

The Impact of the COVID-19 Pandemic on the Mental Health of Frontline Healthcare Professionals in Mali: A Cross-Sectional Study

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Abstract

Introduction: The consequences of the pandemic on the mental health of healthcare professionals in West Africa, particularly in Mali, are poorly documented. This study aimed to assess the mental health status of healthcare workers in Mali during the COVID-19 pandemic. **Methods:** A cross-sectional survey was conducted among 218 healthcare workers. Data were collected on socio-demographic characteristics, vaccination status against SARS-CoV-2, working hours, and mental health indicators (*i.e.*, stress, anxiety, depression, and post-traumatic stress) using validated scales. Measures of central tendency and dispersion were calculated for quantitative variables. Percentages were calculated for categorical variables. **Results:** The sample consisted of 55.0% male participants with an average age of 31.8 ± 7.9 years. The majority of respondents (28.4%) were health technicians or nurses. A total of 61.5% of the respondents indicated that they had received the vaccination against the novel coronavirus. Regarding workload, 50.9% of respondents reported working more than 72 hours per week. Mental health assessments revealed that 53.2% of the participants reported being able to manage stress, 3.7% perceived life as constantly under threat, and 31.2% reported a lack of well-being. The Generalized Anxiety Disorder (GAD-7) scale indicated that 59.2% of participants

exhibited symptoms of anxiety, while the Patient Health Questionnaire (PHQ-9) scale indicated that 58.8% experienced elevated depressive symptoms. Additionally, the Impact of Event Scale-Revised (IES-R) revealed that 98.2% of participants displayed symptoms of post-traumatic stress, with 6.4% meeting the criteria for a post-traumatic stress disorder diagnosis. **Conclusion:** The results demonstrate the significant mental health difficulties encountered by health professionals during the COVID-19 pandemic. They underscore the necessity for comprehensive support and targeted interventions to enhance the well-being of healthcare workers during public health emergencies.

Keywords

COVID-19, Healthcare Workers, Mental Health, Mali

1. Introduction

The 2019 coronavirus disease (COVID-19) is a viral zoonosis caused by the SARS-CoV-2 coronavirus [1]. COVID-19 spread rapidly worldwide, resulting in an unprecedented global health crisis [1] [2]. According to the World Health Organization (WHO), more than 600 million confirmed cases and over 6 million deaths were reported worldwide by 2023 [3]. Although the number of cases in Africa was relatively lower than in other regions, the often-fragile health systems faced significant challenges [3].

In Mali, the first case of COVID-19 was confirmed in March 2020 [4]. Since then, the country has recorded thousands of cases and hundreds of deaths, placing considerable strain on health infrastructures and health professionals [5]. Healthcare workers on the front line of COVID-19 face not only the risk of infection but also increased workloads, challenging working conditions, and significant psychological stress [6] [7].

Numerous studies around the world have highlighted the adverse effects of the pandemic on the mental health of health professionals. For example, research in China found that over 50% of healthcare workers showed symptoms of depression, anxiety, or post-traumatic stress during the pandemic [8]. Similarly, a survey in Italy showed that health professionals were twice as likely to suffer from high psychological stress compared with the general population [9]. These findings underscored the vital importance of healthcare workers' mental well-being to ensure quality patient care.

In response to this COVID-19 mental health crisis, several initiatives have been launched globally to support the mental health of health professionals [8] [9]. For example, the "Stay Well" program in the UK offered psychological support services to health professionals [10]. Additionally, telehealth applications such as Headspace and Calm were provided free of charge to healthcare workers in several countries to assist them in managing stress and anxiety [10].

However, limited data exist on the impact of the pandemic on the mental health of health professionals in West Africa, particularly in Mali. This is pertinent as although some research has been conducted in other African regions, franco-phone West Africa is of particular interest due to its unique socio-cultural and economic challenges, limited mental health resources, and the relative isolation of its healthcare workforce [11]. This study aimed to fill this gap by assessing the mental well-being of Malian healthcare workers engaged in the fight against COVID-19. By identifying levels of stress, anxiety, and depression among these professionals, we hoped to provide essential insights for developing effective psychological support interventions and enhancing the working conditions of these front-line heroes.

2. Methods

2.1. Study Design, Setting, and Study Period

This was a prospectively recruited cross-sectional study that took place over an 11-month period, from January to November 2021, at three COVID-19 management sites in Mali: Hôpital du Mali, Centre Hospitalier Universitaire du Point G, and Hôpital Dermatologique de Bamako.

2.2. Participants

The study population comprised health workers involved in the control of COVID-19 at one of three sites in Mali. Participants were from all professional categories, with no distinction based on gender or rank. To be included in the study, health workers had to have no prior history of COVID-19 and provide informed consent to participate. We conducted a convenience sampling based on the voluntary participation of individuals included in the study population. A total of 218 health workers were included in the study.

2.3. Measurement Procedures

Data was collected using an anonymous survey form, administered during face-to-face interviews. The interviews took place after an arranged appointment with health professionals drawn randomly from the sampling frame according to their availability. The survey form included several instruments to assess relevant variables, encompassing socio-demographic characteristics (*i.e.*, age, gender, professional category, education level, and marital status), workload, COVID-19 vaccination status, and various scales assessing participants' mental well-being.

2.4. Mental Health Measures

To assess the participants' mental health, we used five mental health measures. We administered the 5-item WHO well-being index (1999) to assess general well-being, where a score below 50 indicates reduced well-being and above 50 indicates improved well-being [12]. The Patient Health Questionnaire (PHQ-9) was also

used, which screens for depression with scores ranging from 0 to 27: 0 - 4 indicates “No depression”, 5 - 9 indicates “Mild depression”, 10 - 14 indicates “Moderate depression”, 15 - 19 indicates “Moderately severe depression”, and 20 - 27 indicates “Severe depression” [13]. For generalized anxiety, we used the Generalized Anxiety Disorder Scale (GAD-7), with scores ranging from 0 to 21: 0 - 4 indicates “No anxiety”, 5 - 9 indicates “Mild anxiety”, 10 - 14 indicates “Moderate anxiety”, and 15 - 21 indicates “Severe anxiety” [14]. For stress, we used two scales: Cohen’s Perceived Stress Scale, which includes 10 items and scores as follows: <21 indicates “Good stress management”, 21 - 26 indicates “General ability to cope with stress”, and 27 indicates “Perception of life constantly under threat” [15]. We also used the Impact of Event Scale—Revised (IES-R) to assess post-traumatic stress symptoms (PTS), with scores ranging from 1 to 11 indicating few symptoms, 12 - 33 indicating a notable presence of symptoms, and ≥ 33 indicating post-traumatic stress disorder [16].

2.5. Data Analysis

The data collected was analyzed using SPSS version 25 software. Before analysis, the data were rigorously checked for completeness and accuracy. Measures of central tendency and dispersion were calculated for quantitative variables. Percentages were calculated for categorical variables. The analysis of factors associated with depression, anxiety and post-traumatic stress was performed by binary logistic regression. Each disorder was considered a dichotomized dependent variable (presence/absence), according to the thresholds of the PHQ-9, GAD-7 and IES-R scales. First, univariate analyses identified potential explanatory variables. The factors studied included sociodemographic characteristics (gender, age, level of education), working conditions (weekly load) and psychosocial indicators (well-being, perceived stress). Results were expressed as crude odds ratios (ORs) with 95% confidence intervals (CI) and p-values. Then, variables with a p < value of 0.20 in univariate analysis, as well as those deemed clinically relevant, were integrated into multivariate models to identify independent factors, after adjusting for confounding variables. Results were presented as adjusted odds ratios (ORa) with 95% CI. The statistical significance threshold was set at $p < 0.05$.

2.6. Ethical Considerations

This study was conducted in strict compliance with ethical principles. We ensured the confidentiality and anonymity of participants throughout the research. All collected data was anonymized and de-identified to protect personal information so personal information could not be traced back to the participants. Before the start of the study, each participant received a detailed explanation of the objectives, procedures, potential benefits, and possible risks associated with their participation. Verbal consent was obtained from each participant prior to their inclusion in the study. Participants were also informed of their right to withdraw from

the survey without facing any consequences.

3. Results

Among the 218 health workers surveyed, 55.0% were male. The participants' average age was 31.8 years \pm 7.9 years. Most of the participants were between 20 and 29 years old, accounting for 47.2% (103/218) of the participants. Health technicians and nurses were the most common health professionals, representing 28.4% of the participants. **Table 1** summarizes the socio-demographic characteristics of the participants.

Table 1. Socio-demographic characteristics.

Socio-demographic variables	Frequency (n = 218)	Percentage %
Gender		
Male	120	55.0
Female	98	45.0
Age range (years)		
20 - 29	103	47.2
30 - 39	78	35.8
40 - 49	29	13.3
\geq 50	8	3.6
Profession		
Doctor	54	24.8
Student	23	10.6
Health technician/Nurse	62	28.4
Nurses' aide	2	0.9
Hygienist	55	25.2
Pharmacist	9	4.1
Laboratory technician	13	6.0
Marital status		
Married	118	54.1
Single	98	45.0
Widowed	2	0.9
Education level		
No Schooling	29	13.3
Primary	19	8.7
Secondary	70	32.1
Superior	100	45.9

3.1. Vaccination Status and Workload

Of the surveyed healthcare workers, 61.5% reported having been vaccinated against COVID-19 (Figure 1). In terms of workload, 50.9% of healthcare workers reported working more than 72 hours a week (Figure 2).

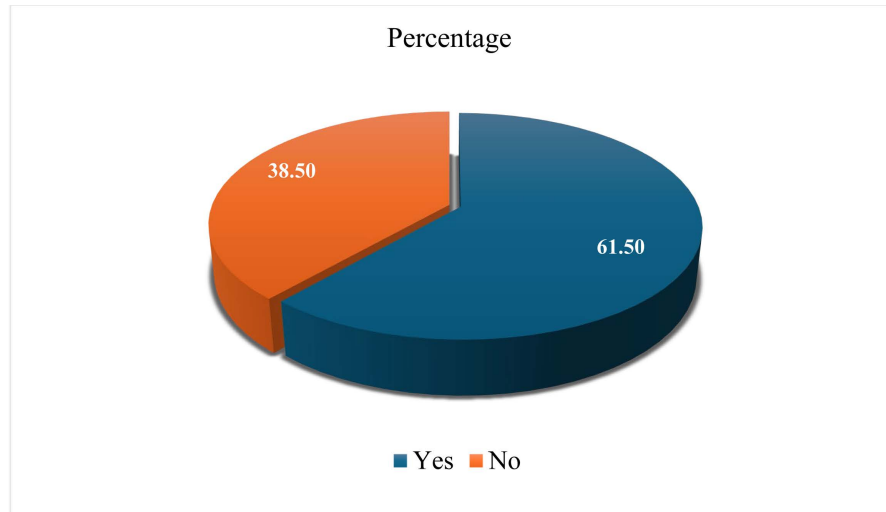


Figure 1. Vaccination status of health professionals involved in the COVID-19 response in Mali in 2021.

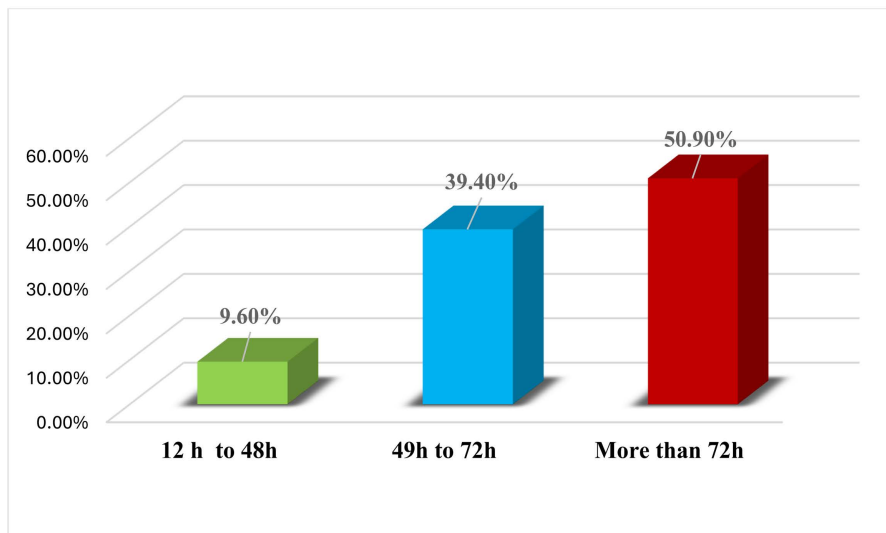


Figure 2. Number of hours worked per week of health professional involved in the COVID-19 response in Mali in 2021.

3.2. Psychopathological Data

According to Cohen's perceived stress scale, 53.2% of health professionals reported knowing how to cope with stress, while 3.7% felt that life was constantly under threat. In addition, 31.2% of healthcare workers reported poor well-being.

The GAD-7 scale results showed that 59.2% of the participants experienced mild to severe anxiety. The PHQ-9 scale results indicated that 58.8% of the healthcare

workers suffered from mild to severe depression.

The IES-R assessment revealed that 98.2% of health professionals had post-traumatic stress symptoms of varying intensity, with 6.4% diagnosed with post-traumatic stress disorder. The detailed results of the mental health measures are summarized in **Table 2**.

Table 2. Assessment of the mental well-being of health professionals involved in the COVID-19 response in Mali in 2021.

Mental well-being	Frequency (n = 218)	Percentage %
Stress management		
Knows how to manage stress	94	43.1
Can generally cope with stress	116	53.2
Life is constantly under threat	8	3.7
Mental well-being		
Good mental well-being	150	68.8
Reduced mental well-being	68	31.2
Anxiety		
No anxiety	89	40.8
Mild anxiety	95	43.6
Moderate anxiety	31	14.2
Severe anxiety	3	1.4
Depression		
No depression	90	41.3
Mild depression	79	36.2
Moderate depression	42	19.3
Moderately severe depression	6	2.8
Severe depression	1	0.5
Post-traumatic stress disorder		
No symptoms of PTS	4	1.8
Few symptoms of PTS	98	45.0
Presents a good number of PTS symptoms	103	47.2
Suffering from PTS disorder	14	6.4

3.3. Data on Associated Factors

Reduced well-being was significantly associated with depression (OR = 2.56; 95% CI: 1.37 - 4.81; $p = 0.003$), as well as a general ability to cope with stress (OR =

1.87; 95% CI: 1.07 - 3.26; $p = 0.028$). After adjustment, these associations remained significant (OR_a = 2.53; 95% CI: 1.27 - 5.05 and OR_a = 2.36; 95% CI: 1.29 - 4.35). In addition, a workload of 49 to 72 hours per week was associated with a lower risk of depression (OR_a = 0.33; 95% CI: 0.11 - 0.99). The other variables (sex, age, perception of life as a threat) were not significant.

Only a state of reduced well-being was related to anxiety in univariate analysis (OR = 2.26; 95% CI: 1.22 - 4.18; $p = 0.010$). After adjustment, no variables were significantly associated (OR_a = 1.66; 95% CI: 0.83 - 3.33).

A reduced state of well-being was associated with an increased risk of PTSD in univariate analysis (OR = 2.33; 95% CI: 1.05 - 5.15; $p = 0.036$). In multivariate analysis, no variables were significant (OR_a = 2.22; 95% CI: 0.93 - 5.32).

The detailed results of the associated factors are summarized in **Tables 3-5**.

Table 3. Factors associated with the occurrence of depression among mental health of frontline healthcare professionals against COVID-19 in Mali, 2021.

Explanatory Variables	Depression				
	Univariate			Multivariate	
	OR	95% CI	p-value	OR	95% CI
Sex					
Male	1.12	0.65 - 1.93	0.6699	1.00	0.56 - 1.82
Female	Ref				
Age (Years)					
20 - 29	0.49	0.12 - 2.00	0.3197	0.35	0.08 - 1.54
30 - 39	0.70	0.17 - 2.93	0.6239	0.41	0.09 - 1.89
40 - 49	0.82	0.18 - 3.80	0.7980	0.37	0.07 - 1.92
≥50	Ref				
Workload					
> 72 h	0.68	0.25 - 1.90	0.4646	0.57	0.19 - 1.66
49 - 72 h	0.40	0.14 - 1.13	0.0833	0.33	0.11 - 0.99*
24 - 48 h	Ref				
Well-being status					
Reduced	2.56	1.37 - 4.81	0.0032*	2.53	1.27 - 5.05*
Better	Ref				
Perceived stress					
Perception of life as a perpetual threat	3.58	0.71 - 18.13	0.1239	2.54	0.45 - 14.32
General ability to cope with stress	1.87	1.07 - 3.26	0.0277*	2.36	1.29 - 4.35*
Good stress management	Ref				

*p-value < 0.05. The same applies to all tables below.

Table 4. Factors associated with the occurrence of anxiety among mental health of frontline healthcare professionals against COVID-19 in Mali, 2021.

Explanatory Variables	Anxiety				
	Univariate			Multivariate	
	OR	95% CI	p-value	OR	95% CI
Sex					
Male	1.08	0.63 - 1.86	0.7837	1.03	
Female	Ref				
Age (Years)					
20 - 29	0.53	0.13 - 2.16	0.3746	0.41	0.10 - 1.80
30 - 39	0.52	0.13 - 2.19	0.3737	0.34	0.07 - 1.53
40 - 49	1.53	0.31 - 7.51	0.6000	1.02	0.19 - 5.57
≥50	Ref				
Educational level					
Primary	2.25	0.57 - 8.97	0.2488	2.24	0.53 - 9.42
Secondary	1.23	0.47 - 3.22	0.6790	1.63	0.56 - 4.73
Higher	0.62	0.25 - 1.56	0.3130	0.75	0.27 - 2.08
Quranic school	0.15	0.01 - 1.56	0.1124	0.22	0.02 - 2.51
No schooling	Ref				
Workload					
> 72 h	1.19	0.46 - 3.05	0.7234	0.89	
49 - 72 h	0.99	0.38 - 2.60	0.9890	0.86	
24 - 48 h	Ref				
Well-being status					
Reduced	2.26	1.22 - 4.18	0.0099*	1.66	
Better	Ref				
Perceived stress					
Perception of life as a perpetual threat	6.59	0.79 - 54.81	0.0811	5.08	0.56 - 45.83
General ability to cope with stress	1.25	0.72 - 2.18	0.4233	1.30	0.70 - 2.41
Good stress management	Ref				

Table 5. Factors associated with the occurrence of Post-Traumatic Stress Disorder (PTSD) among mental health of frontline healthcare professionals against COVID-19 in Mali, 2021.

Explanatory Variables	PTSD				
	Univariate			Multivariate	
	OR	95% CI	p-value	OR	95% CI
Sex					
Male	1.01	0.46 - 2.21	0.9882	0.99	0.42 - 2.30
Female	Ref				
Age (Years)					
20 - 29	0.25	0.06 - 1.10	0.0668	0.24	0.05 - 1.18
30 - 39	0.43	0.10 - 1.91	0.2664	0.36	0.07 - 1.80
40 - 49	0.43	0.08 - 2.26	0.3204	0.27	0.04 - 1.62
≥50	Ref				
Workload					
> 72 h	1.24	0.33 - 4.63	0.7499	0.91	0.23 - 3.64
49 - 72 h	0.53	0.13 - 2.26	0.3919	0.44	0.10 - 1.97
24 - 48 h	Ref				
Well-being status					
Reduced	2.33	1.05 - 5.15	0.0364*	2.22	0.93 - 5.32
Better	Ref				
Perceived stress					
Perception of life as a perpetual threat	0.84	0.10 - 7.36	0.8777	0.62	0.06 - 6.08
General ability to cope with stress	1.08	0.48 - 2.41	0.8511	1.35	0.57 - 3.18
Good stress management	Ref				

4. Discussion

The majority of the healthcare workers surveyed were male, and most fell within the 20-29 age bracket, indicating a relatively young population of professionals. The high proportion of health technicians and nurses highlights the significance of these professions in the healthcare system of a low-resource context, particularly during the COVID-19 pandemic. This is especially important in Mali and most of Sub-Saharan Africa, where primary health care and responding to pandemic emergencies are often nurse-led [17]-[19].

The vaccination status of health workers showed that 61.5% had received COVID-19 vaccines, which is relatively encouraging but still leaves room for improvement. Factors like vaccine access, safety perceptions, and trust in health au-

thorities may have influenced this vaccine uptake rate. However, we did not find a statistically significant association between vaccination status and participants' perceived well-being. The reported workload, with 50.9% of staff working more than 72 hours a week, is alarming and can significantly impact the mental and physical health of health professionals. This mirrors situations in other contexts where long working hours during the pandemic were associated with increased stress and deteriorating mental health [20] [21].

The findings also indicated high distress levels among healthcare workers. Although 53.2% of workers reported generally coping with stress, a third of the participants (31.2%) reported poor well-being, and a significant minority (3.7%) perceived life as constantly under threat. Anxiety and depression levels, measured by the GAD-7 and PHQ-9 scales, are concerning, with 59.2% and 58.8% of participants, respectively, showing symptoms ranging from mild to severe. These results align with international studies documenting the pandemic's severe psychological impact on health professionals [22]-[25].

The IES-R assessment revealed that nearly all participants (98.2%) had post-traumatic stress symptoms of varying intensity, and 6.4% were diagnosed with post-traumatic stress disorder. These results are particularly concerning as they demonstrate the significant traumatic impact the pandemic has had on healthcare workers. Similar studies in other countries have also found a high rate of PTSD symptoms among health professionals [26]-[28], emphasizing the need for specific psychological support programs.

The study's findings emphasize the need for urgent action to support the mental health of health professionals. Essential initiatives include psychological support programs, improved working conditions, and reduced workloads. Health authorities should also promote and facilitate access to vaccination to increase coverage rates among healthcare workers.

Programs like "Stay Well" in the UK and telehealth applications such as "Head-space" and "Calm" can serve as models for similar interventions in Mali. Developing communication strategies to address vaccination-related concerns and building vaccine confidence is also crucial.

5. Study Limits

This study's sample consists of volunteer health workers, which may introduce a selection bias. Volunteer participants may have distinct characteristics, such as a greater interest in mental health, compared to those who did not participate.

Participants' responses may be influenced by the desire to present a positive image of themselves, which could lead to under-reporting or overestimation of certain aspects of their stress, anxiety, or depression.

Working conditions and available resources vary significantly between different healthcare facilities and regions, affecting the comparability of results and limiting the generalizability of conclusions to other environments.

This study did not measure certain factors that may influence the mental health

of healthcare workers, such as family support, facility resources, or public health policies. The absence of these variables may limit a complete understanding of the determinants of health professionals' mental health.

Beyond the cross-sectional nature of the study and the risk of reporting bias associated with face-to-face interviews are also important limitations of this work.

6. Conclusion

This study highlights the significant impact of the COVID-19 pandemic on the mental health of healthcare workers in Mali. The results emphasize the need for targeted interventions to improve the psychological well-being of healthcare workers, including psychological support programs, better workload management, and increased promotion of vaccination.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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List of Abbreviations

COVID-19: Coronavirus Disease 2019

FMOS: Faculty of Medicine and Odontostomatology

GAD-7: Generalized Anxiety Disorder-7

IES-R: Impact of Event Scale—Revised

PTS: Post-Traumatic Stress

PHQ-9: Patient Health Questionnaire-9

USA: United States of America

USTTB: University of Sciences, Techniques and Technologies of Bamako