

Prevalence and Factors Associated with Compliance to Personal Protective Equipment Use after COVID-19 2-year Post-pandemic among Oral Health Care Workers in a Nigerian Tertiary Hospital

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ABSTRACT

Background: Despite the continuous role of Personal Protective Equipment (PPE) in dental practice, most studies only focused on its use during the COVID-19 pandemic.

Aim: This study therefore aimed to evaluate the prevalence and factors associated with compliance with PPE use after the COVID-19 pandemic.

Materials and Methods: This cross-sectional study was conducted at the dental complex of the University of Benin Teaching Hospital, Benin City, Edo state from March to June 2022. All the staff of the dental section of the tertiary health facility were recruited for the study. A self-administered questionnaire was used to collect both the sociodemographic and clinical data. The demographic data include age, sex, marital status, ethnicity, dental health workers, department, smoking, and alcohol intake. The clinical data consists of information on compliance with the use of PPE, history of previous exposure to COVID-19, presence of COVID-19 risk factor(s), availability of PPE, and availability of task force on the use of PPE. Both descriptive and inferential statistical analyses were performed.

Results: The age range of the respondents was 18-70 years with a mean age of 37.3 ± 9.97 years. There were more (53.6%) female respondents than their male counterparts. A high proportion (69.6%) of the respondents were dental practitioners while the least (4.3%) respondents were the dental hygienist. More than two-thirds (92.8%) of the respondents said they comply with using PPE routinely when asked. Both the sociodemographic and clinical characteristics of the respondents were not significantly associated with the prevalence of compliance to the use of PPE ($p > 0.05$).

Conclusion: Our facility had a high prevalence of compliance with PPE use after the COVID-19 epidemic. However, no factors studied could influence the prevalence of compliance by oral health workers.

Keywords: Personal protective equipment use, Oral health workers, Post-covid era, Nigeria

How to cite this article: Amuh VO, Edetanlen BE. Prevalence and Factors Associated with Compliance to Personal Protective Equipment Use after COVID-19 2-year Post-pandemic among Oral Health Care Workers in a Nigerian Tertiary Hospital. Nigerian Journal of Health Sciences. 2024;24:60-65.

INTRODUCTION

The COVID-19 Pandemic, which emanated from Wuhan, China, devastated the global community, disrupting all aspects of human lives.¹ COVID-19 disease is a highly infectious viral respiratory disease that is more severe in older people and is caused by coronavirus (SARS-CoV-2).² COVID-19 infections can either be asymptomatic or

symptomatic with prominent ones being fever, cough, sore throat, and shortness of breath.³ The disease was pronounced a pandemic, although emanated from Wuhan, China, and devastated the global community, disrupting all aspects of human lives.² As of 29th July 2021, there were 172,821 reported COVID-19 cases with 2141 deaths in Nigeria and more than thirty-seven million infected worldwide.⁴ COVID-19 was regarded as a Public Health Event of International

Submitted: June 6, 2024 Revision: August 20, 2024

Accepted: August 26, 2024

Access this article online

Quick Response Code:



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Concern (PHEIC) in January 2020 by the WHO and ended the declaration of an emergency *on the 5th of May 2023, but insists that the disease still poses a global threat.*⁵

Healthcare workers are more likely to be exposed to SARS-CoV-2⁵ in the course of clinical practice and are, therefore, at higher risk of COVID-19 infection than the general community.⁶ Hence, the impact of the COVID-19 disease on healthcare workers has been enormous.⁷ However, prevention remains the best weapon for protecting healthcare workers against the COVID-19 pandemic.⁸ Therefore, adherence to infection prevention and control protocols is critical at minimizing healthcare workers exposure to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).⁹

Standard Precautions for All Patient Care include hand hygiene³, use of personal protective equipment (PPE) to prevent exposure to infection, respiratory hygiene/cough etiquette principles, appropriate patient placement and isolation precautions⁵, patient care equipment and medical instruments management, Ward coats textiles and settings management.⁴ The use of personal protective equipment (PPE), is very important to prevent exposure to infections. It includes the use of face masks/shields, ward coats, goggles, head caps, gloves, and boots. Indeed, correct and consistent compliance with Infection prevention control [IPC] protocols is effective in minimizing the risk of COVID-19 infection⁸. Compliance with IPC protocols is facilitated by training of healthcare workers on IPC, provision of IPC materials and regular audit of IPC practices⁵. Generally, IPC strategies in response to highly infectious diseases, such as COVID-19, should include early recognition, physical distancing, source control, taking precautions and appropriate use of PPEs, Hand washing, restriction of movement, environmental cleaning and disinfection as well as support for healthcare workers^{7,9}.

Despite the continuous role of PPE in dental practice, it appears most studies¹⁰⁻¹⁸ only focus on its use during covid-19 pandemic. This study therefore aimed to evaluate the prevalence of compliance to the use of PPE after the COVID-19 epidemic by dental healthcare workers in a Nigerian healthcare facility. It also determined the factors that influence compliance with the use of PPE.

Dental healthcare workers are actively involved in high-risk procedures such as aerosol-generating procedures (AGPs) and there is continuous close contact interaction with patients¹⁵. This puts them in constant exposure to SARS-CoV-2, which can translate into COVID-19 virus infection if there is no adherence to recommended PPE measures. The WHO recommends the use of special respirators, gloves, aprons, and eye protection during Procedures. Compliance with PPE protocols is critical in minimizing the risk of COVID-19 infections. During the outbreak of COVID-19, attention is focused on compliance with PPE, but after the pandemic compliance with PPE ought to be a continuous process.

MATERIALS AND METHODS

Study setting: This study was conducted at the dental complex of the University of Benin Teaching Hospital, Benin City, Edo state from March to June 2022.

Ethical consideration: Ethical approval (ADM/E 22/A/VOL VII/14831678) was given by the Research and Ethics Committee of the hospital and written informed consent was obtained from the eligible samples.

Study design: This was a cross-sectional study design

Study population: All dental and support staff of the dental facility were recruited for the study.

Sample size estimation: The sample size and its adjustment were calculated to be 138 using the Taro Yamane Formula¹⁹

$$n = \frac{N}{1 + N(e^2)}$$

Inclusion and exclusion criteria: all staff at the dental facility 18 years and above. Those who were unwilling to participate were excluded from the study.

Sampling method: All consecutive dental and support staff

Study instrument: The survey tool was a self-administered questionnaire adapted from the WHO risk assessment tool for healthcare workers in the context of COVID-19¹². This questionnaire had two sections, section one consisted of questions on clinico-demographic characteristics. Section two had questions on compliance with personal protective equipment after the COVID-19 pandemic. It was pretested. Compliance with personal protective equipment use is the appropriate use, maintenance, and adherence to guidelines of the use of PPE to minimize exposure to hazards in the workplace. The indicators of compliance include the rate of PPE use, availability and proper storage of PPE, maintenance of PPE, training of staff, and effective PPE policy enforcement.

Data management: Both sociodemographic and clinical data were collected. The demographic data included age, sex, marital status, ethnicity, dental health workers, department, smoking, and alcohol intake. The clinical data; compliance with the use of PPE, history of previous exposure to COVID-19, presence of COVID-19 risk factor(s), availability of PPE, and availability of task force on the use of PPE. Both descriptive and inferential statistics were analyzed. In the descriptive statistics, the categorical variables were expressed in frequency and percentages while numerical variables were expressed in mean and standard deviation. In the inferential statistics, the Chi-square test was used to find any association between the dependent and independent variables. The data was entered and analyzed using the statistical package for the

social sciences (SPSS), version 26. A critical probability level (p-value) less than 5% was considered significant.

RESULTS

All the 138 questionnaires designed in this study were answered and returned by the respondents given a response rate of 100%. The age range of the respondents was 18-70 years with a mean age of 37.3 ± 9.97 years. Table 1 shows the sociodemographic characteristics of the respondents. More than half (59.8%) of the respondents were middle age adults while the least (2.5%) group were older age respondents. There were more (53.6%) female respondents than their male counterparts. About two-thirds (61.6%) of the respondents were married. As regards the ethnicity of the respondents, more than half (58.6%) of the respondents belong to ethnicity

| Variable | Frequency (n=138) | Percent (%) |
|------------------------------|-------------------|-------------|
| Age group(years) | | |
| Young adults | 52 | 37.7 |
| Middle age adults | 83 | 59.8 |
| Older adults | 3 | 2.5 |
| Gender | | |
| Male | 64 | 46.4 |
| Female | 74 | 53.6 |
| Marital status | | |
| Single | 50 | 36.2 |
| Married | 85 | 61.6 |
| Divorced | 1 | 0.7 |
| Widowed | 2 | 1.4 |
| Ethnicity | | |
| Yorubas | 28 | 20.3 |
| Ibos | 26 | 18.8 |
| Hausas | 3 | 2.3 |
| Others | 81 | 58.6 |
| Dental health workers | | |
| Dental surgeon | 96 | 69.6 |
| Dental nurse | 13 | 9.4 |
| Dental hygienist | 7 | 4.3 |
| Dental technicians | 14 | 10.1 |
| Non-dental professionals | 8 | 5.1 |
| Department | | |
| Restorative | 23 | 16.7 |
| Oral medicine | 24 | 17.5 |
| Oral surgery | 29 | 21.0 |
| Preventive | 22 | 15.9 |
| Oral Diagnosis | 18 | 13.0 |
| Periodontics | 22 | 15.9 |
| Smoking | | |
| Yes | 1 | 0.7 |
| No | 137 | 99.3 |
| Alcohol intake | | |
| Yes | 72 | 52.2 |
| No | 66 | 47.8 |

outside the three national ethnic groups. A majority (69.6%) of the respondents were dental surgeons while the least (4.3%) respondents were dental hygienists. The highest (21.0%) proportion of the respondents was from the Department of Oral and Maxillofacial Surgery while the lowest proportions were from the oral diagnosis and oral radiology department. Interestingly, just one (0.7%) respondent agrees to smoke cigarettes. More than half (52.2%) agree to take alcoholic drinks.

Table 2 shows the clinical characteristics of respondents. More than two-thirds (92.8%) of the respondents said they comply with the use of PPE routinely when asked. Less than one-third of the respondents were previously exposed to

| Variables | Frequency (n=138) | Percent (%) |
|---|-------------------|-------------|
| Compliance with the use of PPE | | |
| Yes | 129 | 92.8 |
| No | 9 | 7.2 |
| History of previous exposure | | |
| Yes | 21 | 15.2 |
| No | 117 | 84.8 |
| Presence of COVID-19 risk factor(s) | | |
| Yes | 69 | 50.0 |
| No | 69 | 50.0 |
| Availability of PPE | | |
| Yes | 100 | 72.5 |
| No | 38 | 27.5 |
| Availability of task force on the use of PPE | | |
| Yes | 70 | 50.7 |
| No | 68 | 49.3 |

| Variable | Frequency (n=138) | Percentage (100) |
|--|-------------------|------------------|
| Compliance with PPE USE | N | % |
| Yes | 128 | 92.8 |
| No | 10 | 7.2 |
| Do you still wear an apron before dental procedures ? | | |
| Always | 56 | 40.6 |
| Most times | 34 | 24.6 |
| Occasionally | 31 | 22.5 |
| Rarely | 17 | 12.3 |
| Do you still wear facemasks ? | | |
| Always | 91 | 65.9 |
| Most times | 37 | 26.8 |
| Occasionally | 7 | 5.1 |
| Rarely | 3 | 2.1 |
| Do you still wear boots/ crocs in the clinic ? | | |
| Always | 44 | 31.9 |
| Most times | 21 | 15.3 |
| Occasionally | 30 | 21.7 |
| Rarely | 43 | 31.1 |

Table 4: The univariable analysis of compliance to the use of PPE

| Variable | Compliance to use of PPE | | Chi-value | p-value |
|---|--------------------------|----------|-----------|---------|
| | Yes (n=129) | No(n=9) | | |
| Age group(years) | | | | |
| Young adults | 47(36.4) | 5(55.6) | 4.159 | 0.13 |
| Middle age adults | 79(61.2) | 3(33.3) | | |
| Older adults | 3(2.4) | 1(11.1) | | |
| Gender | | | | |
| Male | 60(46.5) | 4(44.4) | 0.014 | 0.90 |
| Female | 69(53.5) | 5(55.6) | | |
| Marital status | | | | |
| Single | 46(35.7) | 4(44.4) | 15.1 | 0.23 |
| Married | 81(62.8) | 4(44.4) | | |
| Divorced | 0(0.0) | 1(11.2) | | |
| Widowed | 2(1.6) | 0(0.0) | | |
| Ethnicity | | | | |
| Yorubas | 28(21.7) | 0(0.0) | 3.65 | 0.60 |
| Ibos | 24(18.6) | 2(22.2) | | |
| Hausas | 3(2.3) | 0(0.0) | | |
| Others | 74(57.3) | 7(77.8) | | |
| Dental health workers | | | | |
| Dental surgeon | 91(70.5) | 5(55.6) | 15.6 | 0.85 |
| Dental nurse | 11(8.5) | 2(22.2) | | |
| Dental hygienist | 7(5.4) | 0(0.0) | | |
| Dental technicians | 12(9.3) | 2(22.2) | | |
| Non-dental professionals | 8(6.2) | 0(0.0) | | |
| Department | | | | |
| Restorative | 23(17.8) | 0(0.0) | 8.75 | 0.18 |
| Oral medicine | 21(16.3) | 3(33.3) | | |
| Oral surgery | 29(22.5) | 0(0.0) | | |
| Preventive | 19(14.7) | 3(33.3) | | |
| Oral Diagnosis | 17(13.2) | 1(11.2) | | |
| Periodontics | 20(15.5) | 2(22.2) | | |
| Smoking | | | | |
| Yes | 0(0.0) | 1(11.1) | 9.42 | 0.21 |
| No | 129(100.0) | 8(88.9) | | |
| Alcohol intake | | | | |
| Yes | 69(53.5) | 3(33.3) | 7.53 | 0.53 |
| No | 60(46.5) | 6(66.7) | | |
| History of previous exposure | | | | |
| Yes | 20(15.5) | 1(11.1) | 17.9 | 0.43 |
| No | 109(84.5) | 8(88.9) | | |
| Presence of COVID-19 risk factor(s) | | | | |
| Yes | 69(53.5) | 0(0.0) | 5.31 | 1.09 |
| No | 60(46.5) | 9(100.0) | | |
| Availability of PPE | | | | |
| Yes | 98(76.0) | 2(22.2) | 15.8 | 0.54 |
| No | 31(24.0) | 7(77.8) | | |
| Availability of task force on the use of PPE | | | | |
| Yes | 65(50.4) | 5(55.6) | 3.78 | 0.62 |
| No | 64(49.6) | 4(44.4) | | |

COVID-19 infection. Respondents who said “yes” (50.0%) to the presence of COVID-19 infection risk factors were equal to those who said “no” (50.0%). Only 38(27.5%) said PPEs are not readily available. Barely more than half (50.7%) of the respondents said there is a task force to enforce compliance with to use of PPE

Table 3 shows the type and frequency of the use of PPE by the

respondents. Marital status had a significant (P-value = .002) impact on the use of PPEs by the respondents.

Table 4 presents the univariate analysis of compliance with the use of PPE. Both the sociodemographic and clinical characteristics of the respondents were not significantly associated with the prevalence of compliance to the use of PPE (p>0.05)

DISCUSSION

The response rate was 100% in this study. The mean age of the respondents was 37 years is comparable to the 33 years reported by Ashinyo et al¹² among healthcare workers in Ghana. This corresponds to the average age of the workforce in most developing countries^{12, 13}. As in previous studies^{13,17}, most respondents were females and this could be explained by the fact that they may be more conscious of their oral hygiene³. The dental surgeons constitute the majority of the respondents and this could be due to the fact the study area is a tertiary health center that employed more of their services. Additionally, they have more contact with the patients compared to other members of staff.

The prevalence of compliance with the use of PPE was 92.8% in the present study. Though it appears that no studies were found in the literature on compliance with PPE after the COVID-19 pandemic, this finding in the present study is in line with previous studies^{16,17} on compliance during the outbreak that reported high prevalence. This high prevalence of compliance to the PPE protocol found is a suggestion of the magnitude of fear among the respondents as regards COVID-19 infection. Incidentally, less than one-third of the dental health workers were previously exposed to COVID-19 infection. Risk factors for COVID-19 infection were found in half of the total number of dental health workers and this could also be responsible for the high compliance rate to PPE usage. The task force was not the major reason for this compliance as found in the current study.

In this study, PPEs like face masks/shields, ward coats, goggles, head caps, gloves, and boots were found to be readily available. Ensuring the continuous availability of PPEs for healthcare workers managing COVID-19 patients is essential for maintaining healthcare worker's infection rates below 10% and mortality below 1%⁸. Additionally, wide-scale procurement and distribution of PPEs for low-and-middle-income countries is cost-effective and yields a large downstream return on investment¹⁰. Both the sociodemographic and clinical characteristics of the respondents were not significantly associated with the prevalence of compliance with the use of PPE. Though logistic regression was not performed due to the lack of association, it can be deduced that compliance was better in all the respondents despite their sociodemographic or clinical characteristic differences.

This study had limitations. The compliance with PPE protocols was self-reported by the respondents, which could lead to recall bias. Also since this study is a single-centre study, a suggestion of a multicentre study is recommended for a better representation.

Conclusion: The prevalence of compliance with the use of PPE after the COVID-19 epidemic was high in our facility. However, no factor studied could influence the prevalence of compliance by oral health workers

ACKNOWLEDGMENT

I acknowledge the staff of the University of Benin Teaching Hospital and the head of the department of the various departments of the dental care practice where this research was conducted.

FUNDING

The research was self-funded.

Conflict of interest

The authors declare no conflict of interest related to the study

Data availability: data are available on request with the corresponding author.

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