IS THE AVAILABILITY OF PERSONAL PROTECTIVE EQUIPMENTA PREDICTOR OF COVID-19 PREVALENCE AMONG HEALTHCARE WORKERS IN RIVERS STATE?

ABSTRACT

Background: The covid -19 pandemic had major disruptions on the health systems of several states in Nigeria.. While PPEs have been shown to provide effective barrier against the spread of diseases among care providers, the concern raised by their widespread lack in health facilities heightened during the pandemic.

Aim: To evaluate the availability of personal protective equipment as a predictor of covid-19 prevalence among healthcare workers in Rivers state

Materials and Methods: A descriptive cross-sectional study was carried out among healthcare workers in secondary and tertiary health facilities in Rivers state using a multi-stage sampling procedure between January 1, and July 31, 2021.Asemi- structured questionnaire was used to collect information from therespondents after obtaining informed written consent. Data obtained included, availability of different PPE and occurrence of Covid-19. Data was analyzed with Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were presented in tables, means and figures. Chi-square and Logistic regression models were done where applicable. A p-value of ≥0.05 was considered to be statistically significant.

Results: A total of 383 respondents were recruited for this study. The findings showed that hand gloves were readily available but the availability of other PPE was rather low. There was

however no significant relationship between availability of COVID-19 PPE and COVID-19 prevalence among healthcare workers [$f(1,354) = 3.102$, $p>0.05$]. The study also revealed that higher cadre health workers were more likely to have PPE [$f(1,355) = 3.102$, $p<0.05$].

Conclusion: PPE availability alone was not a significant predictor of COVID-19 prevalence as this may be influenced byother variables

Keywords: Availability, COVID-19,Healthcare workers, Prevalence, PPE.

1.INTRODUCTION

The Covid-19 pandemic caused major challenges across all sectors of the health system.[1,2,3] While the demand for most primary and secondary health services dwindled, the revenue accruable to health facilities decreased.More disturbing was the surge in the demand for oxygen, covid -19 medications and for personal protective equipment (PPE) especially during the second and third peak of the COVID-19 pandemic.[4-9] This concern heightened as the prevalence of COVID- 19 increased among health care workers with surging mortality. In a study conducted among health workers in Rivers State, the prevalence of COVID-19 was found to be 15.2%, which falls within the globally reported range of 3% to 19%.[10-14]

COVID-19 virus Spreads primarily through droplets and aerosols.[15] Transmission is possible by both symptomatic and asymptomatic individuals, making absolute patient isolation extremely difficult.[16,17] As such, the continuous supply and use of appropriate personal protective equipment are paramount in all patients receiving care, in order to maintain universal precaution,reduce transmission of COVID-19 to patients and vice versa, thereby reducing hospital admissions.[18] Though, PPE use among healthcare workers helps to reduce the spread of the disease, its continuous supply and availability during the pandemic was a major challenge.[6,7]

It was also reported that appropriate use of personal protective equipment by health care workers is paramount to preventing Covid-19 transmission to patients coming to receive care and to sustain a safe level of staffing.[18] However, these essential equipment are not widely available in the developing world, whereas the European experience appears to be different. A national survey on the availability of personal protective equipment in NHS hospitals during COVID-19 showed that eye and face protection devices, surgical masks, filtering face piece class 3

(FFP3) respirator, hand gloves, plastic aprons, full body plastic gowns as well as surgical gown were available to more than one quarter of health workers that took part in the survey.[18]

A cross-sectional, trans-national survey in Brazil, Columbia, and Ecuador on the availability of personal protective equipment for healthcare workers showed that among healthcare workers who per formed aerosols generating procedures, there were shortages of gloves, masks and disposable gowns.[19] Disposable shoe protectors, face shields, clear protective glasses, short of special protectives, closed suits, and surgical masks were also lacking.[19]

In Nigeria, a survey among physiotherapist showed that 50% of the respondents reported lack of adequate face masks, hand gloves aprons, and gowns.[20] The report also showed that face shields and protective shoes were lacking.[20]

When PPEs are not available, health workers will be more exposed to the infection. A study reported that most of the physicians do not have access to PPE every time they needed it and this greatly influenced how regular they put on the recommended PPE while attending to patients.[21] The study also reported the willingness of healthcare workers to use PPE if they are consistently made available to them.[21] Another report among healthcare workers showed that the healthcare workers were not comfortable with the donning and doffing procedures that is required for the use of PPE.[22] These reports are worrisome because health workers play a key role in the fight against the disease. Hence, the aim of this study is to investigate whether the availability of COVID-19 personal protective equipment can predict its prevalence among healthcare workers in Rivers State..

Hypotheses: There is no significant relationship between the availability of PPE and COVID-19 prevalence among healthcare workers in Rivers state.

2.MATERIALSAND METHODS

Thisstudy adopted a descriptive cross-sectional research design.The study population comprised of 2,696 healthcare workers in secondary and tertiary health facilities in Rivers State which included eight hundred and fifty-nine (859) doctors, one thousand one hundred and ninety (1,190) nurses, sixty-four (64) pharmacists, fifty-three (53) Pharmacy Technician, three hundred and fifty-two (352) Laboratory Scientist, fifty-two (52) Laboratory Technicians, one hundred and three (103) social workers and twenty-three (23) ambulance drivers. The sample size of 383 was determined using the Taro Yamane formula: $n = N/1+N(e)^{2}$.[23] A multi-staged sampling procedure was adopted for the study. The procedure involved four stages. Firstly, the stratified sampling technique was used to group the State into three strata based on Rivers senatorial districts; Rivers East, Rivers Southeast, and Rivers West; secondly, a simple random sampling method using balloting was done to select three health facilities from each of the Senatorial district. The third stage involved the determination of the number of participants. A proportionate sampling technique was used to select the number of participants in each facility selected while the fourth stage involved the selection of participants using the simple random sampling technique.

The instrument for data collection was a semi-structured and experts validated questionnaire titled: Availability of COVID-19 PPE Questionnaire (ACQ). The instrument has a reliability coefficient of 0.61 and was administered to the respondents directly by the researchers. The aim of the study and methods to be adopted were clearly explained to the respondents before the administration of the instrument. The researcher sought the consent of the respondents before delivering the questionnaire. Data collected was analyzed with the aid of the Statistical Package for Social Sciences. Descriptive statistics were presented in tables and figures. Chi-square and

Logistic regression models were done where applicable. A p-value of ≥0.05 was considered to be statistically significant.

3. RESULTS

The results of the study are shown below:

Table 1: Chi-square test of significant association between age and perceived risk of COVID-19 among healthcare workers

Age	Perceived Risk		Total	df	X^2-value	p-value	Decision
	High F(%)	Low F(%)	F(%)				
20-29yrs	148(75.5)	48(24.5)	196(100)	4	6.76	0.04*	Rejected
30-39yrs	50(70.4)	21(29.6)	71(100)				
40-49yrs	44(75.9)	14(24.1)	58(100)				
50-59yrs	10(66.7)	5(33.3)	15(100)				
60-69yrs	16(100)	0(0.00)	16(100)				
Total	268(75.3)	0(0.00)	356(100)				

***Significant; p<0.05**

Table 1 showed the Chi-square test of significant association between age and perceived risk of COVID-19 among healthcare workers. The result showed that there was no significant association between age and perceived risk of COVID-19 (X^2-value = 6.76, df = 4, p < 0.05).

Table 2: Chi-square test of significant association between cadre of health worker and perceived risk of COVID-19 among healthcare workers

Religion	Perceived Risk		Total	df	X^2-value	p-value	Decision
	High F(%)	Low F(%)	F(%)				
Doctor	132(72.9)	49(27.1)	181(100)	7	13.92	0.04*	Rejected
Nurse	23(57.5)	17(42.5)	40(100)				
Pharmacist	65(85.5)	11(14.5)	76(100)				
Laboratory scientist	31(81.6)	7(18.4)	38(100)				
Dental therapist	4(80.0)	1(20.0)	5(100)				
Dental surgeon	5(71.4)	2(28.6)	7(100)				
Security	4(100)	0(0.00)	4(100)				
Administrator	4(80.0)	1(20.0)	5(100)				
Total	268(75.3)	0(0.00)	356(100)				

***Significant; p<0.05**

Table 2 showed the chi-square test of significant association between cadre of health worker and perceived risk of COVID-19 among healthcare workers. The result showed that there was no significant association between cadre of health worker and perceived risk of COVID-19 (X^2-value = 3.73, df = 2, p-value > 0.05).

Table 3: Availability of COVID-19 PPE for healthcare workers in Rivers State

SN	Items	Mean	S.D.	Decision
1	Availability of hand gloves.	3.11	1.03	High
2	Availability of N95 mask	1.97	0.90	Low
3	Availability of disposable gowns	1.57	0.92	Low
4	Availability of disposable surgical masks	1.53	0.88	Low
5	Adequate and sufficient PPE	1.34	0.84	Low
	Total	**1.90**	**0.91**	**Low**

Table 3 showed the extent to which COVID1-9 PPE was made available for healthcare workers in Rivers State. The analysis revealed that hand gloves were made available to a high extent (3.11±1.03) but the availability of other PPE was low.

Table 4: Regression analysis on relationship between availability of COVID-19 PPE and COVID-19 prevalence among Healthcare Workers in Rivers State

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Decision
1	0.33	0.29	0.29	0.56	**Low relationship**

Guide: 0.00-0.19 = very low, 0.20-0.39 = low, 0.40-0.59 = moderate, 0.60-0.79 = high and 0.80 above is very high relationship

Table 4 illustrated that there is a low relationship between availability of COVID-19 PPE and COVID-19 prevalenceamonghealthcare workers (r = 0.33). The result further showed that availability of COVID-19 PPE predicted 29.0% of COVID-19 prevalence (R^2 = 0.29). Therefore, the relationship between availability of COVID-19 PPE and COVID-19 prevalence among healthcare workers in Rivers State was low.

Table 5: Regression analysis on relationship between cadre of workers and availability of COVID-19 PPE and COVID-19 prevalence among Healthcare Workers in Rivers State

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Decision
1	0.78	0.616	0.615	1.22	**High relationship**

Guide: 0.00-0.19 = very low, 0.20-0.39 = low, 0.40-0.59 = moderate, 0.60-0.79 = high and 0.80 above is very high relationship

Table 5 illustrated that there is a high relationship between cadre of workersandavailability of COVID-19 PPE and COVID-19 prevalencehealthcare workers (r = 0.78). The result further showed that cadre of workerspredicted 616% of the availability of COVID-19 PPE (R^2 = 0.616). Therefore, the relationship between the cadre of workersandavailability of COVID-19 PPE among healthcare workers in Rivers State was high.

Table 6: Regression analysis on significant relationship between availability of COVID-19 PPE and COVID-19 among prevalence healthcare workers

Model		Sum of Squares	df	Mean Square	F	Sig.	Decision
1	Regression	.605	1	.605	3.102	.079*	**Not Rejected**
	Residual	69.044	354	.195			
	Total	69.649	355				

***Not Significant; p > 0.05**

Table 6 revealed the regression analysis on the relationship between availability of COVID-19 PPE and COVID-19 prevalence amonghealthcare workers. The findings of the study revealed that there was no significant relationship between availability of COVID-19 PPE and COVID-19 prevalenceamonghealthcare workers [f(1,354) = 3.102, p>0.05]. Therefore, the null hypothesiswhich stated that there is no significant relationship between availability of COVID-19 PPE and COVID-19 prevalencehealthcare workers Rivers State was not rejected.

Table 7: Regression analysis on significant relationship cadre of health workers and available of COVID-19 PPE in Rivers State

Model		Sum of Squares	df	Mean Square	F	Sig.	Decision
1	Regression	849.779	1	849.77	569.08	0.00*	**Rejected**
	Residual	530.101	355	1.49			
	Total	1379.880[d]	356				

***P<0.05**

Table 7 revealed the regression analysis on the relationship between cadre of health workers and available of COVID-19 PPE amonghealthcare workers. The findings of the study revealed that there was a significant relationship between cadre of health workers and available of COVID-19 PPE [$F(1,355) = 569.08$, $p<0.05$].

4.DISCUSSION

The result showed that hand gloves were readily available, but the availability of other PPE was low. This is similar to the report by Kim et al.,[24] whose study investigated the adherence to personal protective equipment in exposed healthcare workers and COVID-19 illness, severity, symptoms and duration in six countries which showed less access and availability of PPE for healthcare workers.

However, our finding is at variance with that of Alajmi et al.,[25] whose study on COVID-19 infection among healthcare workers in a national healthcare system showed that, full personal protective equipment (PPE) adherence was 82% at COVID-19-designated facilities which was made possible due to availability of PPE. The study corroborates that of Okonkwo et al.,[20] whose study in Nigeria showed that about half of the respondents reported that they lacked adequate face masks some did not have enough hand gloves and reported inadequate aprons or gowns. The study also showed that some lacked enough shield or google and some of the healthcare workers reported a shortage of protective shoes in their workplace. This similarity might be because both studies were carried out in Nigeria.

However, the report differed from a cross sectional study carried out in three countries in South America on the availability of personal protective equipment and diagnostic and treatment facilities for healthcare workers which showed that among healthcare workers who performed aerosols generating procedures, there was shortage of gloves, caps,, masks and disposable gowns. Its report showed that some lacked disposable shoe protectors, face shields, clear protective glasses,closed suits and disposable surgical masks. The result showed that few had adequate and sufficient PPE.[19] This variation could be due to the differences in the study locations.

The finding of this study revealed that there was no significant relationship between availability of COVID-19 PPE and COVID-19 prevalence among healthcare workers. This is similar to that of Alajmi et al.,[25] whose study on COVID-19 infection among healthcare workers in a national healthcare system showed that, full personal protective equipment (PPE) adherence was 82% at COVID-19-designated facilities leading to low prevalence of COVID-19 which was made possible due to availability of PPE. The similar findings might be due to the similarity in the study designs.

5. CONCLUSION

Availability of COVID-19 personal protective equipment was not a significant predictor to covid-19 prevalence among healthcare workers in Rivers State. Thus, the factors which contribute to the prevalence of COVID-19 among healthcare workers is multifaceted.

Recommendations

1. The ministry of health should make PPE readily available for the healthcare workers by providing the needed funding.
2. Healthcare workers should avoid contacting Covid-19 by adhering strictly to PPE utilization when attending to any patient.
3. The healthcare management board should reduce the transmission of the disease by ensuring that PPE is available to all cadre of health workers.

Ethical Considerations

Ethical approval for the study was obtained from the ethics and review board of the of the tertiary and secondary healthcare facilities.

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