Mental health status of doctors and nurses in a Nigerian tertiary hospital: A COVID-19 experience

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Background: Healthcare professionals (HCPs) working to save lives during the coronavirus disease 2019 (COVID-19) pandemic are under tremendous physical and psychological pressure, therefore facing the risk of developing challenges with mental health.

Aim: This study aimed primarily to determine the prevalence and factors associated with depression, anxiety and stress among HCPs in a tertiary hospital in Lagos State during the COVID-19 pandemic.

Setting: Lagos State University Teaching Hospital (LASUTH), Ikeja, Lagos, Nigeria.

Methods: This was a descriptive cross-sectional study conducted between June and July 2021 among 1452 doctors and nurses in LASUTH, Ikeja, Lagos, Nigeria, selected by the multistage sampling method. Depression, anxiety and stress were assessed using the Patient Health Questionnaire, Generalised Anxiety Disorder and Perceived Stress Scale, respectively.

Results: The majority of respondents were female (72.5%), with two-thirds being nurses. The prevalence of depression, anxiety and stress was 9.8%, 5.0% and 62.4%, respectively. Nurses showed a higher prevalence of these mental health conditions as compared with doctors. Younger HCPs, nurses, those that lost a colleague to COVID-19, and those whose family members were infected with COVID-19 were more likely to be depressed. Nurses and those afraid of being infected were more likely to experience anxiety. Younger HCPs, nurses, history of anxiety and/or depression and previous COVID-19 infection were identified as factors associated with stress.

Conclusion: Stress was the most prevalent mental health condition with nurses being the most affected of the HCPs and at a greater risk of developing challenges with mental health. Psychosocial interventions and stress management techniques are recommended to minimise the risks.

Contribution: This study adds to the few studies on the mental health of HCPs during COVID-19 and calls for in-depth surveys to understand psychosocial challenges among HCPs in Nigeria.

Keywords: depression; anxiety; stress; healthcare professional; COVID-19.

Introduction

The first case of coronavirus disease 2019 (COVID-19) broke out in China at the end of December 2019, leading to a pandemic. The pandemic posed a major challenge socially, economically and above all, psychologically worldwide, with healthcare professionals (HCPs) undoubtedly remaining one of the most vulnerable groups.

While the world faced lockdowns, with reduced activity and implementation of social distancing, to reduce chances of community transmission, HCPs performed their duties at the frontline, with continuous pressure to attend to the needs of patients who were heavily dependent on them.

The clinical HCPs, particularly doctors and nurses who worked closely to treat COVID-19, had continuous fear of infection and witnessed frequent mortality and, as such, were at greater risk of developing symptoms and challenges of a psychological nature such as anxiety, panic or other stress-related disorders.

Research has shown that HCPs were significantly at risk of mental health problems during the pandemic. For instance, in China, half (50.0%) and 45.0% of HCPs were found to be depressed and
anxious, respectively, while about 5 in 10 HCPs (48.0%) were reported to be depressed and one-third experienced anxiety, and 57.0% were stressed in the United States. Similar patterns have been reported in other studies. Healthcare professionals in Africa have equally shown evidence of COVID-19 related mental health issues. Nine in 10 HCPs were reported to be depressed, anxious or stressed in Egypt. In Ghana and Tunisia, 21% – 30.0% of HCPs were reported to be depressed, 24.3% – 27.8% anxious and 8.2% – 18.6% stressed.

Healthcare professionals have adopted different coping strategies such as optimism and resilience to manage psychological stress during pandemic, and these strategies have shown to be effective. Similarly, during COVID-19 pandemic, HCPs were reported to have adopted strategies such as engaging in health promotion activities such as resting and consuming balanced diet and learning more about COVID-19 to cope with the pandemic.

There is a dearth of studies on the mental health of HCPs in Nigeria, even though Nigeria ranks among the top five countries in Africa with regard to COVID-19 infections. There is a need to quantify the magnitude of the symptoms of depression, anxiety and stress among clinical HCPs, particularly the doctors and nurses in Nigeria.

Therefore, this study aimed to assess the prevalence and factors associated with depression, anxiety and stress among HCPs in a tertiary hospital in Lagos State during the COVID-19 pandemic as well as the coping strategies adopted by these HCPs.

Research methods and design

Study design, setting and sampling technique

A descriptive cross-sectional study design was adopted in this study. Doctors (consultants and medical residents) and nurses at the Lagos State University Teaching Hospital (LASUTH), Ikeja Lagos State, were surveyed. Lagos State University Teaching Hospital is a tertiary institution owned by the Lagos State Government with several departments such as pediatrics and surgery. Data were collected between June and July 2021 via a self-administered questionnaire. Doctors and nurses that worked in the facility as of March 2020 were eligible to participate; interns and house officers were excluded as they were not working in the study location as of the beginning of the pandemic.

Sample size calculation and sampling technique

The sample size was calculated with the Cochrane formula \(Z^2[pq]/d^2\),\(^{15}\) where \(Z = 1.96\) at a 95.0% confidence interval (CI), and \(\text{‘}p\text{’}\) was the proportion of anxiety among healthcare workers in a previous study conducted in Ghana (27.8%),\(^{15}\) \(q = 1–p\), and \(\text{‘}d\text{’}\) was the level of precision at 0.05.

The calculated sample size was 308, with an additional 10% included to correct for non-response, yielding a sample size of 340 HCPs. According to the hospital records, a total of 1452 doctors and nurses (511 doctors, 941 nurses) worked in the 14 departments (such as psychiatry internal medicine, etc.) that make up LASUTH. By proportionate sampling, the HCPs to be selected from each department were determined. Systematic random sampling was employed from the sampling frame of HCPs. Doctors and nurses were selected for all departments. In all, 120 doctors and 220 nurses (a total of 340 HCPs) were recruited for this study.

Data collection

Sociodemographic characteristics such as age, gender, marital status and occupation were obtained and work-related details such as years of employment and history of anxiety. The Patient Health Questionnaire 9 (PHQ-9), Generalised Anxiety Disorder 7 (GAD-7) and Perceived Stress Scale (PSS) were used to measure depression, anxiety and stress, respectively, while the coping strategy subscale of the COVID-19 questionnaire was used to assess how the HCPs coped with the infection. Other variables include access and adequacy of personal protective equipment (PPE), exposure to COVID-19, the fear of transmitting COVID-19 to colleagues and family and the history of depression, anxiety and comorbidity were sought from the respondents.

Measures

Depression was measured with the PHQ-9, which has been previously used to assess depression among healthcare workers and the general population. The nine-item tool has a four-point Likert scale (not at all = 0 to nearly every day = 3). The scale contains questions such as, ‘feeling down, depressed, or hopeless’ and ‘poor appetite or overeating’. The score range of the PHQ-9 is 0–27, HCPs that score ≥ 10 were considered to be depressed, while those that score below 10 were considered not to be depressed. The PHQ-9 has a Cronbach alpha reliability of 0.84–0.89. In this present study, the Cronbach alpha reliability of the PHQ-9 was 0.868, which is considered very good according to, and the area under the curve (AUC) was 0.795 (95% CI: 0.713–0.877), which is considered good.

Anxiety was measured with the GAD-7, which is a seven-item screening measure with a four-point Likert scale (not at all = 0 to nearly every day = 3). The scale contains questions such as ‘feeling nervous, anxious, or on edge’ and ‘feeling afraid, as if something awful might happen’. The GAD-7 score ranges between 0 and 21. Healthcare professionals that score ≥ 10 were considered to be anxious, while those that score less than 10 were considered not to be anxious. GAD-7 has been previously used to assess anxiety in several studies with a Cronbach alpha reliability range of 0.80–0.92. The reliability of the GAD-7 in this present study was very good at 0.876, and the AUC was fair with 0.689 (95% CI: 0.566–0.813).
The PSS was used to measure stress among the HCPs. The 10-item tool is measured on a five-point Likert scale (from never to very often) and has a score range of 0–40. Four positively worded items (4, 5, 7, 8) were reversed (0 = 4, 1 = 3, 2 = 2, 3 = 1 and 4 = 0). The scale contains questions such as ‘in the past month, how often have you felt that you were unable to control the important things in your life’ and ‘in the past month, how often have you felt nervous and stressed’. Healthcare professionals that score ≥ 14 were considered to be stressed.\(^2\) The Cronbach alpha reported by an earlier study was 0.82,\(^2\) while the Cronbach alpha was low\(^2\) in this present study with 0.575. The AUC for PSS was good\(^4\) with 0.718 (95% CI: 0.661–0.774).

The coping strategies subscale of the COVID-19 questionnaire developed by Zhang et al. was adapted to assess coping strategy with a reliability of 0.77.\(^4\) The reliability of the tool was 0.713 in this present study. Twelve statements were used to assess coping strategies, such as ‘I actively learn about COVID-19 (symptoms, route of transmission)?’ and ‘I keep busy to refrain from thinking about the epidemic?’. The items were placed on a five-point Likert scale (1 = Never to 5 = Always). However, our concern was the individual items as they are relevant to this present study.

**Data analysis**

The SPSS version 26 was used to analyse the data. Simple frequency and means (standard deviation) were used to describe the variables. For binary analysis, Pearson’s chi-square or Fisher’s tests, where appropriate, were used. Spearman’s correlation was used to test the association between the dependent variables because of skewness. Binary logistic regression was used at multivariate analysis to control for confounders. Before then, multicollinearity between the independent variable was tested with the variance inflation factor (VIF). No evidence of collinearity was found as all the VIF were < 2.0. Variables with a p-value of ≤ 0.1 at bivariate analysis were considered for multivariate analysis, while regression analysis was computed at a 95% CI. However, some potential confounders were forced into a model, if necessary, for statistical relevance as suggested by Bursac et al.\(^2\) Hosmer-Lemeshow test was used to assess the fitness of the models. Nagelkerke\(^2\) was deployed to measure the level of variance explained by the independent variables. Later, AUC was used to assess the predictability power of the dependent variables.

**Ethical considerations**

Ethical approval was obtained from the Health Research Ethics Committee (HREC) of the Lagos University Teaching Hospital (HREC Assigned NO: ADM/DSCT/HREC/APP/4331 and LASUTH with reference number LREC/00/10/1598). Written informed consent was sought from the participants after an explicit explanation of the study purpose. Confidentiality was maintained, and participants were allowed to withdraw from the study at any time. Participation was purely voluntary; non-participation was without consequence.

**Results**

**Sociodemographic, history of anxiety and/or depression and comorbidity**

Of the 340 questionnaires distributed, 338 were fit for data analysis giving a response rate of 99.4%. The majority (45.9%) of the health workers were between the ages of 30 years and 39 years, with a mean ± standard deviation of 34.03 ± 8.03 years. The majority (72.5%) were females, and two-thirds (64.5%) were nurses. More than half (58.6%) were married and 41.4% were not married. The majority of the HCPs were Christians (75.7%), and one-fifth lived alone. The mean length of working in the hospital was 6.53 ± 5.96 years, and the majority (58.3%) had worked up to five years in the facility, while only 18% had worked for more than a decade. While 9 in 10 of the HCPs had access to PPE, 61.5% classified the PPE as inadequate. The average working days for the HCPs was 3.66 ± 1.32 during the peak of the pandemic, while the majority (55.9%) worked between three and four days weekly. The majority (89.1%) had no comorbidity, and more than one-fifth (23.1%) have a history of depression or anxiety (Table 1).

Seven in 10 of the HCPs had contact with suspected cases, while more than half (53.3%) had contact with a confirmed case of COVID-19. One in six (16.9%) of the HCPs contracted COVID-19. Many (79.9%) had a colleague infected with the virus and more than one-third (35.2%) of these colleagues died from COVID-19 infection. One in five (20.4%) of the HCPs had a family member that contracted COVID-19, while 56% of the HCPs lost a family member to COVID-19. A large proportion (77.5%) of the HCPs are willing to work as frontline staff (Table 2).

**Prevalence of depression, anxiety, stress and coping strategy and correlation analysis**

The prevalence of depression, anxiety and stress was 9.8%, 5.0% and 62.4%, respectively. Several coping strategies were employed by the HCPs to cope with stress and anxiety. For instance, 45.9% and 45.9%, respectively, learnt about COVID-19 always to cope with the pandemic, while 11% stopped watching TV to avoid COVID-19 news. To cope with the pandemic, 59.2% constantly wore face masks and routinely washed their hands. Ten per cent of employees constantly communicated their worries and needs to their supervisors, while 9.5% took adjuvant medicine, and 4.4% let their feelings out through tears. Six per cent sought psychological support from colleagues, 11.5% always sought spiritual guidance regularly, and 26.6% engaged in chatting with family and friends.

We found a significant positive association between the three dependent variables: depression and anxiety (rs = 0.683, p < 0.001), depression and perceived stress (rs = 0.460, p < 0.001) and anxiety and perceived stress (rs = 0.521, p < 0.001).
Factors associated with depression, anxiety and stress

Independent variables with a p-value of ≤ 0.1 at bivariate analysis were considered for multivariate analysis. Of the seven variables associated with depression (Table 3 and Table 4), five variables were identified as factors associated with depression among the HCPs when the regression model was fitted (Table 5). Healthcare professionals that were at least 40 years were less likely to be depressed compared with those between 20 years and 29 years (odds ratio: 0.167; 95% CI: 0.043–0.649). Nurses were 1.19 more likely (95% CI: 1.194–13.103) to be depressed than doctors; while HCPs that came in contact with specimen were 2.50 times (95% CI: 1.033–6.070) more likely to be depressed. Healthcare professionals whose colleague died of COVID-19 were 2.91 times (95% CI: 1.210–7.004) more likely to be depressed. Also, those whose family members were infected with COVID-19 were 2.66 times (95% CI: 1.128–6.265) more likely to be depressed. The independent variables explained 22.3% of the variance.

The two variables associated with anxiety at bivariate analysis retained their significant power at regression analysis. Nurses, compared with doctors, were 6.82 times more likely (95% CI: 1.360–34.157) to experience anxiety. Healthcare professionals that were not afraid of contracting COVID-19 were 3.12 times (95% CI: 1.022–9.510) more likely to experience anxiety (Table 6). The independent variables explained 11.9% of the variance.

Age, occupation, a history of depression or anxiety and COVID-19 infection were identified as factors associated with stress among the HCPs. Healthcare professionals that were ≥ 40 years were less likely (95% CI: 0.147–0.981) to be stressed compared with their younger counterparts. This implies that younger HCPs (20–29 years) were 2.64 times

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**TABLE 1**: Sociodemographic characteristics, history of anxiety and/or depression and comorbidity (n = 338).

| Variables                      | Frequency | Percentage |
|--------------------------------|-----------|------------|
| Age (years)                    |           |            |
| 20–29                          | 109       | 32.2       |
| 30–39                          | 155       | 45.9       |
| ≥ 40                           | 74        | 21.9       |
| Mean Age ± SD                  | 34.03 ± 8.03 | -         |
| Gender                         |           |            |
| Male                           | 93        | 27.5       |
| Female                         | 245       | 72.5       |
| Occupation                     |           |            |
| Doctor                         | 120       | 35.5       |
| Nurse                          | 218       | 64.5       |
| Marital status                 |           |            |
| Married                        | 198       | 58.6       |
| Not-married                    | 140       | 41.4       |
| Religion                       |           |            |
| Christianity                   | 256       | 75.7       |
| Islam and Others               | 82        | 24.3       |
| Whom you live with             |           |            |
| Alone                          | 67        | 19.8       |
| With family                    | 271       | 80.2       |
| Years of employment            |           |            |
| 1–5                            | 197       | 58.3       |
| 6–10                           | 80        | 23.7       |
| ≥10                            | 61        | 18.0       |
| Mean years ± SD                | 6.53 ± 5.96 | -         |
| Days worked per week during pandemic†| |            |
| 1–2                            | 59        | 18.0       |
| 3–4                            | 184       | 55.9       |
| ≥ 5                            | 86        | 26.1       |
| Mean days ± SD                 | 3.66 ± 1.32 | -         |
| Comorbidities                  |           |            |
| None                           | 301       | 89.1       |
| Cardiovascular disease         | 18        | 5.3        |
| Respiratory illness            | 10        | 2.9        |
| Diabetes                       | 9         | 2.7        |
| History of anxiety and/or depression | |           |
| Yes                            | 78        | 23.1       |
| No                             | 260       | 76.9       |

**TABLE 2**: Personal protective equipment, contact with COVID-19 cases and infection (n = 338).

| Variables                      | Frequency | Percentage |
|--------------------------------|-----------|------------|
| Access to PPE                  |           |            |
| Yes                            | 307       | 90.8       |
| No                             | 31        | 9.2        |
| Adequacy of PPE                |           |            |
| Adequate                       | 130       | 38.5       |
| Inadequate                     | 208       | 61.5       |
| Levels of the protective measures|        |            |
| Adequate                       | 118       | 34.9       |
| Insufficient                   | 214       | 63.3       |
| None                           | 6         | 1.8        |
| Contact with a suspected case  |           |            |
| Yes                            | 237       | 70.1       |
| No                             | 101       | 29.9       |
| Contact with confirmed cases of COVID-19 | |          |
| Yes                            | 180       | 53.3       |
| No                             | 158       | 46.7       |
| Contact with suspected or confirmed specimen | |            |
| Yes                            | 78        | 23.1       |
| No                             | 260       | 76.9       |
| Got infected with COVID-19     |           |            |
| Yes                            | 57        | 16.9       |
| No                             | 281       | 83.1       |
| A colleague got infected with COVID-19 | |          |
| Yes                            | 270       | 79.9       |
| No                             | 68        | 20.1       |
| A colleague died from COVID-19 |           |            |
| Yes                            | 119       | 35.2       |
| No                             | 219       | 64.8       |
| A family member got infected with COVID-19 | |          |
| Yes                            | 69        | 20.4       |
| No                             | 269       | 79.6       |
| A family member died of COVID-19|         |            |
| Yes                            | 19        | 5.6        |
| No                             | 319       | 94.4       |
| Afraid of getting infected with COVID-19 | |          |
| Yes                            | 299       | 88.5       |
| No                             | 39        | 11.5       |
| Willingness to work as a frontline staff | |           |
| Yes                            | 262       | 77.5       |
| No                             | 76        | 22.5       |

SD, standard deviation.
† Variable less than the total population.

PPE, personal protective equipment
TABLE 3: Association between sociodemographic, history of anxiety and/or depression and comorbidity and the dependent variables.

| Variables                                      | Depression | Anxiety | Stress |
|-----------------------------------------------|------------|---------|--------|
|                                               | No %       | Yes %   | p      | No %       | Yes %   | p      | No %       | Yes %   | p      |
| Age (years)                                    |            |         |       |            |         |       |            |         |       |
| 20–29                                         | 92 84.4    | 17 15.6 | 0.028F* | 101 92.7   | 8 7.3   | 0.402F | 28 25.7    | 81 74.3 | 0.003F* |
| 30–39                                         | 142 91.6   | 13 8.4 |        | 148 95.5   | 7 4.5   |        | 62 40.0    | 93 60.0 |        |
| ≥ 40                                          | 71 95.9    | 3 4.1  |        | 72 97.3    | 2 2.7   |        | 37 50.0    | 37 50.0 |        |
| Gender                                         |            |         |       |            |         |       |            |         |       |
| Male                                          | 83 89.2    | 10 10.8 | 0.706  | 87 93.5    | 6 6.5   | 0.461  | 36 38.7    | 57 61.3 | 0.791  |
| Female                                        | 222 90.6   | 23 9.4  |        | 234 95.5   | 11 4.5  |        | 91 37.1    | 154 62.9 |        |
| Occupation                                     |            |         |       |            |         |       |            |         |       |
| Doctor                                        | 115 95.8   | 5 4.2  | 0.010* | 118 98.3   | 2 1.7   | 0.038F* | 61 50.8    | 59 49.2 | < 0.001* |
| Nurse                                         | 190 87.2   | 28 12.8 |        | 203 93.1   | 15 6.9  |        | 66 30.3    | 152 69.7 |        |
| Marital status                                 |            |         |       |            |         |       |            |         |       |
| Married                                       | 181 91.4   | 17 8.6  | 0.386  | 189 95.5   | 9 4.5   | 0.628  | 82 41.4    | 116 58.6 | 0.083* |
| Not-married                                   | 124 88.6   | 16 11.4 |        | 132 94.3   | 8 5.7   |        | 45 32.1    | 95 67.9 |        |
| Religion                                       |            |         |       |            |         |       |            |         |       |
| Christianity                                  | 234 91.4   | 22 8.6  | 0.201  | 244 95.3   | 12 4.7  | 0.611  | 97 37.9    | 159 62.1 | 0.832  |
| Islam and Others                              | 71 86.6    | 11 13.4 |        | 77 93.9    | 5 6.1   |        | 30 36.6    | 52 63.4 |        |
| Whom you live with                            |            |         |       |            |         |       |            |         |       |
| Alone                                         | 61 91.0    | 6 9.0   | 0.803  | 63 94.0    | 4 6.0   | 0.754F | 18 26.9    | 49 73.1 | 0.043* |
| With family                                   | 244 90.0   | 27 10.0 |        | 258 95.2   | 13 4.8  |        | 109 40.2   | 162 59.8 |        |
| Years of employment                           |            |         |       |            |         |       |            |         |       |
| 1–5                                          | 175 88.8   | 22 11.2 | 0.159F | 187 94.9   | 10 5.1  | 0.787F | 69 35.0    | 128 65.0 | 0.061* |
| 6–10                                         | 71 88.8    | 9 11.2  |        | 75 93.8    | 5 6.2   |        | 27 33.8    | 53 66.2 |        |
| ≥ 5                                          | 59 96.7    | 2 3.3   |        | 59 96.6    | 2 3.3   |        | 31 50.8    | 39 49.2 |        |
| Days worked per week during the pandemic      |            |         |       |            |         |       |            |         |       |
| 1–2                                          | 51 86.4    | 8 13.6  | 0.320  | 53 89.8    | 6 10.2  | 0.108  | 21 35.6    | 38 64.4 | 0.679  |
| 3–4                                          | 170 92.4   | 14 7.6  |        | 178 96.7   | 6 3.3   |        | 68 37.0    | 116 63.0 |        |
| ≥ 5                                          | 76 88.4    | 10 11.6 |        | 81 94.2    | 5 5.8   |        | 36 41.9    | 50 58.1 |        |
| Comorbidities                                  |            |         |       |            |         |       |            |         |       |
| None                                          | 272 90.4   | 29 9.6  | 0.531F | 286 95.0   | 15 5.0  | 0.357F | 110 36 191 | 63.5  | 0.624F |
| Cardiovascular disease                        | 17 94.4    | 1 5.6   |        | 18 100.0   | 0.0 0.0  |        | 9 50.0    | 9 50.0 |        |
| Respiratory illness                           | 8 80.0     | 2 20.0  |        | 9 90.0     | 1 10    |        | 4 40.0    | 6 63.5 |        |
| Diabetes                                      | 8 88.9     | 1 11.1  |        | 8 88.9     | 1 11.1  |        | 4 44.4    | 5 55.6 |        |
| History of anxiety and/or depression          |            |         |       |            |         |       |            |         |       |
| Yes                                           | 66 84.6    | 12 15.4 | 0.057* | 74 94.9    | 4 5.1   | 1.000F | 21 29.6    | 57 73.4 | 0.027* |
| No                                            | 239 91.9   | 21 8.1  |        | 247 95.0   | 13 5.0  |        | 106 40.8   | 154 59.2 |        |

F. Fisher’s p-value.  
* p-value < 0.1

more likely to be stressed (reversed reference). Nurses were more likely to be stressed (OR: 2.35; 95% CI: 1.388–3.974) than doctors. Those with a history of anxiety or depression were almost inevitably bound to be stressed compared to those without such history. Stress became more significant, up to 3.33 times more probable (95% CI: 1.599–6.935) if the HCPs had been infected with COVID-19 (Table 7). The independent variables explained 17.7% of the variance.

Discussion

This study assessed the prevalence and factors associated with depression, anxiety and stress among clinical HCPs working in a tertiary hospital in Nigeria. The prevalence of depression, anxiety and stress was 9.8%, 5.0% and 62.4%, respectively. Comparing the findings in this study to other studies in Africa is challenging because of the paucity of studies on the mental health of healthcare workers since the COVID-19 pandemic. A recent systematic review conducted by29 found no African studies. Since their review, however, some studies have emerged from Africa.31,14,15 The prevalence of depression among HCPs in our study is significantly lower than the 21% reported in Ghana15 and 30.5% reported in Tunisia.14 In comparison to studies outside Africa, our finding is still lower than the pooled depression prevalence of 21.7% in a recent systematic review,28 18.3% reported in China and 42.3% reported in Trinidad and Tobago.13,29

The prevalence of anxiety of 5% found in this present study is significantly lower than 22.2% – 27.8% reported in Africa.14,15 Also, it is lower than the pooled anxiety prevalence of 22.1% across 57 countries,26 as well as 11.0% reported in Saudi Arabia,30 12.3% in China,27 20.7% in Spain,25 9.5% in Oman31 and 33% in the United States.8 The prevalence of stress was 62.4% in our study, which is similar to the 56.4% reported in Oman31 and considerably higher than the 8.2% in a study conducted among Ghanaian health workers,15 17.9% in Trinidad and Tobago14 and 18.6% in Tunisia.14 The plausible explanations for the variation in the prevalence of depression, anxiety and stress can be linked to the assessment tools used in these studies and the time the studies were conducted.15
TABLE 4: Association between personal protective equipment, contact with COVID-19 cases and infection and the dependent variables.

| Variables                        | Depression | Anxiety | Stress |
|----------------------------------|------------|---------|--------|
|                                  | No %       | Yes %   | p      | No %       | Yes %   | p      | No %       | Yes %   | p      |
| Access to PPE                    |            |         |       |            |         |       |            |         |       |
| Yes                              | 277 90.2   | 30 9.8  | 1.000F| 292 95.1   | 15 4.9  | 0.662F| 120 39.1   | 187 60.9| 0.071  |
| No                               | 28 90.3    | 3 9.7   |       | 29 93.5    | 2 6.5   |       | 7 22.6     | 24 77.4|        |
| Adequacy of PPE                  |            |         |       |            |         |       |            |         |       |
| Adequate                         | 117 90.0   | 13 10.0 | 0.908 | 122 93.8   | 8 6.2   | 0.455 | 52 40.0     | 78 60.0| 0.467  |
| Inadequate                       | 188 90.4   | 20 9.6  |       | 199 95.7   | 9 4.3   |       | 75 36.1     | 133 63.9|        |
| Protective measures              |            |         |       |            |         |       |            |         |       |
| Adequate                         | 109 92.4   | 9 7.6   | 0.398F| 112 94.9   | 6 5.1   | 0.408F| 48 40.7     | 70 59.3| 0.134F |
| Insufficient                     | 191 89.3   | 23 10.7 |       | 204 95.3   | 10 4.7  |       | 79 36.9     | 135 63.1|        |
| None                             | 5 83.3     | 1 16.7  |       | 5 83.3     | 1 16.7  |       | 0 0.0       | 6 100.0|        |
| Contact with a suspected case    |            |         |       |            |         |       |            |         |       |
| Yes                              | 218 92.0   | 19 8.0  | 0.098*| 228 96.2   | 9 3.8   | 0.112 | 90 38.0     | 147 62.0| 0.816  |
| No                               | 87 86.1    | 14 13.9 |       | 93 92.1    | 8 7.9   |       | 37 36.6     | 64 63.4|        |
| Contact with a confirmed case    |            |         |       |            |         |       |            |         |       |
| Yes                              | 161 89.4   | 19 10.6 | 0.600 | 172 95.6   | 8 4.4   | 0.599 | 71 39.4     | 109 60.6| 0.449  |
| No                               | 144 91.1   | 14 8.9  |       | 149 94.3   | 9 5.7   |       | 56 35.4     | 102 64.6|        |
| Contact with suspected or confirmed specimen |        |         |       |            |         |       |            |         |       |
| Yes                              | 66 84.6    | 12 15.4 | 0.057*| 76 97.4    | 2 2.6   | 0.379F| 24 30.8     | 54 69.2| 0.157  |
| No                               | 239 91.9   | 21 8.1  |       | 245 94.2   | 15 5.8  |       | 103 39.6    | 157 60.4|        |
| Got infected with COVID-19       |            |         |       |            |         |       |            |         |       |
| Yes                              | 49 86.0    | 8 14.0  | 0.233 | 55 96.5    | 2 3.5   | 0.748F| 12 21.1     | 45 78.9| 0.005* |
| No                               | 256 91.1   | 25 8.9  |       | 266 94.7   | 15 5.3  |       | 115 40.9    | 166 59.1|        |
| A colleague got infected with COVID-19 |        |         |       |            |         |       |            |         |       |
| Yes                              | 244 90.4   | 26 9.6  | 0.869 | 256 94.8   | 14 5.2  | 1.000F| 108 40.0    | 162 60.0| 0.066* |
| No                               | 61 89.7    | 7 10.3  |       | 65 95.6    | 3 4.4   |       | 19 27.9     | 49 72.1|        |
| A colleague died from COVID-19    |            |         |       |            |         |       |            |         |       |
| Yes                              | 102 85.7   | 17 14.3 | 0.039*| 113 95.0   | 6 5.0   | 1.000 | 38 31.9     | 81 68.1| 0.114  |
| No                               | 203 92.7   | 16 7.3  |       | 208 95.0   | 11 5.0  |       | 89 40.6     | 130 59.4|        |
| A family member got infected with COVID-19 |        |         |       |            |         |       |            |         |       |
| Yes                              | 57 82.6    | 12 17.4 | 0.017*| 65 94.2    | 4 5.8   | 0.758F| 23 33.3     | 46 66.7| 0.415  |
| No                               | 248 92.2   | 21 7.8  |       | 256 95.2   | 13 4.8  |       | 104 38.7    | 165 61.3|        |
| A family member died of COVID-19  |            |         |       |            |         |       |            |         |       |
| Yes                              | 16 84.2    | 3 15.8  | 0.414F| 18 94.7    | 1 5.3   | 1.000F| 5 26.3      | 14 73.7| 0.297  |
| No                               | 289 90.6   | 30 9.4  |       | 303 95.0   | 16 5.0  |       | 122 38.2    | 197 61.8|        |
| Afraid of getting infected with COVID-19 |        |         |       |            |         |       |            |         |       |
| Yes                              | 237 90.5   | 25 9.5  | 0.799 | 252 96.2   | 10 3.8  | 0.058*| 96 36.6     | 166 63.4| 0.511  |
| No                               | 68 89.5    | 8 10.5  |       | 69 90.8    | 7 9.2   |       | 31 40.8     | 45 59.2|        |
| Willingness to work as a frontline staff |        |         |       |            |         |       |            |         |       |
| Yes                              | 145 89.0   | 18 11.0 | 0.444 | 154 94.5   | 9 5.5   | 0.690 | 57 35.0     | 106 65.0| 0.340  |
| No                               | 160 91.4   | 15 8.6  |       | 167 95.4   | 8 4.6   |       | 70 40.0     | 105 60.0|        |

PPE, Personal Protective Equipment; F, Fisher’s p-value. COVID-19, coronavirus disease 2019.
Bolded p-values are significant at < 0.1.
*, p-values < 0.1

While some studies were conducted close to the peak of the pandemic, others studies were conducted nearly a year later – such as the current study.

Several measures were adopted by the HCPs to cope with COVID-19 and associated stress. An increase in knowledge about COVID-19, contributed to a more positive attitude towards working with COVID-19 patients. Respondents also used preventive measures (such as regular hand washing and use of face masks) to cope with stress. Earlier studies are in agreement with this finding.15,16

Preventive measures against COVID-19 are extremely important, more so for HCPs that treat patients with COVID-19. Almost all the HCPs used social engagement such as regular contact via social media with family and friends to cope with symptoms of depression, anxiety and stress. This is similar to findings reported in earlier studies.14,15 Interpersonal contact is seen as a mitigating factor to alleviate anxiety and depression to improve the mood of the HCPs.72 About one in ten of the HCPs in this study stopped watching COVID-19-related news and two-thirds resorted to spiritual means to assist them to cope with the stress of COVID-19, findings that are in agreement with an earlier study.15

Healthcare professionals at least 40 years of age, compared to those between 20 years and 29 years, were found to have less symptoms associated with depression and stress. A study conducted in China reported an inverse of our findings.2 A plausible explanation for our findings could be that older HCPs play more of a supervisory or clinical instructor role, thereby limiting their contact with COVID-19 patients. In
addition, there were concerns about the adequacy of the protective equipment available in the facility by more than half of the HCPs (see Table 2); this may contribute to depression among the younger HCPs as they are likely to have more contact with COVID-19 patients while providing care. Healthcare professionals whose colleagues and relatives died because of complications relating to COVID-19 were more likely to be depressed in our study. Some of the reasons include the affected HCPs might still find it difficult to cope with the deaths of their colleagues; unresolved grieve might lead to depression, especially if the deceased is a close family member. Another reason might be that the fear of contracting COVID-19 may increase if a colleague or family member dies of COVID-19, which might lead to concerns over the possibility of contracting COVID-19, making one vulnerable to stress, anxiety or depression.

We found that nurses were significantly more depressed and experienced anxiety-related symptoms than doctors. This is in line with the conclusion of Pappa et al. in their systematic review and meta-analysis as they reported that nurses presented with significantly greater anxiety-related features than doctors. A similar observation was reported in Switzerland, Spain and China. The variation in the level of anxiety between both professionals can be attributed to two possible reasons. Firstly, nurses tend to have more contact with infected patients because they spend more time in the

TABLE 5: Binary logistic regression analysis of covariates and depression.

| Variables | AOR | Coefficient | 95% CI | p     |
|-----------|-----|-------------|--------|-------|
| Age       |     |             |        |       |
| 20–29 years (Reference) | 1   |             |        |       |
| 30–39     | 0.581 | -0.543      | 0.235  | 1.436 | 0.240 |
| ≥ 40      | 0.224 | -1.484      | 0.057  | 0.876 | 0.032*|
| Occupation|     |             |        |       |
| Doctor (Reference) | 1   |             |        |       |
| Nurse     | 3.956 | 1.375       | 1.194  | 13.103| 0.024*|
| Days worked per week during pandemic | | | | |
| 1–2 (Reference) | 1   |             |        |       |
| 3–4       | 0.392 | -0.936      | 0.140  | 1.098 | 0.075 |
| ≥ 5       | 0.954 | -0.047      | 0.299  | 3.047 | 0.937 |
| History of anxiety and/or depression | | | | |
| No (Reference) | 1   |             |        |       |
| Yes       | 1.802 | 0.589       | 0.749  | 4.336 | 0.189 |
| Contact with a suspected case | | | | |
| Yes (Reference) | 1   |             |        |       |
| No        | 2.313 | 0.839       | 0.895  | 5.976 | 0.083 |
| Contact with suspected or confirmed specimen | | | | |
| No (Reference) | 1   |             |        |       |
| Yes       | 2.504 | 0.918       | 1.033  | 6.070 | 0.042*|
| A colleague died of COVID-19 | | | | |
| No (Reference) | 1   |             |        |       |
| Yes       | 2.912 | 1.069       | 1.210  | 7.004 | 0.017*|
| A family member got infected | | | | |
| No (Reference) | 1   |             |        |       |
| Yes       | 2.659 | 0.978       | 1.128  | 6.265 | 0.025*|

AOR, Adjusted Odds Ratio. COVID-19, coronavirus disease 2019. Hosmer and Lemeshow χ² (p-value): 6.308 (0.613); Nagelkerke R²: 0.223. *, p-value <0.05

TABLE 6: Binary logistic regression analysis of covariates and anxiety.

| Variables | AOR | Coefficient | 95% CI | p     |
|-----------|-----|-------------|--------|-------|
| Age       |     |             |        |       |
| 20–29 years (Reference) | 1   |             |        |       |
| 30–39     | 0.798 | -0.226      | 0.263  | 2.421 | 0.690 |
| ≥ 40      | 0.388 | -0.947      | 0.074  | 2.035 | 0.263 |
| Gender    |     |             |        |       |
| Male (Reference) | 1   |             |        |       |
| Female    | 0.536 | -0.623      | 0.173  | 1.659 | 0.279 |
| Occupation|     |             |        |       |
| Doctor (Reference) | 1   |             |        |       |
| Nurse     | 6.815 | 1.919       | 1.360  | 34.157| 0.020*|
| A colleague got infected with COVID-19 | | | | |
| Yes (Reference) | 1   |             |        |       |
| No        | 0.491 | -0.711      | 0.121  | 1.989 | 0.319 |
| A colleague died of COVID-19 | | | | |
| Yes (Reference) | 1   |             |        |       |
| No        | 0.843 | -0.171      | 0.275  | 2.581 | 0.765 |
| A family member got infected | | | | |
| No (Reference) | 1   |             |        |       |
| Yes       | 0.895 | -0.111      | 0.222  | 3.615 | 0.876 |
| A family member died of COVID-19 | | | | |
| Yes (Reference) | 1   |             |        |       |
| No        | 1.435 | 0.361       | 0.128  | 16.042| 0.769 |
| Afraid of getting infected with COVID-19 | | | | |
| Yes (Reference) | 1   |             |        |       |
| No        | 3.118 | 1.137       | 1.022  | 9.510 | 0.046*|

AOR, Adjusted Odds Ratio. COVID-19, coronavirus disease 2019. Hosmer and Lemeshow χ² (p-value): 8.120 (0.422); Nagelkerke R²: 0.119. *, p-value <0.05

TABLE 7: Binary logistic regression analysis of covariates and stress.

| Variables | AOR | Coefficient | 95% CI | p     |
|-----------|-----|-------------|--------|-------|
| Age       |     |             |        |       |
| 20–29 years (Reference) | 1   |             |        |       |
| 30–39     | 0.505 | -0.684      | 0.254  | 1.001 | 0.050 |
| ≥ 40      | 0.379 | -0.969      | 0.147  | 0.981 | 0.046*|
| Occupation|     |             |        |       |
| Doctor (Reference) | 1   |             |        |       |
| Nurse     | 2.349 | 0.854       | 1.388  | 3.974 | 0.001*|
| Marital status| | | | |
| Married (Reference) | 1   |             |        |       |
| Not-married| 1.594 | 0.466       | 0.812  | 3.128 | 0.175 |
| Whom you live with | | | | |
| Alone (Reference) | 1   |             |        |       |
| With family | 0.552 | -0.594      | 0.267  | 1.144 | 0.110 |
| Years of employment | | | | |
| 1–5 (Reference) | 1   |             |        |       |
| 6–10      | 1.010 | 0.010       | 0.542  | 1.882 | 0.975 |
| > 10      | 0.763 | -0.271      | 0.340  | 1.714 | 0.512 |
| History of anxiety and/or depression | | | | |
| No (Reference) | 1   |             |        |       |
| Yes       | 1.925 | 0.655       | 1.057  | 3.507 | 0.032*|
| Access to PPE | | | | |
| Yes (Reference) | 1   |             |        |       |
| No        | 2.089 | 0.737       | 0.826  | 5.282 | 0.119 |
| Got infected with COVID-19 | | | | |
| No (Reference) | 1   |             |        |       |
| Yes       | 3.330 | 1.203       | 1.599  | 6.935 | 0.001*|
| A colleague got infected with COVID-19 | | | | |
| Yes (Reference) | 1   |             |        |       |
| No        | 1.375 | 0.318       | 0.714  | 2.646 | 0.341 |

AOR, Adjusted Odds Ratio; PPE, personal protective equipment. COVID-19, coronavirus disease 2019. Hosmer and Lemeshow χ² (p-value): 7.759 (0.457); Nagelkerke R²: 0.177. *, p-value <0.05
ward in direct contact with the patients, collecting specimens. Secondly, nurses may witness more injuries including ethical dilemmas and death, which can contribute to their high level of anxiety. Therefore, there is a need to focus on interventions for nurses to alleviate their anxiety as suggested by Zhu et al. Healthcare professionals that were afraid of getting infected with the virus had a very high probability of experiencing anxiety. Perhaps the fear of COVID-19 infection and witnessing frequent mortality may have led to the high levels of anxiety.

One study affirms our finding that older HCPs were less likely to be stressed. The study stated that younger HCPs were also likely to be junior in rank, attending to patients directly, while the older HCPs work primarily in a supervisory capacity. In addition, the lack of experience with COVID-19 patients may further increase the level of stress among the younger HCPs. Our findings point to the fact that nurses were more stressed than doctors. In addition to spending more time caring for COVID-19 patients, nurses also had to provide social and emotional support in the absence of family members, which might have increased the likelihood of stress among the nurses. The HCPs with a history of anxiety and/or depression experienced significantly more stress. A history of stress is generally seen as a predisposing factor for anxiety or depression, which was proven in this study. Healthcare professionals that returned to work after recovering from COVID-19 were more stressed than those who never tested positive for COVID-19. The stress could be induced by the circumstances related to the recovery from COVID-19 such as isolation from family and colleagues.

**Strength and limitations**

Many of the previous studies selected participants with non-probability sampling such as convenience and consecutive sampling. A major strength of our study is the use of probability sampling to limit sampling bias. Also, this study is one of the few available studies on COVID-19-related mental health among HCPs in Nigeria. This study is not without limitations. Firstly, only one health facility was surveyed, which may not be a representation of the mental health status of HCP in Lagos State and Nigeria at large; more studies across the country are warranted. Secondly, causal effect cannot be established as this is a cross-sectional study; therefore, the findings should be interpreted with caution. Thirdly, self-administered closed-ended questions may have limited the extent of experience of the HCPs; we recommend a qualitative study to assess the lived-in experience of HCPs during the peak of COVID-19. Finally, the low Cronbach alpha of the PSS tool suggests that the scale is less reliable in this setting; therefore, the findings should be interpreted with some caution. Further, there is a need for the PSS tool to be validated in the Nigerian setting.

**Conclusions**

Nurses experienced the most stress and were therefore identified as a vulnerable group, more at risk to develop anxiety and depression. Psychosocial interventions and stress management techniques are recommended to minimise the risks.

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**Competing interests**

The authors have declared that no competing interest exists.

**Authors’ contributions**

O.A.O. and K.O. conceived the idea. O.A.O., K.O., O.A.B., and J.O.O. developed methodology. O.A.O., O.A.B., and S.A.B. managed data. O.A.B. performed data analysis. O.A.O and O.J.K-O supervised the project. K.O., O.J.K., and O.A. validated the findings. All authors contributed to the final write-up.

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**Data availability**

Raw data is available as supplementary material.

**Disclaimer**

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