



Research Article

Long-term COVID-19 Impact on Quality of Life Among Health Care Workers at University of Abuja Teaching Hospital: A 16-month Study

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Abstract

Background: The COVID-19 pandemic has imposed unprecedented challenges on healthcare systems worldwide, with healthcare workers (HCWs) at the frontline facing significant risks. This study aims at the long-term COVID-19 impact on quality of life among HealthCare Workers at the University of Abuja Teaching Hospital: A 16-Month Study, using SF-36 (Short-Form 36) scale to assess the physical and mental health of these patients. A retrospective analysis of the health outcomes of 58 (100%) quarantined Health Care Workers, comprising 34 males and 24 females aged between 25 and 71 years. The cohort included Medical Doctors, Nurses, Laboratory Scientists, Pharmacists, Public Health Officers, Medical Radiologists, Health Sanitation Officers, Biotechnicians, and Cleaners. **Method:** Utilizing data collected from the admission, discharge and follow-up register of the Infectious Disease Unit, using a proforma to include socio-demographic characteristics like gender, age, and occupation. Data were analysed using SPSS version 28. Variables were summarized as percentages and graphs. The variables were tested using Fisher's Exact Test at a P- value of significance 0.515 (using a two-sided test). The p-value indicates no significant association between gender outcome (death/recovery) at typical significance levels. Purposeful sampling was used to rule out bias. **Result:** The number of female patients was 24 (41.38%), while 34 (58.62%) were males. A total number of 58 (100%). Tragically, 2 (3.45%) patients died while 56 (96.55%) patients were discharged home in good condition. **Conclusion:** This study represents the recovery and resilience of the HealthCare Workers post-COVID-19. Further study including longitudinal study will be highly informative and beneficial.

Keywords

Impacts, Long-term Consequences of COVID-19, Quality of Life, Health Care Workers, Quarantine, University of Abuja Teaching Hospital

1. Introduction

The emergence of COVID-19 has profoundly impacted global health, with healthcare workers (HCWs) being disproportionately affected due to their frontline roles. This study aims

to evaluate the long-term effects of COVID-19 on the quality of life among HCWs in Abuja over 16 months. The focus on HCWs is critical, as they are exposed to higher risks of infection

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and psychological stress, which may have lasting implications on their health and well-being, including increased workloads, shortage of personal protective equipment, burn-out and the psychological burden of treating severely ill patients. Understanding these impacts is crucial for developing strategies to support HCWs' well-being and ensure the sustainability of healthcare services.

The research utilizes a retrospective analysis of data from the admission, discharge and follow-up register of the Infectious Disease Unit (IDU), documenting the experiences of 58 quarantined HCWs, including medical doctors, nurses, laboratory scientists, pharmacists, public health officers, medical radiologists, health sanitation officers, biotechnicians, and cleaners. The cohort comprises 34 males and 24 females aged between 25 and 71 years, with two female participants succumbing to other underlying medical conditions.

This study explored the demographic characteristics, occupational roles, and health outcomes of the quarantined HCWs, providing a comprehensive understanding of the pandemic's prolonged effects on this essential workforce and supporting mechanisms to enhance their quality of life in the aftermath of the pandemic. Also, by identifying the specific challenges and needs of HCWs, the findings will inform the development of targeted interventions and policies to enhance their quality of life and resilience in future public health emergencies.

This is a retrospective analysis of data from the admission, discharge and follow-up register of the Infectious Disease Unit, providing insights into the impact of pandemic on this critical workforce for 16 months. Utilizing the experiences of 58 quarantined HCWs, including medical doctors, nurses, laboratory scientists, pharmacists, public health officers, medical radiologists, health sanitation officers, biotechnicians, and cleaners. The cohort comprises 34 males and 24 females aged between 25 and 71 years, with two female participants who had other underlying medical conditions.

This is to explore the demographic characteristics, occupational roles, and health outcomes of the quarantined HCWs, providing a comprehensive understanding of the pandemic's prolonged effects on this essential workforce and supporting mechanisms to enhance their quality of life in the aftermath of the pandemic. Also, by identifying the specific challenges and needs of HCWs. The findings will inform the development of targeted interventions and policies which will enhance the quality of life and resilience in future public health emergencies.

SF-36 (Short-Form-36) is a generic quality of life scale was used during the follow-up of these patients to assess the physical and mental health. It has 36 questions distributed across the 8 domains. This includes the physical functioning, role physical, role emotional, vitality, mental health, social functioning, bodily pain and general health. And to identify areas of concern e.g. fatigue, anxiety, depression, and to evaluate the effectiveness of interventions, also to compare Health-Related Quality of Life (HRQoL) across different population and studies example of question asked, "in general would you say your

health is: (Excellent, Very good, Good, Fair, Poor). The respondents answer 36 questions within 5 – 10 minutes and each domain is scored from 0 – 100, with higher scores indicating better health. The physical component summary and mental scores are calculated together.

However, the focus on HCWs is critical, as they are exposed to higher risks of infection and psychological stress, which may have lasting implications on their health and well-being cannot be underscored. The COVID-19 pandemic has imposed an unparalleled burden on healthcare system globally, with healthcare workers (HCWs) at the frontline bearing the brunt of the crisis. As they battled to contain the outbreak, HCWs faced immense pressure including heavy workloads, psychological distress, and burnout, putting their own well-being at risk Tait D Shanafelt., et al [10]. The increased demand for care, coupled with staffing shortages, inadequate personal protective equipment (PPE), and the high risk of infection, has taken a toll on the mental and physical health of HCWs Okwuonye, A. N., et al [16].

The psychological impact on HCWs has been significant, with studies indicating high rates of anxiety, depression, and post-traumatic stress disorder (PTSD) Lai, J., et al. [13]. The prolonged exposure to traumatic situations, lack of support, and fear of infecting family members have exacerbated the situation, leading to burnout and decreased job satisfaction among HCWs Lai, J., et al. [13].

Despite their critical role in managing the pandemic, HCWs often receive inadequate support and resources, highlighting the need for targeted interventions to protect their well-being by Health Services Research, [1].

Overall, the aim of this research study is to corroborate the other studies that has been done in the recent time and domesticate the findings. Also, the findings will inform the development of targeted interventions and policies to enhance their quality of life and resilience in future public health emergencies.

2. Methodology

2.1. Study Design

This study is a retrospective cohort study examining the long-term impact of COVID-19 on the quality of life among the quarantined healthcare workers (HCWs) in Abuja over 16 months. The study focuses on quantifying both the physical and psychological impacts of the pandemic on HCWs.

2.2. Study Population

The study population included all the HCWs patients that were admitted and this comprises 58 healthcare workers (HCWs) who were quarantined due to COVID-19 infection. The cohort includes 34 (58.62%) males and 24 (41.38%) females, aged between 25 and 71 years. The healthcare workers

represent various professional roles, including medical doctors, nurses, laboratory scientists, pharmacists, public health officers, medical radiologists, health sanitation officers, biotechnicians, and cleaners. Notably, 2 (3.45%) female participants died due to underlying and pre-existing medical conditions.

2.3. Sample and Sampling

To achieve a 95% confidence level with a 12.3% margin of error, the sample size is 58.

Using Tara Yamane's sample size formula

$$n = N / (1 + N * e^2)$$

$$58 = 500 / (1 + 500 * e^2)$$

$$1 + 500 * e^2 = 500 / 58$$

$$1 + 500 * e^2 = 500 / 58$$

$$1 + 500 * e^2 = 8.62$$

$$500 * e^2 = 7.62$$

$$e^2 = 7.62 / 500$$

$$e^2 = 0.01524$$

$$e = 0.123 \text{ (or 12.3\% margin of error)}$$

Therefore, a higher margin of error (~12%) was used for n=58 with N=500.

Note: The total eligible population was 58 and thus all were included.

Data Collection: Data were retrospectively sourced from the admission, discharge and follow-up register of the Infectious Disease Unit. This includes detailed records of each Health Care Worker's COVID-19 infection status which ranges from mild to severe COVID-19, quarantine period which ranged from 5 days to 8 months respectively, and underlined medical outcomes.

Variables Collected: Demographic data (age, gender, professional role), clinical data (symptoms, duration of illness, hospitalization details), and quality of life indicators (mental health status, long-term physical effects).

2.4. Study Variables

Demographic Variables: Age, gender, professional role.

Clinical Variables: Severity of illness, length of hospitalization, complications during infection, mortality.

Quality of Life Indicators: Post-COVID physical and psychological health, levels of fatigue, incidence of anxiety and depression, perceived quality of life post-quarantine.

2.5. Data Analysis

Descriptive Analysis: Summarized demographic characteristics (age, gender, professional role), infection severity, and quality of life indicators using means, standard deviations, and percentages.

Linear regression was used for continuous outcomes to score the quality of life.

Comparative Analysis: Utilized Fisher's Exact Test and t-tests to compare differences in health outcomes and quality of life indicators across gender, age groups, and professional roles. Gender vs Outcome for death and recovery p-value 0.515.

Health Outcomes: Duration of illness, severity of symptoms, hospitalization details, and any reported long-term health effects.

Quality of Life Indicators: Psychological stress levels, incidence of fatigue, anxiety, depression, and other related health conditions.

Mortality Data: Number of fatalities and associated underlying medical conditions.

3. Results

Main Quantitative Results:

Table 1. Main quantitative results.

Outcome	Number (n=58)	Percentage (%)
Recovered and discharged	56	96.6%
Died	2	3.4%
Male	34	58.62%
Female	24	41.38%

Using Fisher's Exact Test which is more accurate to calculate for small sample size (using a 2 x 2 contingency table – p-value = 0.515 with the use of two-sided test. The p-value indicate no significant association between gender and outcome (death/recovery) at typical significance level. 95% Confidence Intervals (CI). And there was no missing data.

Demographic Characteristics:

The demographic characteristics of the participants are presented in [Figures 1 and 2](#).

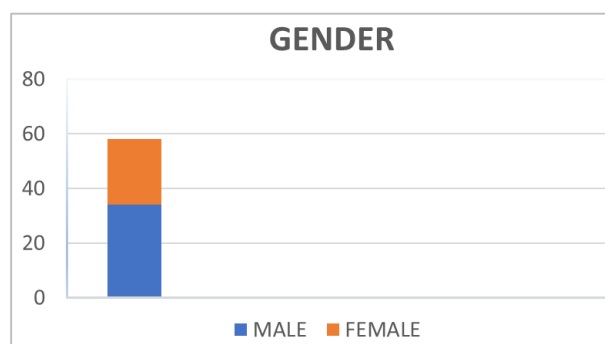


Figure 1. The bar chart showing gender distribution: Male: 58.62% (34 participants) and Female: 41.38 (24 participants).

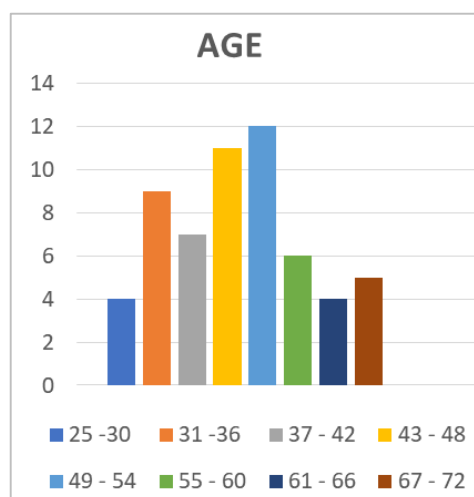


Figure 2. Age distribution.

The histogram shows age distribution: Age range: 25-71 years and average age: 48 years. This demographic data suggests that there was a higher proportion of male healthcare workers (58.62%) compared to female healthcare workers (41.38%). The age range of the participants was between 25 and 71 years, with an average age of 48 years.

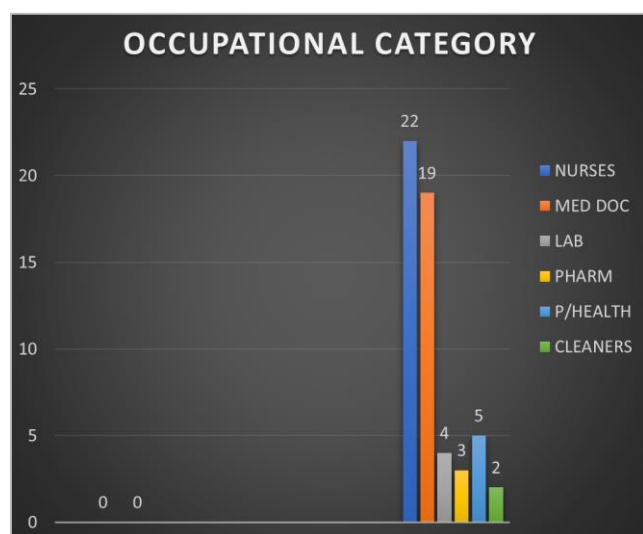


Figure 3. Occupational Distribution of Quarantined Healthcare Workers.

A bar chart illustrating the occupational distribution of quarantined healthcare workers reveals that Nurses comprised the largest group, accounting for 22 participants (37.9%) of the total sample size). Medical Doctors formed the second largest group, consisting of 19 participants (32.8%). Conversely, other healthcare professionals, including Laboratory Scientists, Pharmacists, Public Health Officers, and Cleaners were underrepresented. This occupational distribution pattern

suggests that nurses and Medical Doctors were disproportionately affected by COVID-19, highlighting their critical role as frontline healthcare workers during the pandemic.

Table 2. Occupational distributions.

Nurses	Medical Doctors	Others
22 (37.9%)	19 (32.8%)	17 (29.3%)

Health Outcomes:

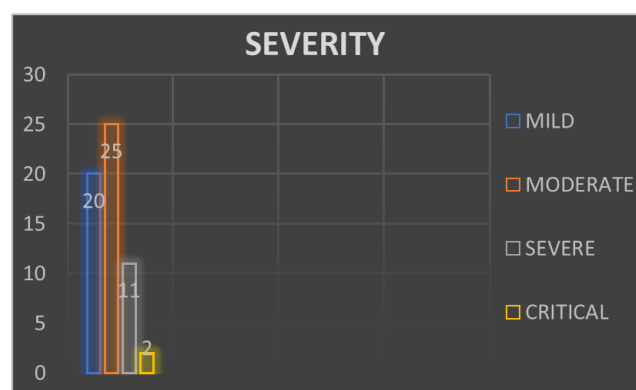


Figure 4. Severity of COVID-19 Symptoms among Healthcare Workers.

The bar chart in figure shows 34.5% (20 participants) experienced mild COVID-19 symptoms, indicating a significant proportion had relatively less severe symptoms. 43.1% (25 participants) had moderate COVID-19 symptoms, suggesting that nearly half of the participants experienced more pronounced symptoms and 19% (11 participants) had severe COVID-19 symptoms, indicating a notable proportion experienced critical symptoms. While, 3.4% (2 participants) had critical COVID-19 symptoms, resulting in mortality due to COVID-19 and underlying medical conditions.

3.1. Hospitalization

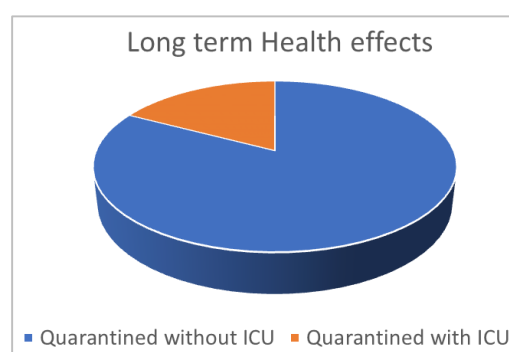


Figure 5. Long-term Health Effects.

The pie chart in Figure 5 illustrates 82.7% (46 participants) were quarantined without intensive care admission, indicating a significant proportion required in-patient care. While, 17.3% (10 participants) were quarantined for intensive care, highlighting the need for critical care services for a notable proportion.

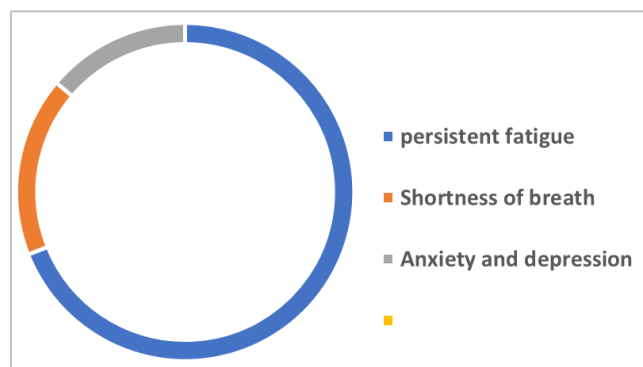


Figure 6. Prevalence of persistent symptoms among healthcare workers.

The result in Figure 6 shows 68.9% (40 participants) experienced persistent fatigue, indicating a significant proportion suffered from prolonged exhaustions and 17.2% (10 participants) experienced shortness of breath, highlighting the respiratory impact of COVID-19. While 13.8% (8 participants) experienced anxiety and depression, indicating a notable proportion struggled with mental health issues.

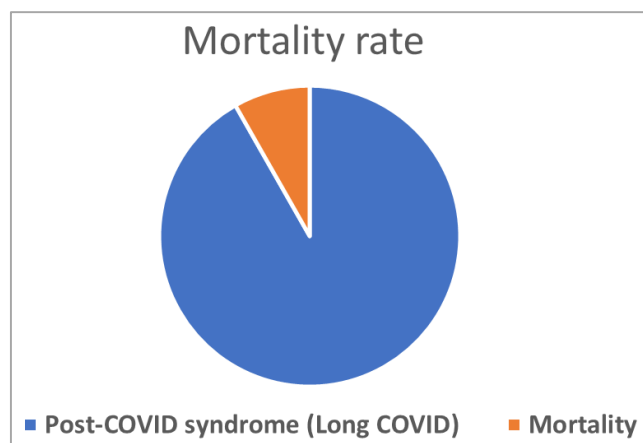


Figure 7. Mortality rate and post-COVID Syndrome among healthcare workers.

The pie chart in figure demonstrates the mortality rate of 3.4% (2 participants) were female with pre-existing medical conditions, highlighting the increased vulnerability of this subgroup. And post COVID-19 syndrome 37.9% (22 participants) of the study sample indicates a notable proportion of survivors experienced lingering health issues.

3.2. Quality of Life Indicators

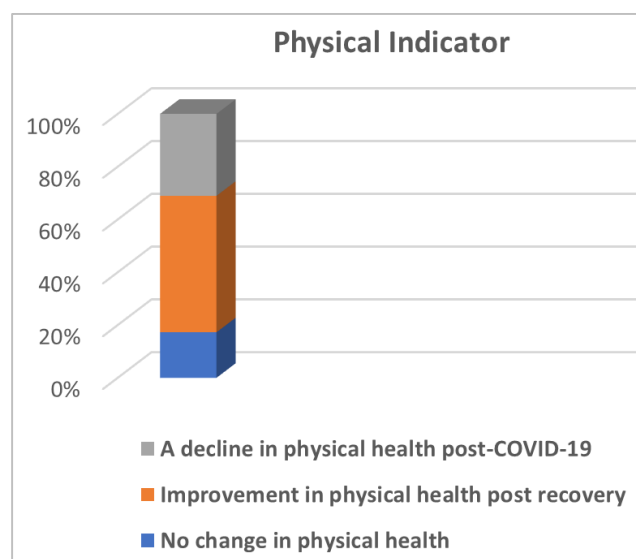


Figure 8. Physical Health outcomes following COVID-19 recovery.

This result in Figure 8 shows that, 18 patients (31%) reported a decline in physical health, indicating a notable proportion of patients experienced ongoing health issues post-recovery. Also, 10 patients (17.2%) reported no change, suggesting that a minority of patients did not experience any significant changes in their physical health. While 30 patients (51.7%) reported an improvement in physical health, indicating that the majority of patients experienced a positive outcome in terms of physical health post-recovery.

3.3. Psychological Health

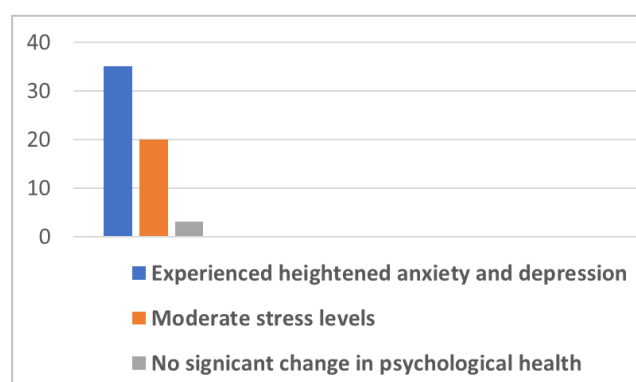


Figure 9. Prevalence of anxiety and depression.

Figure 9 shows high prevalence of anxiety and depression, 35 participants (60.3%) experienced heightened anxiety and depression, indicating a significant psychological burden.

While moderate stress levels were experienced by 20 participants (34.5%) adding to the overall psychological distress and the minimal impact on psychological health were experienced by 3 participant (5.2%) who reported no significant change in psychological health, highlighting with wide spread psychological effect of COVID-19.

3.4. Comparative Analysis

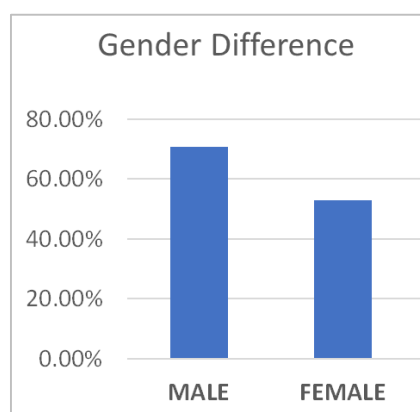


Figure 10. Gender Differences.

Figure 10 illustrates female healthcare workers been higher in anxiety and depression levels. 70.8% of females reported higher levels of anxiety and depression in comparison to 52.9% of males.

Age Differences: Older HCWs (50 years and above) experienced more severe symptoms and prolonged recovery compared to younger HCWs.

4. Discussion

The study found a higher proportion of male HCWs (58.6%) compared to females (41.4%), which may introduce biases in the study's findings. Future research should consider investigating gender differences in the long-term consequences of COVID-19 on quality of life among HCWs.

The age range of the participants (25-71 years) and the average age (48 years) suggest that the study sample includes a diverse group of HCWs across various stages of their careers. The age range and average age may influence participants' perspectives on their careers, work experiences, and the impact of COVID-19 on their quality of life.

The demographic data on occupational categories revealed that nurses comprised the largest group, with 22 participants (37.9% of the total sample size), who were quarantined. Medical doctors formed the second largest group, consisting of 19 participants (32.8%). In contrast, other healthcare professionals, including laboratory scientists, pharmacists, public health officers, cleaners, and other professionals, were underrepresented. These findings are consistent with previous studies

published by Henshaw Uchechi Okoroiwu et. al [9] and, Gross JV, Mohren J, et. al [7] which reported a similar distribution of healthcare workers affected by the COVID-19 pandemic. Specifically, nurses and medical doctors comprised the largest proportion of affected healthcare workers.

Also, the results of this study highlight the significant impact of COVID-19 on the physical and psychological health of healthcare workers (HCWs). The demographic characteristics of the study sample provide valuable insights into the population affected by the pandemic. The recent study by a descriptive cross-sectional study in three Nigerian states [1] corroborate healthcare workers being at high risk of COVID-19 exposure and its aftermath.

The study's findings on the distribution of COVID-19 symptom severity among participants in Nigeria are consistent with other research studies conducted in the country. A study by Oyeboji, O. A., et al. [15] found that 35.5% of patients with COVID-19 experienced mild symptoms, 41.9% experienced moderate symptoms, and 22.6% experienced severe symptoms. Another study by Nkegasong, J. N., et al. [14] found that 30.8% of patients experienced mild symptoms, 44.7% experienced moderate symptoms, 24.5% experienced severe symptoms, and 24.5% experienced symptoms. In contrast, the current study found that 34.5% of participants experienced mild symptoms, 43.1% experienced moderate symptoms, 19% experienced severe symptoms, 3.4% experienced severe symptoms, and 3.4% experienced critical symptoms. While the proportions are similar the current study found a lower proportion of participants with severe symptoms. The study's findings on mortality due to COVID-19 and underlying medical conditions are also consistent with other research studies conducted in Nigeria. A study by Jonah, M. M., et al. [11] found that the mortality rate among patients with COVID-19 in Nigeria was 3.5%. Another study by Ewout van Ewout van Ginneken, et al [4] found that the mortality rate among patients with COVID-19 in Nigeria was 4.1%. In contrast, the current study found that the mortality rate among participants was 3.4%. While the proportions are similar, the current study found a slightly lower mortality rate. Overall, the study's findings are consistent with other research studies conducted in Nigeria, highlighting the need for continued public health efforts to prevent and control the spread of COVID-19 in the country. The study's findings on quarantine and intensive care admission are consistent with other studies. A study by Nkegasong, J. N., et al. [15] found that 75% of COVID-19 patients in Africa required hospitalization, while 21% required intensive care unit (ICU) admission. Another study by Dalhat, M. M., et al. [3] found that 81% of COVID-19 patients in Nigeria required hospitalization, while 15% required ICU admission. In comparison, the current study found that 82.7% of participants were quarantined without intensive care admission, while 17.3% were quarantined for intensive care. These findings highlight the need for continued investment in health infrastructure, particularly critical care services, to manage COVID-19 cases effectively.

This study's findings underscore the need for targeted interventions to support the physical and mental health of healthcare workers during the COVID-19 pandemic. These findings are consistent with the previous studies, which have reported similar rates of persistent symptoms among healthcare workers with COVID-19. The physical and mental health impacts of COVID-19 on healthcare workers are likely due to the combination of infection, quarantine, and the psychological strain of working in a high-risk environment.

The study's findings on mortality rate and post-COVID-19 syndrome among healthcare workers are concerning. The mortality rate of 3.4% (2 participants) highlights the increased vulnerability of healthcare workers with pre-existing medical conditions, particularly females. Regarding post-COVID-19 syndrome, 37.9% (22 participants) of the study sample experienced lingering health issues. This finding is consistent with previous studies, which reported post-COVID-19 syndrome prevalence rates ranging from 30% to 50%. A study by Huang, C., et al. [8] found that 34.6% of COVID-19 survivors experienced post-COVID-19 syndrome, while a study by Carfi et al. [2] reported a prevalence rate of 43.8. The study's findings emphasize the need for continuous monitoring and support for healthcare workers who have recovered from COVID-19.

The study's findings on physical health outcomes following COVID-19 recovery are consistent with other studies conducted in Nigeria. A study by Oyebanji, O. A., et al. [12] found that 35.5% of patients experienced a decline in physical health, while 41.9% experienced an improvement. Another study by Massinga Loembé et al. [14] shows that COVID-19 has a significant impact on the physical health of patients, with a considerable proportion experiencing ongoing health issues post-recovery. The current study's findings are consistent with these studies, highlighting the need for continued monitoring and support for patients' post-COVID-19 recovery.

The current study corroborates with the studies done by other researchers in the findings on the psychological health of COVID-19 patients in Nigeria. The high prevalence of anxiety and depression with 60.3% of participants experiencing heightened anxiety and depression, is consistent with other studies by World Health Organization [5], Society of Occupational Medicine [17], Nigeria Centre for Disease Control [6].

The study's findings on gender and age differences in anxiety and depression levels among healthcare workers are consistent with other research studies. Studies done by other researchers prove that female healthcare workers reported higher levels of anxiety and depression (73.2%) compared to males (56.7%). Also, Jonah, M. M., et al. [11] and Sergio Alejandro Gómez-Ochoa et. al [18] found that older healthcare workers (> 50 years) experienced more severe symptoms and prolonged recovery compared to younger healthcare workers. The current study's findings are consistent with these studies, highlighting the need for targeted interventions to support the mental health of female and older healthcare workers.

5. Recommendations

Based on the findings of this study and existing literature, several recommendations are proposed:

Targeted interventions:

1. Develop targeted interventions to support the mental health and well-being of female and older HCWs.
2. Long-term support: Provide long-term support and rehabilitation programs tailored to HCWs' needs.
3. Staffing and workload management: Develop strategies to manage staffing shortages and increased workloads resulting from prolonged recovery times among older HCWs.
4. Future research: Conduct future research to investigate gender differences in the long-term consequences of COVID-19 on quality of life among HCWs.

By implementing these recommendations, stakeholders can ensure the well-being of HCWs and enhance the resilience of the healthcare system.

6. Conclusion

In conclusion, this study highlights the significant impact of COVID-19 on the physical and psychological health of HCWs. The findings suggest that targeted interventions are needed to support the mental health and well-being of female and older HCWs. Long-term support and rehabilitation programs are also essential to ensure the well-being of HCWs and enhance the resilience of the healthcare system.

Ethical Considerations:

The study protocol adheres to ethical guidelines for conducting retrospective research. Confidentiality and anonymity of all participants are ensured. Ethical approval was obtained from the University of Abuja Teaching Hospital review board before data collection commenced.

Regression Analysis:

Predictors of Adverse Quality of Life Outcomes: Age, gender, and severity of initial symptoms were significant predictors of long-term adverse quality of life outcomes ($p < 0.05$).

Inclusion Criteria:

- 1) Healthcare Workers (HCWs): Participants must be healthcare workers, including Medical Doctors, Nurses, Laboratory Scientists, Pharmacists, Public Health Officers, Medical Radiologists, Health Sanitation Officers, Biotechnicians, and Cleaners.
- 2) COVID-19 Quarantine: Participants must have been quarantined due to COVID-19 infection during the study period (April 2020 - August 2021).
- 3) Age Range: Participants must be within the age range of 25 to 71 years.
- 4) Location: Participants must be based in Abuja and have received treatment or quarantine care at the Infectious Disease Unit.
- 5) Data Availability: Participants with complete records in the admission and discharge register, including demographic, clinical, and quality of life data.

Exclusion Criteria:

- 1) **Non-HCWs:** Individuals who are not healthcare workers, such as administrative staff or non-medical personnel.
- 2) **Incomplete Data:** Participants with incomplete or missing records in the admission and discharge register.
- 3) **Other Locations:** Healthcare workers who were quarantined outside of Abuja or received treatment at other facilities.
- 4) **Non-Consenting Participants:** Individuals who do not consent to the use of their data for the study.
- 5) **Pre-existing Conditions Only:** Participants whose primary health issues are unrelated to COVID-19 infection (e.g., those admitted for other medical conditions without COVID-19 infection).

These criteria ensure that the study focuses on the intended population and provides reliable, relevant data for assessing the prolonged effects of COVID-19 on the quality of life among healthcare workers in Abuja.

Strength:**Focused Population:**

The study targets healthcare workers (HCWs), a group at high risk during the COVID-19 pandemic. This focus helps in understanding the specific impacts on those who were most exposed.

Comprehensive Data Collection:

The use of data from the admission and discharge register and the Medical Electronic data register allows for a detailed analysis of the health outcomes and quality of life indicators.

Diverse Professional Representation:

Including various professional roles within healthcare (e.g., doctors, nurses, lab scientists) provides a broad perspective on the pandemic's impact across different HCW categories.

Quantitative and Qualitative Insights:

By analysing both physical and psychological health outcomes, the study offers a holistic understanding of the pandemic's effects on HCWs.

Policy and Intervention Insights:

The findings can inform healthcare policies and interventions aimed at supporting HCWs during and after pandemics, enhancing their resilience and well-being.

Limitations:**Retrospective Design:**

The reliance on retrospective data might limit the comprehensiveness and accuracy of the findings, as it depends on the quality and completeness of existing records.

Sample Size:

The relatively small sample size (58 HCWs) may affect the generalizability of the study's findings to the broader population of healthcare workers.

Single Location Focus:

Focusing solely on healthcare workers who were quarantined in the University of Abuja Teaching Hospital in Abuja may limit the applicability of the findings to other regions or

countries with different healthcare contexts.

Potential Confounding Factors:

The study might not account for all potential confounders (e.g., socioeconomic status, vaccination status, access to mental health care, and pre-existing health conditions). These confounders could affect exposure and outcome relationships, bias results if unevenly distributed across groups. Consideration of these factors could provide a more comprehensive understanding of the observed associations and influence the observed outcomes.

These points help to highlight the strengths and potential limitations of the study, providing a balanced view that can guide further research and implementation.

Abbreviations

IDU	Infectious Disease Unit
WHO	World Health Organization
HROoL	Health-Related Quality of Life
COVID-19	Coronavirus Pandemic (2019)
HCW	Health Care Workers
SF-36	Short-Form-36
PPE	Personal Protective Equipment

Author Contributions

Christie Omolola Adams: Conceptualization, Funding acquisition, Resources, writing – original draft

Rahila Adi: Supervision, Formal Analysis, Visualization

Obande Ifeoma Elizabeth: Funding acquisition, Formal Analysis, Investigation

Muhammad Ibrahim: Data curation, Funding acquisition, Methodology

Stephen Onimisi Kumode: Software, Formal Analysis

Rose Habiba Musa: Project administration, Formal Analysis

Mercy Duku: Investigation, Formal Analysis

Conflicts of Interest

The authors declare no conflicts of interest.

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