Research Report

PSYCHOLOGICAL OUTCOMES AMONG COVID-19-INFECTED AND NON-INFECTED HEALTHCARE WORKERS FROM A TERTIARY CARE CENTER IN NORTH INDIA: A CROSS-SECTIONAL COMPARATIVE STUDY

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ABSTRACT

Background: Numerous studies have examined the psychological impact of COVID-19 within the Indian context. However, there is limited evidence comparing psychological distress among healthcare workers, both with and without a history of COVID-19 infection. This study seeks to identify psychological distress in healthcare workers from a tertiary care hospital in North India, with comparisons between those who had contracted COVID-19 and those who had not. **Materials and Methods**: The present study used a cross-sectional comparative design, selecting participants based on their past RTPCR-confirmed COVID-19 infection status. Psychological distress was assessed using three standardized screening instruments: the Patient Health Questionnaire-9 (PHQ-9), the Generalized Anxiety Disorder Scale (GAD-7), and the Impact of Event Scale–Revised (IES-R). **Results**: The mean age of the participants was 35.59 ± 8.6 years, with the majority being female (74%), married (80%), and working as nurses (62.6%). The overall prevalence of depression, anxiety, and post-traumatic symptoms related to COVID-19 among the participants was 25.7%, 13.5%, and 8.8%, respectively. These psychological symptoms were more frequently reported among those who had been infected with COVID-19 than among those who had not. Logistic regression analysis indicated that individuals with a history of COVID-19 infection were twice as likely to experience depressive symptoms, anxiety symptoms, and post-traumatic stress compared to those without such a history. **Conclusion**: The study found that 11–27% of healthcare workers experienced psychological morbidities during the COVID-19 pandemic. These findings emphasize the importance of ongoing psychological assessment and support for healthcare workers in similar pandemic situations.

Keywords: COVID-19, Psychological impact, Health care workers, India

INTRODUCTION

COVID-19 rapidly evolved into a global pandemic in 2019, impacting millions of people around the world.[1] The effects of COVID-19 on global health have been widespread and complex, disrupting various facets of healthcare systems and populations globally. The disease has led to significant levels of illness and death, straining healthcare resources in many areas.[2] The impact of the COVID-19 pandemic has been particularly profound on healthcare workers (HCWs) worldwide. These workers have experienced increased workloads, extended shifts, and heightened exposure to the virus, resulting in

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physical exhaustion. The prolonged nature of the pandemic and its associated difficulties resulted in higher rates of burnout among HCWs.[3] Due to their close contact with infected patients, HCWs were at a higher risk of contracting COVID-19. In many healthcare settings, shortages of personal protective equipment (PPE) were reported, raising concerns about the adequacy of protection for these workers.[4] The lack of sufficient PPE heightened the risk of infection among HCWs and exacerbated their stress and anxiety. As a result, many healthcare professionals left their jobs or took extended leaves due to concerns about their physical and mental health.[5]

Several studies have documented the psychological impact of COVID-19 on HCWs in India. Mental health conditions such as anxiety, depression, and PTSD have been observed at elevated rates among HCWs during the pandemic.[6] There is limited research on psychological distress post-COVID among HCWs in India, both for those who got infected with the virus and those who did not. Understanding the psychological distress experienced by HCWs, regardless of their COVID-19 infection status, can provide valuable insights into the comprehensive mental health impact of the pandemic and inform targeted interventions for future pandemics. Consequently, the study aimed to explore psychological distress post-COVID among HCWs, both with and without COVID-19 infection, in a tertiary care hospital in North India.

MATERIALS AND METHODS

The present study was conducted among healthcare workers (HCWs), including doctors, nurses, and allied health professionals, employed at PGIMS, Rohtak. Data were collected over a one-month period, from 9 March to 8 April 2022. COVID-19 infection status was determined based on participants' past test results using the real-time reverse transcription polymerase chain reaction (RT-PCR) test. The classification of participants into COVID-positive or COVID-negative groups was based on whether they had tested RT-PCR positive at any point within the last two years, as documented in hospital records. Participants who had previously tested RTPCR positive but were negative at the time of data collection were still categorized as COVID positive, since the study focused on a history of infection rather than current disease status. In addition, participants who had never tested positive by RT-PCR were categorized as COVID negative. Individuals who were only antigen positive without confirmatory RT-PCR testing were excluded from the study to ensure diagnostic accuracy and group comparability. Participants were also excluded if they had any cognitive impairment that could hinder their ability to participate in a face-to-face interview. The study was limited to healthcare workers (HCWs) who were physically present within the hospital facility during the data collection period. Sleep and regular exercise were operationally defined as sleeping for at least six to eight hours per night and engaging in physical activity at least three times per week, respectively.[7]

The psychological impact of COVID-19 was assessed using the Hindi versions of the Generalized Anxiety Disorder Scale (GAD-7) and the Patient Health Questionnaire-9 (PHQ-9). Each question on these scales offered responses scored from 0 to 3, with the cumulative score indicating the severity of the symptoms. For GAD-7, scores were categorized as follows: 0-4 (minimal anxiety), 5-9 (mild anxiety), 10-14 (moderate anxiety), and 15-21 (severe anxiety).[8] For the PHQ-9,

scores of 5-9, 10-14, and >15 corresponded to mild, moderate, and severe depression, respectively.[9] The impact of event scale–revised (IES-R) was used to measure post-traumatic stress symptoms. This 22-item scale provided scores ranging from 0 to 4 for each item, with scores between 33 and 36 indicating moderate stress, and scores above 37 indicating severe post-traumatic stress.[10]

HCWs on day duty during the study period were approached to participate. They received a participant information sheet detailing the study, along with informed consent forms. Participation was entirely voluntary, with participants free to withdraw at any point during data collection. Data were collected using a self-administered questionnaire that included items on socio-demographic and clinical characteristics, sleep patterns, exercise habits, and living conditions during the COVID-19 pandemic. COVID was not tested during the study; instead, participants were classified as COVID-positive or COVID-negative based on past RT-PCR test results recorded in hospital records from the previous year. The principal researcher assisted participants with any difficulties in understanding the questionnaire items.

The study received IEC approval and the contact information for the researcher was provided, allowing participants to reach out for any treatment-related assistance during the study.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 21 (IBM SPSS Inc., Chicago, Illinois, USA). Socio-demographic and clinical variables were summarized using frequencies and percentages for categorical variables, and means and standard deviations (SD) for continuous variables. Pearson's chi-square test (or Fisher's exact test when expected cell frequencies were below 5) was employed to compare categorical variables, while the independent sample t-test was used for quantitative data. The Kolmogorov-Smirnov test was used to determine the normality of the data distribution, and binary logistic regression was employed to predict selected outcome variables.

RESULTS

A total of 222 cases and 163 controls were included in the analysis. The mean age of the participants was 35.59 years (SD = 8.6). The majority of HCWs were female (74%), married (80%), and employed as nurses (62.6%). Most participants reported maintaining adequate sleep (78.2%), engaging in regular exercise (69.6%), and living with their families (82.9%) during the COVID-19 pandemic. Almost all participants had received the COVID-19 vaccination (99%). There was no significant difference between cases and controls on the variables as mentioned above, except for gender. (p = 0.01) (Table 1)

Overall, symptoms of depression, anxiety, and post-traumatic stress were reported in 25.7%, 13.5%, and 8.8% of participants, respectively. The study revealed a statistically significant difference in psychological distress between cases and controls. According to the PHQ-9 scale, depression was more prevalent among cases (18.7%; n=72) compared to controls (7%; n=27). Anxiety was reported by 10.4% (n=40) of cases, while only 3.1% (n=12) of reported anxiety. Post-traumatic symptoms were more common among cases (8.1%; n=32) compared to controls (3.1%; n=12) (Table 2).

Table 3 shows the association between psychological impact and the demographic profile of the study subjects. Psychological morbidity was highest among female and unmarried participants. Depression, anxiety,

and post-traumatic symptoms were more pronounced among those living alone compared to those residing with their families. Higher scores on the PHQ-9, GAD-7, and IES-R scales were observed among participants who did not maintain adequate sleep or regular exercise.

Table 1: Characteristics of the study subjects

Demographic variables	**Control (N/%)**	**Cases (N/%)**	**Chi Square/ df**	**P value**
Gender				
Female	106 (27.5)	179 (46.5)	11.89	**0.01***
Male	57 (14.8)	43 (11.2)	/1	
Marital status				
Married	132 (34.3)	176 (45.7)	0.17/	0.68
Unmarried	31 (8.1)	46 (11.9)	1	
Occupation				
Doctor	09 (1.8)	15 (3.8)	0.28/	0.99
Nurse	78 (20.2)	107 (27.7)	4	
Others	76 (19.74)	100 (25.9)		
Regular Exercise				
Yes	47 (12.2)	70 (18.2)	0.32/	0.57
No	116 (30.1)	152 (39.5)	1	
Sleep				
Good	147 (38.1)	154 (40)	0.72/	0.39
Bad	36 (9.3)	48 (12.4)	1	
Living Condition				
Family	137 (35.6)	182 (47.3)	0.28/	0.59
Alone	26 (6.8)	40 (10.4)	1	

A statistically significant association was found between all selected socio-demographic variables and the outcome measures ($p < 0.05$). The logistic regression model indicated that having contracted COVID-19 was significantly associated with developing depressive symptoms, anxiety symptoms, and post-traumatic symptoms among HCWs in this study (Table 4).

Table 2: Association between COVID-19 status and outcome measures.

Outcomes measures		**COVID-19 positive N (Percentage)**	**COVID-19 negative N (Percentage)**	**Chi Square / df**	**P value**
Depression (PHQ-9)	Present (>10)	72 (18.7%)	27 (7%)	12.38	**0.001**
	Absent	150 (39%)	136 (35.3%)		
Anxiety (GAD-7)	Present (>10)	40 (10.4%)	12 (3.1%)	9.136	**0.002**
	Absent	182 (47.3%)	151 (39.2%)		
Post-traumatic stress symptoms (IES-R)	Present (>33)	32 (8.1%)	12 (3.1%)	4.129	**0.042**
	Absent	190 (49.6%)	151 (39.2%)		

Table 3: Association between selected sociodemographic variables and the psychological impact of COVID-19.

Demographic variables	**Depression Mean ±S.D.**	**Depression t/P value**	**Anxiety Mean±S.D.**	**Anxiety t/P value**	**PTSD Mean±S.D.**	**PTSD t/P value**
Gender						
Male	5.97 ± 3.59	3.58	4.31± 3.38	3.74	12.18±11.25	3.28
Female	7.69 ± 4.32	**0.001***	5.85± 3.60	**0.001***	17.23±13.8	**0.001**
Marital Status						
Married	5.90 ± 4.12	3.19	3.69 ± 3.44	4.94	10.27±13.04	4.22
Unmarried	7.58 ± 4.16	**0.002***	5.89 ± 3.52	**0.001***	17.33±13.4	**0.001**
Living Condition						
Family	5.79 ± 3.83	3.13	3.29± 2.83	5.56	9.00±10.67	4.73
Alone	7.55 ± 4.22	**0.002***	5.90± 3.58	**0.001***	17.35±13.4	**0.001**
Regular Exercise						
Yes	6.17 ± 4.54	3.36	4.13 ± 3.70	4.89	11.74±13.81	4.13
No	7.72 ± 3.97	**0.001***	6.03 ± 3.41	**0.001***	17.74±12.83	**0.001**
Adequate Sleep						
Yes	6.80 ± 4.10	4.02	5.13±3.85	3.34	14.81±12.97	3.08
No	8.85 ± 4.18	**0.001***	6.60±3.45	**0.001***	19.87±14.25	**0.002**

Table 4: Predictors of psychological impact of COVID-19 as per logistic regression analysis

Variables	The presence of COVID-19 infection Adjusted odds ratio (95% CI)	P value
Depressive symptoms	2.418 (1.467 –3.984)	**0.001**
Anxiety Symptoms	2.776 (1.401 – 5.460)	**0.003**
Post-traumatic symptoms	2.427 (1.463 – 4.025)	**0.001**

DISCUSSION

The present study evaluated psychological distress among HCWs with and without COVID-19 infection in the Indian setting. We employed a cross-sectional comparative design to assess both the history of COVID-19 infection over the past two years and current psychological distress levels within one month, without any follow-up. Overall, we found increased levels of anxiety, depression, and post-traumatic stress symptoms among individuals infected with COVID-19. This could be because HCWs who contract COVID-19 may experience heightened levels of psychological distress due to factors such as fear of severe illness, concerns about transmitting the virus to loved ones, and the stigma associated with the disease.[11] The present study also found that even HCWs who had not tested positive for COVID-19 experienced significant levels of psychological distress, including depression, anxiety, and post-traumatic symptoms. This indicates that the psychological impact of the pandemic was not limited to those who were infected. Factors such as constant fear of contracting the virus, long working hours, uncertainty about the future, financial concerns, and reduced social interaction may have played a significant role in contributing to psychological distress irrespective of COVID-19 infection status.[12, 13] Different studies have shown a higher prevalence of psychological distress among persons who had developed COVID-19 infection. Some of the studies have reported a higher rate of psychological distress as part of long COVID. It is possible that these factors could have also played a role in the development of a higher rate of psychological distress in our study sample.

Our findings show that both groups, infected and uninfected HCWs, experience psychological distress. However, the nature and intensity of the distress may differ ($p < 0.05$), which is consistent with an earlier study.[14] In this study, depression and anxiety symptoms of COVID-19 among HCWs were reported as 25.7% and 13.5%, respectively. Meta-analyses from India show varying prevalence rates of depression and anxiety, ranging from 20.2% to 33% in the general population and 20.1% to 25.0% in HCWs.[15-17] The psychological impact of the pandemic is influenced by factors such as national context, pandemic preparedness, and the onset and burden of the crisis, which may explain the wide variation in reported prevalence rates.[18] The present study also found that psychological morbidity was highest among female and unmarried HCWs who were living alone, and those who did not maintain adequate sleep and regular exercise during the COVID-19 outbreak period ($p < 0.05$). These findings are consistent with earlier research.[19, 20] Given the increased demand for mental health resources during the pandemic, government policies should address the specialized mental health needs of HCWs and develop strategies to support the well-being of these frontline heroes.

Our findings need to be taken with some caution. The data collection period for the index study took place between March and April 2022. The first wave of COVID-19 in India started in March 2020 with a peak in

September 2020.[21] Therefore, the current findings reflect the mental health of HCWs two years after the onset of the first wave of COVID-19 in India. We observed a modest level of COVID-19-related psychological distress among HCWs in this setting, possibly due to the relatively controlled infection rate during the first wave of the pandemic in India.[22] First, the study relied on self-reported measures from healthcare workers (HCWs) at a single hospital, which may not be generalizable to other settings. Second, the study was conducted several months after the COVID-19 outbreak, which may have affected the accuracy of the reported psychological impact. Third, the presence of pre-existing mental illness was not assessed, which could be a confounding factor. Finally, the ratio of cases to controls was not 1:1, as it was challenging to recruit controls who had not been infected during the pandemic.

CONCLUSION

The study found that 11–27% of HCWs experienced psychological morbidities during the COVID-19 pandemic. These findings emphasize the importance of ongoing psychological assessment and support for healthcare workers in similar pandemic situations.

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Conflicts of interest: - There are no conflicts of interest

Ethical clearance: the Institutional Ethics Committee - Biomedical Research Ethics Committee at UHS, Rohtak (Ref No., approved the study BREC/21/106 dated 29.10.2021).

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"The author(s) attest that there was no use of generative artificial intelligence (AI) technology in the generation of text, figures, or other informational content of this manuscript."

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