Compliance with Non-Pharmacological Measures of Prevention against Covid-19 Infection among Undergraduate Students in a Nigerian University

Alphonsus Rukevwe Isara*, Amenze Judith Osayande, Joshua Oreoluwa Orifunmishe, Mary-Jane Obehi Onohaebi
Department of Community Health, University of Benin, Benin City, Nigeria

Abstract

Non-pharmaceutical interventions (NPIs) such as wearing a facemask in public, effective hand hygiene, cough etiquette, physical distancing, and voluntary self-isolation are critical in the prevention and control of Covid-19. This study was carried out to assess compliance with NPIs against Covid-19 among undergraduate students at the University of Benin, Benin City, Nigeria. A multi-stage sampling technique was used to recruit 600 students for this cross-sectional study. Data was collected using a structured, self-administered questionnaire and analyzed using SPSS version 25. The mean age of students was 22.0 ± 3.3 years. Overall, 340 (56.7%) respondents had a good knowledge of NPIs against Covid-19, 395 (65.8%) had a positive attitude towards NPI, majority, 345 (90.8%), had poor compliance with of NPIs. The student's level of study (p=0.009) and faculty (p=0.002) were statistically significantly associated with their knowledge of NPIs. This study showed fair knowledge, and an encouraging positive attitude but sub-optimal compliance with NPIs in the prevention and control of Covid-19 among the undergraduate students studied. The University of Benin authority should institute measures aimed at the continuous education of undergraduate students on the importance of compliance with NPIs targeted against Covid-19.

Keywords: *Covid-19, Non-pharmacological interventions, University undergraduates, Nigeria.*

Introduction

Covid-19 is a disease caused by a novel strain of coronavirus. The former name "2019 novel coronavirus" was officially changed on February 11, 2020, by the World Health Organization (WHO) to its present name [1]. This novel coronavirus strain is called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [2]. Covid-19 is a serious disease that has infected over 506 million people, with over 6.2 million deaths globally. Many survivors face severe long-term health impacts [3].

Coronaviruses have been identified as a large group of enveloped, positive-sense RNA viruses with club-like spikes projecting from their surfaces [4]. These viruses mostly circulate in animals such as bats, camels, pigs, and cats, but during a spillover event, they can infect humans to cause mild to moderate upper-respiratory tract illnesses. Seven of them have been identified to infect man, and three of them can cause more fatal diseases; SARS coronavirus (emerged in November 2002), Middle East Respiratory Syndrome coronavirus (MERS-CoV; emerged in September 2012), and the novel SARS-CoV-2 [5]. The virus is transmitted through direct contact with infected respiratory droplets generated from individuals while coughing, sneezing, talking, and even singing or touching contaminated surfaces and their faces (e.g., eyes, nose, mouth). Covid-19 has an incubation period ranging from one to fourteen days, with its symptoms including fever, dry cough, dyspnea,

headache, sore throat, rhinorrhea and sometimes hemoptysis [6].

Covid-19 was declared a public health emergency of international concern on January 30, 2020, amid the rising cases, and was declared a global pandemic by the WHO on March 11, 2020 [5]. Since then, Covid-19 has relentlessly spread around the world, with nearly 200 countries being affected. The African continent has over 8.7 million cases and more than 171,000 deaths, with South Africa, Ethiopia and Nigeria having leading numbers of confirmed cases in sub-Saharan Africa [3].

Regardless of the availability of Covid-19 vaccines, non-pharmaceutical interventions (NPIs) such as wearing a facemask in public, effective hand hygiene, and physical distancing remain the mainstay for prevention and control of the virus [2]. This is mainly due to scarcity and uneven distribution of the vaccine supplies, lack of evidence-based information on the degree to which the vaccines can protect against infection, disease, and transmission, and hesitancy of individuals towards receiving the vaccine.

Compliance with these non-pharmacological measures is influenced by the knowledge and attitude of individuals and intricate interaction between several modifiable and non-modifiable factors [7,8]. The effectiveness of the non-pharmacological measures to control the spread of SARS-CoV-2 largely depends on public compliance. It is, therefore, necessary to assess the level of compliance of individuals with these measures. Thus, the objective of this study was to assess compliance with the non-pharmacological measures of prevention against Covid-19 infection among undergraduate students at the University of Benin, Benin City, Nigeria.

Materials and Methods

Study Design, Setting, and Population

This descriptive, cross-sectional study was carried out among undergraduate students at the University of Benin, Benin City, Nigeria. The university was established in 1971 and offers both undergraduate and postgraduate courses in 15 faculties. As at the time of the study, the student enrolment stands at over 75,000. Only full-time undergraduate students selected from all the faculties were included in the study.

Sample Size Determination

The minimum sample size required for this study was determined statistically by applying the population proportion sample size determination formula (Cochran formula) in which a design effect was factored into the calculation while taking into consideration the sampling technique (multi-stage technique) [9,10]. After making the following assumptions: a confidence interval of 95%; the estimate of the expected proportion (p) of 17.6% being the proportion of undergraduate students complied with the protocol of wearing and removing facemask among those who used facemask, in a previous study carried out in a university in South-South, Nigeria [11], a desired level of absolute precision (d) of ± 5%, a design effect of 2, and a non-response rate of 5%, the calculated sample size was 585. This was rounded up to 600 in this study.

Sampling Technique

A multi-stage sampling technique comprising of three stages was used to recruit the students for this study. Stage one: Selection of Departments. A department was selected from each of the 15 faculties in the university. The faculties of law, veterinary medicine, medicine, and dentistry was taken as a department. A list of the departments of the remaining 11 faculties was obtained from the university brochure, from which one department was selected using a simple random sampling technique by balloting.

Stage two: Selection of academic level. Each department is comprised of levels ranging from 100 to 600, corresponding to the year of study. A simple random sampling technique by balloting was used to select one academic level from each of the selected departments.

Stage three: Selection of respondents. A systematic sampling technique was used to select the students from the class list (sampling frame) of the selected academic level. The sampling interval (k) was calculated by dividing the total number of students in the selected academic level (N) with a sample size allocated to that faculty (n). The first respondent in the level was selected by simple random sampling within the sampling interval. Subsequently, every nth student was recruited for the study until the sample size allocated to the respective faculty is reached. Students were selected in each of the faculties proportional to the student population in the faculties relative to the total undergraduate student population of the university.

Data Collection

Data collection was done using a structured, pre-tested, self-administered questionnaire. The questionnaire was pre-tested among 60 undergraduate students of Benson Idahosa University, a private university in Benin City, Nigeria. The questionnaire consisted of four sections, namely: Section one: Socio-demographic characteristics of the students. This included the students' age, sex, marital status, faculty, and academic level. Section two: Assessment of knowledge of the use of non-pharmacological measures in the prevention and control of Covid-19. Section three: Assessment of the attitude towards the use of non-pharmacological measures in the prevention and control of Covid-19. Section four: Assessment of the students' practice of the various components of non-pharmacological measures in the prevention and control of Covid-19: use of face masks, cough etiquette, hand hygiene, physical distancing, and voluntary self-isolation.

Statistical Analysis

The data obtained were sorted and screened for completeness and accuracy of information, after which they were coded and analyzed using IBM SPSS version 25.0 (IBM Corp, Armonk,

NY, USA). An initial univariate analysis was done for all the variables to determine their distribution. A bivariate analysis was carried out using the Chi-square test to determine the association between the independent variables (socio-demographic characteristics), and the knowledge of the non-pharmacological measures in the prevention and control of Covid-19. The questions used for knowledge were scored as follows: a score of 1 was given to a correct response, and a score of 0 was given to a wrong response. The maximum scores obtained by each student was used converted to a percentage and used to categorize them into good (score ≥ 80 %) and poor knowledge (score < 80 %). For the bivariate analysis, the faculty of the students were grouped into three categories as follows: Medical/Health Sciences (Medicine, Dentistry, Pharmacy, Basic Medical Sciences, and Veterinary Medicine), Pure Sciences (Engineering, Life Sciences, Physical Sciences, Agricultural Sciences, and Environmental Science), and Arts/Humanities (Arts, Social Sciences, Management Sciences, Law, and Education). A p-value less than 0.05 were considered statistically significant. Six questions were used to assess the attitude toward the non-pharmacological measures in the prevention and control of Covid-19. A three-point Likert scale was used to assess the responses provided. The correct answers were given a score of 1 and the least correct answers were given a score of 0. A maximum score of 6 was achievable. Scores ≥ 5 were grouped as a positive attitudes, while negative attitudes were grouped as ≤ 4.

Results

A total of 600 undergraduate students participated in the study. Their socio-demographic characteristics is shown in Table 1. The mean age of the students was 22.0 ± 3.3 years, with half of them aged 21 – 25 years. A higher proportion 331 (55.2%) were males, in 300 level 247 (41.2%), and from the faculty of education 113 (18.8%). Most of the students, 582 (97.0%) were single.

Table 1. Socio-demographic Characteristics of the Students

Variables	Frequency (n = 600)	Percent
Age group (years)		
16-20	227	37.8
21-25	300	50.0
26-30	64	10.7
>30	9	1.5
Mean age: 22.0 ± 3.3		
Sex		
Male	331	55.2
Female	269	44.8
Level of study		
100	92	15.3
200	126	21.0
300	247	41.2
400	35	5.8
500	88	14.7
600	12	2.0
Faculty		
Agriculture	26	4.3
Arts	93	15.5
Basic Medical Sciences	35	5.8
Dentistry	2	0.3
Education	113	18.8
Engineering	58	9.7
Environmental Sciences	13	2.2
Law	12	2.0
Life Sciences	78	13.0
Management Science	47	7.8
Medicine	12	2.0
Pharmacy	16	2.7
Physical Sciences	53	8.8
Social Sciences	41	6.8
Veterinary Medicine	1	0.2
Marital status		
Single	582	97.0
Married	18	3.0

Table 2 shows the students' knowledge of the non-pharmacological measures of non-pharmacological measures of prevention and control of Covid-19. Although the majority, 516 (86.0%) of them, knew that facemasks should snugly fit the nose, mouth, and chin, a few 34 (5.7%) said facemasks should be worn only around sick people. The majority knew the meaning of cough etiquette (87.3%) and the importance of running water and soap in hygiene (78.2%), but only 220 (36.7%) and 408 (68.0%) knew the correct meaning of physical distancing

and duration of Covid-19 quarantine respectively. Overall, a little more than half, 340 (56.6%) of the students had good knowledge of NPIs in the prevention and control of Covid-19.

Table 2. Knowledge of the Non-Pharmacological Measures of Non-Pharmacological Measures of Prevention and Control of Covid-19 among the Students

Variables (n = 600)	Frequency	Percent
Proper use of face masks		
Should snugly fit the nose, mouth, and chin	516	86.0
Should be worn only around sick people	34	5.7
Can be substituted with face shield	50	8.3
Cough etiquette		
Covering of mouth and nose with a tissue when coughing/sneezing	524	87.3
Throw used tissues at any convenient location	43	4.2
In the absence of tissue, coughing and sneezing into your hands	33	5.5
Hand hygiene		
Running water and soap are important	469	78.2
Hands should be washed for at least 10 seconds	57	9.5
20% alcohol-based sanitizers can be used	74	12.3
Physical distancing		
Spacing people at least 1m apart	251	41.8
Spacing people at least 2m apart	220	36.7
Spacing people at least 3m apart	129	21.5
Duration of Covid-19 quarantine		
1 week	117	19.5
2 weeks	408	68.0
3 weeks	75	12.5
Overall knowledge		
Good	340	56.7
Poor	260	43.3

The bivariate analysis showed that of all the socio-demographic characteristics, the level of study ($p = 0.009$) and faculty ($p = 0.002$) of the students was statistically significantly associated with their knowledge of NPIs. A higher proportion of students in the higher level of study and those in the medical/health sciences faculty were more knowledgeable in NPIs in the prevention and control of Covid-19 (Table 3).

Table 3. Socio-demographic Characteristics and Knowledge of Non-pharmacological Measures of Prevention and Control of Covid-19

Variables	Knowledge of NPIs		χ^2	p-value
	Good n (%)	Poor n (%)		
Age group (years)				
16-20	124 (54.6)	103 (45.4)	1.34	0.719
21-25	174 (58.0)	126 (42.0)		

26-30	38 (59.4)	26 (40.6)		
> 30	4 (44.4)	5 (55.6)		
Sex				
Male	177 (53.5)	154 (46.5)	3.064	0.080
Female	163 (60.6)	106 (39.4)		
Level of study				
100	43 (46.7)	49 (53.3)	15.306	**0.009**
200	69 (54.8)	57 (45.2)		
300	149 (60.3)	98 (39.7)		
400	26 (74.3)	9 (25.7)		
500	43 (48.9)	45 (51.1)		
600	10 (83.3)	2 (16.7)		
Faculty				
Medical/Health Sciences	48 (72.7)	18 (27.3)	12.038	**0.002**
Physical/Life Sciences	113 (49.6)	115 (50.4)		
Arts/Humanities	179 (58.5)	127 (41.5)		
Marital status				
Single	331 (56.9)	252 (45.1)	0.114	0.735
Married	9 (50.0)	9 (50.0)		

Most 553 (92.2%) of the students agreed that non-pharmacological measures are important mitigation strategies to help control the Covid-19 pandemic. Similarly, the majority 525 (87.5%) of them, agreed that it is important to wear a mask and quarantine when one develops symptoms. However, 62 (10.3%) do not know that coughing and sneezing directly into the air is not advisable. Overall, two-thirds of 395 (65.8%) of the students demonstrated a positive attitude towards the NPIs in the prevention and control of Covid-19 (Table 4).

Table 4. Attitude of the Students towards the Non-Pharmacological Measures of Prevention and Control of Covid-19

Variables (n = 600)	Agree	Don't know	Disagree
	n (%)	n (%)	n (%)
Non-pharmacological measures are important mitigation strategies to help control the pandemic	553 (92.2)	35 (5.8)	12 (2.0)
Physical distancing is not important in the lecture halls	63 (10.5)	109 (18.2)	428 (71.3)
Wearing facemasks should not be made mandatory	107 (17.8)	136 (22.7)	357 (59.5)
Hands should be washed only when visibly soiled or dirty	72 (12.0)	60 (10.0)	468 (78.0)
Coughing and sneezing directly into the air is not advisable	519 (86.5)	62 (10.3)	19 (3.2)
It is important to wear a mask and quarantine when one develops symptoms	525 (87.5)	50 (8.3)	25 (4.2)
Overall attitude	**Frequency**		**Percent**

Positive	395	65.8
Negative	205	34.2

The practice of non-pharmacological measures of prevention and control of Covid-19 among the students is shown in Table 5. The majority of 490 (81.7%) admitted the use of facemasks, but more than half of them 291 (59.4%) pulled their facemasks down when talking to people. Similarly, 441 (73.5%) cough/sneeze into a handkerchief/disposable tissue, but 197 (32.8%) and 241 (40.2%) cough/sneeze into the air and into their hands, respectively. Good hand hygiene (washing hand with running water and soap) was practiced by 306 (51.0%) and 459 (82.5%) of the students after coughing and using the toilets, respectively. Concerning physical distancing, the majority 514 (85.7%) of the students, reported being in a crowded place in the last 7 days prior to study while only less than a third 189 (31.5%) observed physical distancing in lecture theatres. The majority of 411 (81.2%) of students who have not been tested for Covid-9 expressed willingness to self-isolate if they developed the symptoms of Covid-19. Of almost all those who have tested positive for Covid-19, 12 (92.3%) reported that they self-isolated.

Table 5. Practice of non-Pharmacological Measures of Prevention and Control of Covid-19

Variables	Frequency	Percent
Face masks		
Use of face masks (n = 600)	490	81.7
Pulling facemask down to chin when talking to people (n = 490)	291	59.4
Wash used disposable facemasks for reuse (n = 490)	184	37.6
Wash hands before wearing facemasks (n = 490)	132	26.9
Wash hands after taking off facemasks (n = 490)	129	26.3
Cough etiquette (n = 600)		
Cough or sneeze into the air	197	32.8
Cough or sneeze into hands	241	40.2
Cough or sneeze into a handkerchief/disposable tissue	441	73.5
Cough or sneeze into elbow	398	66.3
Good hand hygiene (n = 600)		
After coughing	306	51.0
After using the toilet	459	82.5
After caring for a sick person	275	45.8
Before eating	350	58.3
While preparing food	328	54.7
After handling pets and their waste	239	39.8
Touching common public places	329	54.8
Ownership of personal hand sanitizer	398	66.3
Physical distancing (n = 600)		
Been in a crowded place in the last 7 days prior to study	514	85.7
Wore facemask in crowded places	378	63.0

Observed physical distancing in lecture theatres	189	31.5
Self-isolation if they have symptoms of Covid -19		
Students who have never had a Covid -19 Test (n = 510)	414	81.2
Students with a Negative Covid -19 Test (n = 77)	63	81.8
Students with a Positive Covid -19 Test (n = 13)	12	92.3

Discussion

The WHO recent estimate showed that "the full death toll associated directly or indirectly with the Covid-19 pandemic (described as "excess mortality") between 1st January 2020 and 31st December 2021 was approximately 14.9 million" [12]. This figure is nearly five times the recorded number of mortalities from Covid-19 globally. NPIs are critical in controlling the Covid-19 pandemic and other infectious diseases and in better preparation for future pandemics. This study has revealed fair knowledge, an encouraging positive attitude but sub-optimal compliance with NPIs in the prevention and control of Covid-19 among the undergraduate students studied.

The finding of a little more than half of the students having good knowledge of NPIs was not encouraging because this study was carried out in an academic environment among young people who are supposed to be versed in topical issues. This may probably be due to several myths and misconceptions surrounding the Covid-19 pandemic and the misinformation from social media concerning the NPIs, as these groups of individuals are very active on the internet and rely on it for information daily. Poor knowledge of the NPIs has serious public health implications as it may limit the practice of these measures and hence favour the spread of Covid-19 within the school environment. Studies in Nigeria reported a better knowledge of NPIs among the general population [13, 14] compared to our findings among undergraduate students. This underscores the need for university authorities to regularly educate their students to always verify information gotten from social

media/internet, especially with regards to NPIs in the prevention of Covid-19 and other infectious diseases, so that they do not believe whatever they read in the internet hook, line, and sinker.

Unsurprisingly, students in medical/health sciences faculties were significantly more knowledgeable about NPIs in the prevention and control of Covid-19. This could be due to the nature of their training and their exposure to health information compared to other undergraduate students. This finding is important because students in medical/health sciences may have day-to-day encounters with patients in hospitals where the risk of contracting the disease is high. Knowledge of these preventive measures may create an inner consciousness for them to utilize these measures to protect themselves from contracting Covid-19 infection. In addition, this positive finding can be explored to commission students of medical/health sciences faculty to educate other students on the NPIs in the prevention and control of Covid-19 through a peer-education strategy.

This study revealed that a higher proportion of the respondents had a positive attitude towards the NPIs in the prevention and control of Covid-19. This reflects the findings in the general population in Nigeria and Pakistan in which studies have shown that residents generally had positive attitudes towards preventive measures against Covid-19 [15, 16]. A positive attitude is a precursor to good practice. Thus, this positive attitude demonstrated by most of the undergraduate students could serve as a veritable tool for the management of the university in the design of

social and behaviour change communication strategies that will improve compliance to NPIs in the prevention and control of Covid-19 in the university community.

In this study, compliance with NPIs was generally poor across the five domains as exemplified by significant proportions of the students not using their facemasks properly, exhibiting poor cough etiquette and hand hygiene and disregard for physical distancing, and so on. The reason for this finding may probably be due to low-risk perception among the students who are young adults and apparently healthy. They may be capitalizing on the fact that Covid-19 causes a more severe illness in older people and those with co-morbidities. This worrisome finding has serious implications in preventing and controlling Covid-19 because young people can contract Covid-19 and spread it to people in the high-risk population.

Another probable reason for our finding is the fact that poor compliance with NPIs may have dovetailed from the general population into the university community, as many studies in Nigeria showed that residents in the general population, including healthcare workers, fared very poorly in the use of Covid-19 preventive measures [17-20]. This may not be unconnected with cultural beliefs, low-risk perceptions, financial constraints to procure NPI commodities such as facemasks and alcohol-based hand sanitizers, and relaxation of government policies on restrictions after the first wave of the Covid-19 pandemic. Again, all these are factors that could militate against the effective use of NPIs in the prevention and control of Covid-19 infection.

The low level of compliance with NPIs in our study is comparable to a study in South-South, Nigeria, which showed very low effective use of

facemasks among university students [11]. Studies in Ethiopia [21] and Egypt [22] also revealed a low level of adherence to Covid-19 preventive measures among university students.

Limitation

Data collection using a self-administered questionnaire may be prone to both information and recall bias.

Conclusion

This study showed that a little above half of the undergraduate students at the University of Benin had good knowledge of non-pharmacological preventive measures against Covid-19. Students in a higher level of study and those in the medical/health sciences faculty were more knowledgeable about the NPIs. Although a higher proportion of the students had a positive attitude towards the NPIs, their practice of the measures was generally poor. We recommend that the university authority should institute measures aimed at the continuous education of undergraduate students on the importance of compliance with NPIs targeted against Covid-19. The benefit of this will go beyond the Covid-19 pandemic because of the universal applicability of NPIs in the prevention and control of infectious diseases.

Conflict of Interest

The authors have no conflict of interest declare.

References

[1] Center for Disease Control and Prevention, 2020, About Covid-19. [cited 2021 Feb. 21]. Available

from https://www.cdc.gov/coronavirus/2019-nCoV/index.html.

[2] World Health Organization, 2020, Coronavirus disease 2019 (COVID-19) Situation Report - 94,

WHO, Geneva. [cited 2021 Feb. 21] Available from https://apps.who.int/iris/bitstream/handle/10665/331 865/nCoVsitrep23Apr2020-eng.pdf?sequence=1&isAllowed=y

[3] World Health Organization, 2022, WHO Coronavirus Dashboard, WHO, Geneva, [cited 2022 Apr. 28]. Available from https://Covid19.who.int/.

[4] Fehr, A. R., Perlman, S., 2015, Coronaviruses: an overview of their replication and pathogenesis, Methods. *Mol Biol*, 282:1-23, DOI: 10.1007/978-1-4939-2438-7_1.

[5] National Institute of Allergy and Infectious Diseases, 2020, Coronaviruses. National Institute of Health, [cited 2021 Feb 21]. Available from https://www.niaid.nih.gov/diseases-conditions/coronaviruses.

[6] Akonomeh, E. A., Ajonina, M. U., Ajonina, I. E., Akonomeh, S. D., Bibaa, L. O. N., 2020, Public Knowledge, Attitude and Practices towards Covid19: A Cross-Sectional Study in the Conflict-Affected Area of the Northwest Region of Cameroon, *Merit Research Journal of Medicine, and Medical Sciences*, 8(12):745-755, DOI: 10.5281/zenodo.43923.

[7] Al-Hanawi, M. K., Angawi, K., Alshareef, N., Qattan, A., Helmy, H. Z., Abudawood, Y., Alqurashi, M., Kattan, W., Kadasah, N. A., Chirwa, G. C., Alsharqi, O., 2020, Knowledge, attitude, and practice toward Covid-19 among the public in the kingdom of Saudi Arabia: a cross-sectional study, *Front Public Health,* 2020;8:217, DOI: 10.3389/fpubh.2020.00217.

[8] Seale, H., Dyer, E. F. C., Abdi, I., Rahman, K. M., Sun, Y., Qureshi, M. O., Dowell-Day, A., Sward, J., Islam, M. S., 2020, Improving the impact of non-pharmaceutical interventions during Covid-19: examining the factors that influence engagement and the impact on individuals. *BMC Infectious Diseases,* 20:607, DOI: 10.1186/s12879-020-05340.

[9] Cochran, W. G., 1977, Sampling Techniques, 3rd ed., New York, John Wiley, and Sons. 223-34.

[10] Suresh, K. P., Chandrashekara S., 2012, Sample Size Estimation and Power Analysis for Clinical Research Studies, *J Hum Reprod Sci.*, 5:7-13, DOI: 10.4103/0974-1208.97779.

[11] Osaro, B. O., Alali, A., Ben-Osaro, N. V., 2021, Knowledge of Covid-19 and Compliance with the Use of Facemasks among Undergraduate Students in a University in South-South Nigeria. *J Infect Dis Epidemiol*, 7:235, DOI: 10.23937/2474-3658/1510235.

[12] World Health Organization, 2022, 14.9 million excess deaths associated with the Covid-19 pandemic in 2020 and 2021, WHO, Geneva, [cited 2022 May 5]. Available from https://www.who.int/news/item/05-05-2022-14.9-million-excess-deaths-were-associated-with-the-Covid-19-pandemic-in-2020-and-2021.

[13] Habib, M. A., Day, F. M., Iliyasu, G., Habib, A. G., 2021, Knowledge, attitude, and practice survey of Covid-19 pandemic in Northern Nigeria, *PLoS One*, 16(1): e0245176, DOI: 10.1371/journal.pone.024517.

[14] Adesegun, O. A., Binuyo, T., Adeyemi, O., Ehioghae, O., Rabor, D. F., Amusan, O., Akinboboye, O., Duke, O. F., Olafimihan, A. G., Ajose, O., Idowu, A. O., Abiodun, O., 2020, The Covid-19 Crisis in Sub-Saharan Africa: Knowledge, Attitudes, and Practices of the Nigerian Public. *Am J Trop Med Hyg.*,103(5):1997-2004, DOI: 10.4269/ajtmh.20-0461.

[15] Reuben, R. C., Danladi, M. M. A., Saleh, D. A., Ejembi, P. E., 2021, Knowledge, Attitudes and Practices Towards Covid-19: An Epidemiological Survey in North-Central Nigeria. *J Community Health*, 46(3):457-470, DOI: 10.1007/s10900-020-00881-1.

[16] Mahmood, S., Hussain, T., Mahmood, F., Ahmad, M., Majeed, A., Beg, B. M., Areej, S., 2020, Attitude, Perception, and Knowledge of Covid-19 Among General Public in Pakistan. *Front. Public Health*, 8:602434. DOI: 10.3389/fpubh.2020.602434.

[17] Ogboghodo, E. O., Osaigbovo, I. I., Obaseki, D. E., Nneka Okwara, O. H., Omo-Ikirodah, O. T., Adio, F., Ehinze, E. S., 2021, Community mitigation strategies for coronavirus disease 2019: An assessment of knowledge and adherence amongst residents of Benin City, Edo State, Nigeria. *Niger Postgrad Med J.*, 28(1):14-21, DOI: 10.4103/npmj.npmj_321_20.

[18] Owhonda, G., Onyekwere, N., Kanee, R. B., Maduka, O., Nwadiuto, I., Okafor, C., Chibianotu, O., Aigbogun, E. O., 2021, Community Awareness,

Perceptions, Enablers and Potential Barriers to Non-Pharmaceutical Interventions (NPIs) in the Covid-19 Pandemic in Rivers State, Nigeria. *Biomed J Sci & Tech Res*, 36(5):28984-28995, DOI: 10.26717/BJSTR.2021.36.005928.

[19] Ajayi, A. D., Gaknung, B. K., Gotodok, K. H., Shaba, V. L., Okpe, C. O., 2021, Assessment of Knowledge and Compliance with Covid-19 Safety Precautions and Protocols in Federal Medical Centre Bida, Niger State-Nigeria. *World Journal of Innovative Research*, 10(4):26-35, DOI: 10.31871/WJIR.10.4.13.

[20] Nnama-Okechukwu, C. U., Chukwu, N. E., Nkechukwu, C. N., 2020, Covid-19 in Nigeria: Knowledge and compliance with preventive measures. *Soc Work Public Health*, 1;35(7):590-602, DOI: 10.1080/19371918.2020.1806985.

[21] Tsegaw, M., Mulat, B., Shitu, K., 2022, Risk perception and preventive behaviours of Covid-19 among university students, Gondar, Ethiopia: a cross-sectional study. *BMJ Open*, 8;12(4): e057404, DOI: 10.1136/bmjopen-2021-057404.

[22] Ahmed, H. M., 2022, Adherence to Covid-19 preventive measures among male medical students, Egypt. *Journal of the Egyptian Public Health Association*, 97:8, DOI: 10.1186/s42506-022-00103-7.