the Faculty of Education reporting the highest good adherence rate at 43.8% and the Faculty of Sciences the lowest at 25.6%—these differences did not reach statistical significance (p = 0.058). Furthermore, while there was a trend indicating that respondents with good knowledge about COVID-19 (35.5%) were more adherent compared to those with poor knowledge (25.0%), this association was marginally non-significant (p = 0.062).

Table 9: Barriers associated with Adherence to COVID-19 Protocol Adherence

Variables	Good n (%)	Poor n (%)	Total	*X2*	P value
Shortage of PPEs					
Yes	73 (33.3)	146 (66.7)	219	0.026	0.871
No	56 (32.6)	116 (67.4)	172		
Perception the body's immunity to resist the disease					
Yes	89 (33.6)	176 (66.4)	265	0.131	0.718
No	40 (31.7)	86 (68.3)	126		
Confusion about COVID-19					
Yes	77 (34.1)	149 (65.9)	226	0.282	0.596
No	52 (31.5)	113 (68.5)	165		
Use of home remedies for prevention purposes					
Yes	76 (32.8)	156 (67.2)	232	0.014	0.905
No	53 (33.3)	106 (66.7)	159		
Lack of trust on early evidence toward COVID-19					
Yes	87 (33.1)	176 (66.9)	263	0.003	0.958
No	42 (32.8)	86 (67.2)	128		
Lifestyles with depression					
Yes	63 (32.0)	134 (68.0)	197	0.184	0.668
No	66 (34.0)	128 (66.0)	194		
Ease of movement restriction					
Yes	83 (34.4)	158 (65.6)	241	0.595	0.440
No	46 (30.7)	104 (69.3)	150		
Lack of centers for information toward COVID-19					
Yes	95 (34.7)	179 (65.3)	274	1.168	0.280
No	34 (29.1)	83 (70.9)	117		
Substance use (alcohol, smoking)					
Yes 58 (32.8)		119 (67.2)	177	0.007	0.932
No	71 (33.2)	143 (66.8)	214		
Negligence toward practicing preventive measures					
Yes	91 (31.8)	195 (68.2)	286	0.664	0.415
No	38 (36.2)	67 (63.8)	105		
Lack of a confirmed case at nearby or within school community					
Yes	75 (30.7)	169 (69.3)	244	1.492	0.222
No	54 (36.7)	93 (63.3)	147		

The analysis of barriers associated with adherence to COVID-19 protocols indicated that none of the examined factors were significantly associated with adherence levels. For instance, respondents who reported a shortage of personal protective equipment exhibited a good adherence rate of 33.3%, which was comparable to the 32.6% among those who did not report such a shortage (χ^2 = 0.026, p = 0.871). Similarly, the perception that one's immunity was sufficient to resist the disease was associated with good adherence in 33.6% of respondents compared to 31.7% among those without this perception (χ^2 = 0.131, p = 0.718). Confusion about COVID-19, use of home remedies for prevention, and lack of trust in early evidence regarding the disease also did not show significant differences in adherence, with p-values of 0.596, 0.905, and 0.958, respectively. In addition, lifestyles affected by depression, ease of movement restrictions, and the absence of dedicated information centers were not significantly associated with adherence, as evidenced by p-values of 0.668, 0.440, and 0.280. Substance use, negligence toward practicing preventive measures, and the lack of a confirmed case in the nearby or school community also did not yield significant differences in adherence outcomes, with p-values of 0.932, 0.415, and 0.222, respectively. Overall, these findings suggest that the examined barriers did not significantly influence whether respondents adhered to COVID-19 protocols.

Table 10: Significant difference of Attitude score about COVID-19 and knowledge and Adherence

Variables	n	Mean ± SD	t	p- value
Knowledge				
Good	299	36.7 ± 3.8	-1.921	0.055
Poor 92	37.5 ± 3.4			
Adherence				
Good	129	37.2 ± 3.8	1.306	0.192
Poor 262	36.7 ± 3.7			

The analysis of attitude scores in relation to respondents' levels of knowledge revealed that those with good knowledge had a mean attitude score of 36.7 ± 3.8, whereas respondents with poor knowledge exhibited a slightly higher mean score of 37.5 ± 3.4. This difference approached statistical significance (t = -1.921, p = 0.055). In contrast, when examining adherence to COVID-19 protocols, respondents with good adherence recorded a mean attitude score of 37.2 ± 3.8, while those with poor adherence had a mean score of 36.7 ± 3.7; however, this difference was not statistically significant (t = 1.306, p = 0.192).

Table 11: Multiple linear regression of factors associated with Attitude

Variables	Coefficient	95% CI lower limit	95% CI upper limit	p- value
Sex				
Male (ref)				
Female	0.9	0.2	1.6	0.016*
Religion				
Christian (ref)				
Muslim	-0.2	-1.2	0.8	0.729
Others	-3.6	-6.9	-0.4	0.029*
Marital status				
Single (ref)				
Married	1.1	-0.2	2.3	0.090
Knowledge				
Poor (ref)				
Good	-0.7	-1.6	0.	0.122

The multiple linear regression analysis indicated that, after controlling for other factors, female respondents had an attitude score that was 0.9 points higher than their male counterparts, a difference that was statistically significant (95% CI: 0.2 to 1.6, p = 0.016). In terms of religion, respondents who identified as "Others" had an attitude score that was 3.6 points lower compared to Christians (95% CI: -6.9 to -0.4, p = 0.029), while the difference between Muslims and Christians was not statistically significant (coefficient = -0.2, 95% CI: -1.2 to 0.8, p = 0.729). Marital status also appeared to influence attitude scores, with married respondents scoring 1.1 points higher than single respondents; however, this difference did not reach statistical significance (95% CI: -0.2 to 2.3, p = 0.090). Additionally, respondents with good knowledge about COVID-19 had an attitude score that was 0.7 points lower than those with poor knowledge, although this difference was not statistically significant (95% CI: -1.6 to 0, p = 0.122).

Table 12: Adjusted logistics regression of factors associated with Adherence

Variables	Odds ratio	95% CI lower limit	95% CI upper limit	p- value
Age group				
>25 years (ref)				
25-29 years	2.0	1.2	3.2	0.008*
30-34 years	1.3	0.6	3.1	0.527
>=35 years	2.9	1,1	8.2	0.049*
Marital status				
Single (ref)				
Married	1.4	3.6	0.6	0.488
Faculty				
Arts (ref)				
Education	1.5	0.8	3.0	0.247
Law	1.1	0.3	3.1	0.953
Sciences	0.7	0.4	1.4	0.314
Soc. & Mgt. Sciences	1.3	0.6	2.7	0.569
Knowledge				
Poor (ref)				
Good	1.7	1.0	3.0	0.057
Knowledge				
Poor (ref)				
Good	1.7	1.0	3.2	0.057

Adjusted logistic regression analysis indicated that respondents aged 25–29 years had twice the odds of demonstrating good adherence to COVID-19 protocols compared to those older than 25 years, with an odds ratio of 2.0 (95% CI: 1.2–3.2, p = 0.008). Similarly, respondents aged 35 years and above exhibited significantly higher odds of adherence (OR = 2.9, 95% CI: 1.1–8.2, p = 0.049), whereas the 30–34-year age group did not differ significantly from the reference group (OR = 1.3, 95% CI: 0.6–3.1, p = 0.527). Marital status did not significantly affect adherence, as married respondents had an odds ratio of 1.4 relative to single respondents (p = 0.488). Comparisons across faculties revealed no statistically significant differences in adherence, with Education (OR = 1.5, 95% CI: 0.8–3.0, p = 0.247), Law (OR = 1.1, 95% CI: 0.3–3.1, p = 0.953), Sciences (OR = 0.7, 95% CI: 0.4–1.4, p = 0.314), and Social & Management Sciences (OR = 1.3, 95% CI: 0.6–2.7, p = 0.569) not differing significantly from the reference category of Arts. Although respondents with good knowledge about COVID-19 had an odds ratio of 1.7 for good adherence compared to those with poor knowledge, this association approached but did not achieve statistical significance (95% CI: 1.0–3.2, p = 0.057).

Discussion

Nigeria, the most populous country in Africa, had a history of successfully containing outbreaks of emerging and re-emerging diseases such as poliomyelitis, avian influenza, African swine fever, yellow fever, Lassa fever, and Ebola virus disease (Isere et al., 2015). However, the unprecedented COVID-19 pandemic posed unique challenges due to the country's rich culture of social interaction and the daily income-dependent lifestyle of many Nigerians. Measures such as movement restrictions, physical and social distancing, closure of schools and religious centers, and the mandatory use of face masks greatly impacted the population (Olapegba et al., 2020). University students in Nigeria, representing a significant segment of the young generation, experienced direct disruptions to their daily lives and academic activities. Although they generally had less financial independence compared to the broader adult workforce, their relatively greater free time and wider range of activities made them a particularly interesting group to study. This period is crucial for personal development, and university students often rely on their self-judgment when making decisions, including those related to health and safety. Given the influence of knowledge and attitude on adherence to government guidelines and preventive measures, this study sought to evaluate these factors among postgraduate students at the University of Ibadan.

The findings indicated that a substantial proportion of students (76.5%) demonstrated good knowledge about COVID-19. This result was higher than that reported in some studies from Indonesia (Olum et al., 2020) and surpassed the figures obtained from research conducted in Bangladesh (Kumar et al., 2020). Respondents correctly identified key aspects of COVID-19, with high percentages providing accurate responses on etiology (95%), clinical symptoms (91.1%), and management (99%). However, gaps in knowledge were observed concerning the transmission of COVID-19, particularly regarding the potential for virus spread from dead bodies of COVID-19 patients; only 11% of the students correctly recognized the risks in this area. Although official protocols for the safe burial of COVID-19 victims had been issued by the Indonesian Ministry of Health, misinformation persisted among the respondents. In addition, while most students understood that COVID-19 transmission occurred primarily through respiratory droplets and contact with contaminated surfaces, a minority (18.6%) mistakenly believed that the virus spread exclusively through fomites rather than through the air, contradicting established evidence (Berhan, 2020). These gaps underscore the importance of continuous education, as an accurate understanding of transmission is crucial for effective adherence to preventive practices.

Attitude toward COVID-19 and its prevention was evaluated, revealing that a very small proportion of participants exhibited a positive attitude; only 1.0% demonstrated a favorable disposition towards the disease and its prevention measures. This finding was consistent with studies conducted in Iran (Erfani, 2020) but was considerably lower than the 61.5% observed in a study from Thailand (Srichan et al., 2020). The temporal context of the studies and the unique characteristics of postgraduate students might explain these discrepancies, particularly in light of the global crises and fatalities that had occurred between the two studies. Despite the low overall attitude scores, a majority of respondents recognized the importance of preventive measures such as wearing masks, frequent handwashing with soap, and the use of hand sanitizers, aligning with findings from studies in China (Zetzsche, 2020) and Indonesia (Olum et al., 2020).

Multiple linear regression analysis further revealed that female respondents had significantly higher attitude scores compared to male respondents, a finding that is consistent with observations from studies among Saudi and Egyptian populations (Almutairi et al., 2020; Hamza et al., 2021). In contrast, while a higher level of knowledge about COVID-19 generally correlated with better adherence to preventive measures (Olapegba et al., 2020), this study observed only marginal differences in adherence between those with good and poor knowledge.

Regarding adherence to COVID-19 protocols, the study found that only 33% of respondents practiced the measures favorably. Although 67.8% of participants reported using face masks for

prevention, this was substantially lower than the rates observed in studies conducted in Taiwan and Malaysia, where face mask usage exceeded 90% (Peeradone et al., 2021; Azlan et al., 2021). In contrast, hand hygiene practices, such as avoiding handshaking and regular handwashing with soap, were more commonly reported. These practices were likely more acceptable given their lower cost and ease of implementation compared to other preventive measures. Nevertheless, the reuse of disposable face masks, driven by economic constraints and the scarcity of personal protective equipment, remains a public health concern, as repeated use can diminish the protective efficacy of these masks (WHO, 2021).

Barriers to adherence identified in this study included the shortage of PPEs, the perception of adequate personal immunity, confusion about COVID-19, and the use of home remedies for prevention. These findings were consistent with those of previous studies conducted by Ferdous et al. (2020), Qutob and Awartani (2021), and Lee et al. (2020). Moreover, limited understanding of social distancing measures and inadequate access to updated information further hindered effective adherence. This lack of awareness is particularly problematic in Nigeria, where communal living conditions make the implementation of social distancing challenging. The study also found significant associations between adherence to COVID-19 protocols and certain socio-demographic factors. Specifically, age and marital status emerged as significant predictors, with respondents in the older age groups and those who were married exhibiting higher rates of adherence. Adjusted logistic regression analysis indicated that respondents aged 25–29 years and those aged 35 years and above were significantly more likely to adhere to the protocols compared to those older than 25 years, suggesting that age played a pivotal role in influencing preventive behavior. This is in line with a similar study by Tawose et al,(2023) where they found that age, marital status, and education had a significant effect on level of compliance and adherence.

Conclusion

This study provided evidence that demographic factors were essential predictors of knowledge, attitudes, and practices regarding COVID-19, thereby contributing to the development of intervention strategies aimed at promoting and sustaining community safety during the pandemic. The results of the proportional odds model indicated that socio-demographic variables and related factors were critical determinants of knowledge, with respondent age, educational level, and occupation having statistically significant effects on knowledge outcomes. In addition, the findings revealed that age and gender significantly influenced attitudes, while the partial proportional odds model demonstrated that socio-demographic factors were also important determinants of practice. Moreover, the study showed that various factors, including respondents' gender and attitude, had a statistically significant effect on practice outcomes. The results of this investigation were considered promising for addressing practical challenges in COVID-19 prevention within urban settings. In light of these findings, it was recommended that the government, in partnership with academia, civil society, and the media, launch a comprehensive campaign employing innovative strategies tailored to different population groups. Given the widespread access to information via electronic and print media, efforts should be made to reduce knowledge inequalities among those with limited health knowledge. Furthermore, additional studies were encouraged among other groups outside university communities, such as less educated, more rural populations, and those without internet access, in order to obtain a clearer picture of COVID-19-related knowledge, attitudes, and practices and to develop appropriate interventions. Healthcare providers were also urged to play an active role in addressing these concerns by increasing awareness about the importance of vaccination in preventing the spread of infection and achieving herd immunity.

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