Prevalence and Predictors of Stress, Anxiety, and Depression Among Healthcare Workers Managing COVID-19 Pandemic in India: A Nationwide Observational Study

William Wilson¹, Jeffrey Pradeep Raj², Seema Rao³, Murtuza Ghiya⁴, Nisanth Menon Nedungalaparambil⁵, Harshit Mundra⁶, Roshan Mathew⁷

ABSTRACT

Background: The coronavirus disease 2019 (COVID-19) pandemic has caused great financial and psychological havoc. Healthcare professionals (HCPs) are among the many groups of people who are in the frontline and facing a risk of direct exposure to the virus. This study aimed to assess the prevalence and predictors of stress, depressive, and anxiety symptoms among HCPs of India.

Methods: It was a cross-sectional, online survey conducted in April 2020 among HCPs who are directly involved in the triage, screening, diagnosing, and treatment of COVID-19 patients and suspects. Stress was estimated using Cohen’s perceived stress scale. Depression and anxiety were assessed using the tools Public Health Questionnaire—9 and Generalized Anxiety Disorder—7. Predictors were analyzed using univariate and multivariate binary logistic regression.

Results: A total of 433 online responses were obtained, and N = 350 were finally included. The prevalence (95% CI) of HCPs with high-level stress was 3.7% (2.2, 6.2), while the prevalence rates of HCPs with depressive symptoms requiring treatment and anxiety symptoms requiring further evaluation were 11.4% (8.3, 15.2) and 17.7% (13.9, 22.1), respectively. Women had approximately two times the increased odds of developing moderate- or high-level stress, depressive symptoms requiring treatment, and anxiety symptoms requiring further evaluation. Similarly, women staying in a hostel/temporary accommodation had two times the increased odds of developing depression or anxiety symptoms.

Conclusion: The prevalence of stress, depressive, and anxiety symptoms among HCPs in India during the pandemic is comparable with other countries.

Keywords: Pandemic, COVID-19, stress, anxiety, depression, prevalence, risk factors

HOW TO CITE THIS ARTICLE: Wilson W, Raj JP, Rao S, Ghiya M, Nedungalaparambil NM, Mundra H, Mathew R. Prevalence and predictors of stress, anxiety, and depression among healthcare workers managing COVID-19 pandemic in India: A nationwide observational study. Indian J Psychol Med. 2020;42(4): 353–358.

Address for correspondence: Jeffrey Pradeep Raj, Dept. of Clinical Pharmacology, Seth GS Medical College and King Edward Memorial Hospital, Mumbai, Maharashtra, India. E-mail: jpraj.m07@gmail.com
world, with numbers increasing by the day. This has put healthcare professionals (HCP) under tremendous pressures as they deal with many variables some of which are longer working hours, lack of personal protective equipment, lack of specific drugs and protocols, and being away from family. According to previous studies, during the outbreaks of severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS), frontline medical staff had reported high levels of stress that resulted in posttraumatic stress disorder (PTSD). It was also found that HCPs considered resignation, faced stigmatization, and feared contagion and spread to family and friends, resulting in high levels of stress, depression, and anxiety symptoms. There have been plenty of reports from China detailing the number of HCPs getting infected and even succumbing to the illness. Concerns of the psychological impact of the pandemic like before are arising. This resulted in interventions such as setting up psychological assistance services over the telephone, internet, and application-based sessions.

As on April 11, 2020, India faces the most critical phase of the pandemic, with community transmission not yet in full flow. HCPs across the country are facing a fight like never before. Vulnerable to psychological impact, we aim to evaluate the magnitude of stress, anxiety, and depression and to assess possible associated risk factors at this early stage of the pandemic. This would help us plan appropriate interventions at the early stage to prevent a detrimental outcome for the brave HCPs out there.

Materials and Methods

Ethics

The study was approved by the institutional ethics committee. An online written informed consent was obtained from all potential participants.

Study Design and Eligibility Criteria

This was an online-questionnaire-based cross-sectional study conducted in India during the month of April 2020. The online questionnaire was designed on Google Forms and circulated in multiple WhatsApp groups, targeting doctors and nurses involved in triage, screening, diagnosing, and treatment of COVID-19 patients and suspects. Those who were currently doing their internship were excluded.

Study Procedures

The link to the online questionnaire was circulated on April 10, 2020, and the target sample size was achieved on April 25, 2020. A maximum of three reminders were sent in all WhatsApp groups. To limit the number of HCPs who inadvertently answer the questionnaire without being involved in COVID-19 work, a specific yes/no question confirming their work in COVID-19 was asked. Those who marked the answer as “Yes” were allowed to continue answering the questionnaire. The questionnaire had five sections, namely, baseline sociodemographic characteristics, Generalized Anxiety Disorder 7-item (GAD-7), Patient Health Questionnaire-9 (PHQ-9), Perceived Stress Scale-10 (PSS-10), and miscellaneous psychosocial questions. Data were collected anonymously, with only one response was permitted per person.

PHQ-9 is a 9-item self-report questionnaire used in clinical practice for screening, diagnosing, monitoring, and measuring the severity of depression. PHQ scores ≥10 have a sensitivity of 88% and a specificity of 88% for major depression and require treatment. PSS-10 is an instrument designed to measure the degree to which situations in one's life are appraised as stressful. PSS items have been found to have good correlations with other stress measures, self-reported health and health service measures, health behavior measures, smoking status, and help-seeking behavior. GAD-7 is a 7-item self-report questionnaire used in clinical practice for screening and assessing severity of generalized anxiety disorder. Cut-off points of 5, 10, and 15 may be interpreted as representing mild, moderate, and severe levels of anxiety on the GAD-7. A score of >10 would require further evaluation.

Sample Size Estimation

Considering an estimated prevalence of depression (p) among HCPs to be 13.5% based on the study by Zhu et al., the sample size estimated using the formula (Zn*pq/d²) using an alpha error of 5% and an absolute precision (d) of 5% was 179. If estimated considering the prevalence of stress (p = 29.8%), although a different tool being used, and anxiety (p = 24.1%), the sample size, with the other assumptions remaining constant, would be 322 and 281, respectively. Considering the largest value among the three and assuming an approximate 10% of questionnaires to have incomplete responses, we decided to increase the sample size to 350.

Data Management

Data were exported from the Google Forms to Microsoft Excel (Microsoft Corporation, Redmond, Washington, USA, 2016) spreadsheet and coded. Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) Statistics for Windows, Version 20.0 (IBM Corp., USA, 2011).

Statistical Analysis Plan

Demographic characteristics were summarized using descriptive statistics such as frequency and percentages in case of discrete data, or mean and standard deviation (SD) in the case of continuous data. Prevalence rates of high-level stress, anxiety symptoms requiring further evaluation, and depressive symptoms requiring treatment were expressed as proportions with 95% confidence intervals (CI). The hypothesized factors/predictors to each of these conditions, namely stress, anxiety, and depression, such as age, gender, being a doctor, years of experience, hostel/temporary accommodation, history of mental illness, presence of comorbidities, perceived inability to distress, and employment in the government sector, were subjected to univariate binary logistic regression. Those with a significance of P < 0.2 in the univariate analysis were included in the multivariate binary logistic regression model.

Results

A total of 433 responses were received. Of these, 83 respondents were not involved
in any of the COVID-19 related activities and hence were excluded. The remaining 350 from across ten states and one union territory were included in the analysis. A total of 344 participants had disclosed their institutions of affiliation, and the number of participating institutions totaled to 98. Of the 350 participants, 84.3% (n = 295/350) were doctors and the remaining 15.7% (n = 55/350) were nurses. The mean (SD) age of the participants was 30.21 (5.22) years. The demographic characteristics are summarized in Table 1.

The details regarding the occupation of participants are given in Table 2. Junior residents formed the major proportion (n = 168/350; 48.0%). The mean (SD) years of experience of the participants were 5.52 (4.79).

The prevalence (95% CI) of HCPs with high-level stress was 3.7% (2.2, 6.2). The prevalence rates (95% CI) of HCPs with depressive symptoms requiring treatment, the significant predictors (adjusted OR; 95% CI; P value) were female gender (2.180; 1.230, 3.862; 0.008) and hostel/temporary accommodation (1.926; 1.046, 3.548; 0.035). The details of the univariate analysis and multivariate analysis to identify the predictors of stress, depression, and anxiety are summarized in Table 4.

**Discussion**

The prevalence of high-level stress was low (3.7%) and the rates for depressive symptoms requiring treatment and anxiety symptoms requiring further evaluation (11.4% and 17.7%, respectively) were comparatively more. The prevalence rates of depressive and anxiety symptoms are in line with the findings from similar studies assessing psychological impact during the COVID-19 pandemic in China but the prevalence of high-level stress in our study is comparatively low. However, a huge majority of our participants still have moderately-high stress (78.0%), which is clinically relevant. Zhu et al. from Wuhan, China, the epicenter of the virus outbreak, have reported that among 5,062 HCPs, the prevalence rates of stress, depression, and anxiety were 29.8%, 13.5%, and 24.1%, respectively. Another study from China, conducted among 1,257 HCPs, reported that the prevalence rates of severe distress, depressive symptoms requiring treatment, and anxiety symptoms requiring further evaluation were 10.5% (n = 122/1257), 14.8% (n = 186/1257), and 13.3% (n = 154/1257), respectively. To the best of the authors' knowledge, as on April 20, 2020, study results from India or other countries on the psychological impact of COVID-19 among HCPs are yet to be published.

A closer look into the baseline prevalence of stress, depression, and anxiety among medical staff revealed similar prevalence rates even without the pandemic. A study by Grover et al. among doctors from Chandigarh, conducted in the pre-pandemic period, has reported the prevalence of moderate or severe depression to be 13.2% (n = 59/445) and moderate- or high-level stress to be 80.2% (n = 357/445), using the same tools used by us. Swapnil et al. have reported that the prevalence rates of anxiety

| TABLE 1. Demographic Characteristics |
|-------------------------------------|
| **Characteristic**                  | **Frequency (N = 350)** | **Percentage (%)** |
| Age (years)                         |                         |                    |
| 18–29                               | 178                     | 50.9               |
| 30–44                               | 178                     | 50.9               |
| 45–60                               | 9                       | 2.6                |
| Gender                              |                         |                    |
| Male                                | 187                     | 53.4               |
| Female                              | 163                     | 46.6               |
| Geographical distribution of participants within Indiaa | | |
| North and Central                   | 42                      | 12.0               |
| South                               | 219                     | 62.6               |
| East and North East                 | 20                      | 5.7                |
| West                                | 69                      | 19.7               |
| Accommodation                       |                         |                    |
| Home                                | 189                     | 54.0               |
| Hostel                              | 133                     | 38.0               |
| Temporary arrangement               | 28                      | 8.0                |
| History of mental disorders         |                         |                    |
| Yes                                 | 15                      | 4.3                |
| No                                  | 331                     | 94.6               |
| Did not disclose                    | 4                       | 1.1                |
| Comorbidities                       |                         |                    |
| Asthma/OPD                          | 15                      | 4.3                |
| Hypertension                        | 9                       | 2.6                |
| Diabetes mellitus                   | 8                       | 2.3                |
| Hypothyroidism                      | 4                       | 1.1                |
| Miscellaneousa                      | 6                       | 1.7                |

As per the six administrative zones of India recognized under Part III of the States Reorganisation Act, 1956. 
Poly cystic ovarian disease and allergic chinitis: two participants each; seronegative arthritis and migraine: one participant each. COPD: chronic obstructive pulmonary disease.
Wilson et al.

and depression were 64.60% and 14.18% as assessed using the 28-item general health questionnaire. This suggests that the pandemic has not overtly affected the psychological well-being of the HCPs in India. One possible reason could be that the community transmission is in check due to the ongoing nationwide lockdown, thereby reducing the patient load. Another factor could be resilience that Indian doctors might have developed during the course of their professional life. Medical post-graduate training in India is very competitive, usually very vigorous, and with long working hours, associated burnout, and routine exposure to a variety of infectious diseases. Furthermore, even without a pandemic, the public sector hospitals in India always see a huge number of cases, with very limited staff and infrastructure. Exposed to such stressors, the attitude of HCPs to the current crisis could be paradoxically less panic-stricken. Although we discuss that the psychological issues are not much different now when compared to the non-pandemic days, the concern of spreading the infection to family and friends and the concern about lack of administrative support and adequate personal protective equipment is very high as noted in HCPs across the world.

An analysis of the risk factors for stress, depression, and anxiety symptoms revealed that female gender was a significant predictor. Women were at approximately two times higher odds to develop these conditions. This finding is in line with the findings reported by Lai et al., where women are at increased odds of developing distress (OR: 1.45; P = 0.01), depression (OR: 1.94; P = 0.003), and anxiety (OR: 1.69; P = 0.001). Staying at a hostel or other temporary makeshift accommodations was yet another significant predictor, with participants at two-times the increased odds of developing depression or anxiety symptoms. Those living away from home are most likely feeling lonely, which itself is an important risk factor for psychiatric symptoms. Female gender is yet another risk factor for the development of psychiatric symptoms during loneliness. Although

### Table 2. Occupational History

| Variable     | Category                  | Frequency (N = 350) | Percentage (%) |
|--------------|---------------------------|--------------------|----------------|
| Employment sector | Government               | 165                | 47.1           |
|              | Private                   | 185                | 52.9           |
| Occupation  | Doctor                    | 295                | 84.3           |
|              | Nurses                    | 55                 | 15.7           |
| Designation | Junior resident           | 168                | 48.0           |
|              | Senior resident/assistant professor | 95                | 27.1           |
|              | Associate professor/professor | 35                | 10.0           |
|              | Staff nurse               | 52                 | 14.9           |
| Department  | Emergency medicine        | 166                | 47.3           |
|              | General medicine          | 68                 | 19.4           |
|              | Critical care             | 27                 | 7.7            |
|              | Paediatrics               | 16                 | 4.6            |
|              | Otorhinolaryngology       | 8                  | 2.3            |
|              | Infectious diseases       | 6                  | 1.7            |
|              | Pulmonology               | 6                  | 1.7            |
|              | Other medical specialties | 33                 | 9.4            |
|              | Other surgical specialties | 20                | 5.7            |
| Years of experience | Ten years and below | 310                | 88.6           |
|              | Greater than ten years    | 40                 | 11.4           |

### Table 3. Psychological Characteristics

| Variable           | Category                   | Frequency (N = 350) | Percentage (%) |
|--------------------|----------------------------|--------------------|----------------|
| Perceived stress   | Low                        | 61                 | 17.4           |
|                    | Moderate                   | 276                | 78.9           |
|                    | High                       | 13                 | 3.7            |
| Depressive symptoms| None-Minimal              | 177                | 50.6           |
|                    | Mild                       | 133                | 38.0           |
|                    | Moderate                   | 30                 | 8.6            |
|                    | Moderately severe          | 7                  | 2.0            |
|                    | Severe                     | 3                  | 0.8            |
| Anxiety symptoms   | None-Minimal              | 118                | 33.7           |
|                    | Mild                       | 170                | 48.6           |
|                    | Moderate                   | 48                 | 13.7           |
|                    | Severe                     | 14                 | 4.0            |
| Leisure activities | Online entertainment       | 260                | 74.3           |
|                    | Talking with friends       | 214                | 61.1           |
|                    | Physical fitness           | 118                | 33.7           |
|                    | Smoking                    | 28                 | 8.0            |
|                    | Alcohol                    | 15                 | 4.3            |
|                    | Unable to do any           | 25                 | 7.1            |
| Concern about the spread of infection to family | High                  | 273                | 78.0           |
|                    | Moderate                   | 44                 | 12.5           |
|                    | Low                        | 33                 | 9.4            |

(Table 3 Continued)
studies from other countries have identified many other predictors of psychological symptoms,14–17 we believe that the resilience developed during the early days of the professional career, as discussed, have helped Indian HCPs to tide over the psychological crisis the pandemic otherwise would have created.

Our study has a few limitations. By virtue of its design that it is an online questionnaire without face-to-face interviews, it is difficult to pin a clinical diagnosis on participants who exhibited symptoms. The actual prevalence rates of clinically diagnosed psychological issues studied may vary, although validated screening tools have been used in this study. Also, self-selection bias is a possibility. Further, not all cadres of HCPs other than nurses and doctors have participated in the study. Yet another limitation is that India being a large country in area, the burden of patients diagnosed with COVID-19 is varied, with metros facing the brunt of the pandemic rather than the interiors. Thus, the findings may not be truly reflective of the entire nation during the time of this study. Having said that, the main strength of this study is that the psychological impact has been assessed while the trigger event is actually still ongoing and the threat is still looming.

Conclusion

The prevalence rates of high-level stress, depressive symptoms requiring treatment, and anxiety symptoms requiring further evaluation were 3.7%, 11.4%, and 17.7%, respectively. These were comparable to the reports from other countries. Female gender and staying away from family were significant predictors. The government of India has already been taking a lot of initiatives to cater to the psychological needs of the general population and its HCPs, and we recommend that these measures continue to be in place at least till the pandemic completely phases out itself.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

References

1. Coronavirus update (live). https://www.worldometers.info/coronavirus. Accessed April 25, 2020.
2. Tam CWC, Pang EPF, Lam LCW, et al. Severe acute respiratory syndrome (SARS) in Hong Kong in, 2003: stress and psychological impact among frontline healthcare workers. Psychol Med 2004; 34(7): 1197–1204.
3. Lee SM, Kang WS, Cho A, et al. Psychological impact of the, 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. Compr Psychiatry 2018; 87: 123–127.
4. Maunder R, Hunter J, Vincent L, et al. The immediate psychological and occupational impact of the 2003 SARS outbreak in

### Table 4.
Univariate Analysis for Predictors of Stress, Depression, and Anxiety

| Predictors                                      | Moderate or High-Level Stress | Depression Requiring Treatment | Anxiety Requiring Further Evaluation |
|-------------------------------------------------|------------------------------|-------------------------------|--------------------------------------|
|                                                  | Odds Ratio P Value           | Odds Ratio P Value            | Odds Ratio P Value P Value           |
| Younger age                                      | 1.01                         | 0.85                          | 1.02                                 | 0.57                                 | 1.03                                 | 0.39                                 |
| Female gender                                    | 2.01                         | 0.02                          | 2.08                                 | 0.04                                 | 2.24                                 | <0.01                                 |
| Being a doctor                                   | 1.23                         | 0.58                          | 0.72                                 | 0.43                                 | 0.73                                 | 0.39                                 |
| Less years of experience                        | 1.01                         | 0.79                          | 1.03                                 | 0.52                                 | 1.06                                 | 0.11                                 |
| Hostel/temporary accommodation                   | 1.18                         | 0.56                          | 2.41                                 | 0.01                                 | 2.21                                 | 0.01                                 |
| History of mental illness                       | 1.39                         | 0.67                          | 1.21                                 | 0.81                                 | 1.17                                 | 0.81                                 |
| Presence of comorbidities                       | 0.72                         | 0.42                          | 1.39                                 | 0.49                                 | 0.95                                 | 0.01                                 |
| Perceived inability to distress                  | 1.12                         | 0.85                          | 0.66                                 | 0.58                                 | 0.88                                 | 0.82                                 |
| Employed in government sector                    | 0.77                         | 0.35                          | 1.27                                 | 0.47                                 | 1.24                                 | 0.44                                 |

*Considered as continuous variables with the hypothesis that lower the value, greater the risk.; Results of multivariate analysis for predictors of depressive symptoms requiring further treatment (adjusted odds ratio; 95% confidence intervals; P value): female gender (2.023; 1.021, 4.010; 0.044) and hostel/temporary accommodation (2.355; 1.180, 4.702; 0.035); c Results of multivariate analysis for predictors of anxiety symptoms requiring further evaluation (adjusted odds ratio; 95% confidence intervals; P value): female gender (2.180; 1.230, 4.010; 0.008), less years of experience (1.023; 0.993,1.059; 0.528) and hostel/temporary accommodation (1.926; 1.046, 3.548; 0.035).
a teaching hospital. CMAJ 2003; 168(10): 1245–1251.
5. Lee AM, Wong JG, McAlonan GM, et al. Stress and psychological distress among SARS survivors 1 year after the outbreak. Can J Psychiatry 2007; 52(4): 233–240.
6. Wu P, Fang Y, Guan Z, et al. The psychological impact of the SARS epidemic on hospital employees in China: exposure, risk perception, and altruistic acceptance of risk. Can J Psychiatry 2009; 54(5): 302–311.
7. Hindustan Times. “No community transmission of Covid-19 in India,” WHO rectifies error in report, 2020. https://www.hindustantimes.com/india-news/no-community-transmission-of-covid-19-in-india-who-rectifies-error-in-report/story-akxjThGS55OFzu32BYaHYJ.html. Accessed April 27, 2020.
8. Kroenke K, Spitzer RL, and Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med 2001; 16: 606–613.
9. Cohen S, Kamarck T, and Mermelstein R. A global measure of perceived stress. J Health Soc Behav 1983; 24: 385–396.
10. Spitzer RL, Kroenke K, Williams JB, et al. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med 2006 May 22; 166(10): 1092–1097.
11. Zhu Z, Xu S, Wang H, et al. COVID-19 in Wuhan: immediate psychological impact on 5062 health workers. medRxiv, 2020 Jan 1.
12. Lai J, Ma S, Wang Y, et al. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA Netw Open 2020 Mar 2; 3(3): e203976.
13. Grover S, Sahoo S, Bhalla A, et al. Psychological problems and burnout among medical professionals of a tertiary care hospital of North India: a cross-sectional study. Indian J Psychiatry 2018; 60: 175–188.
14. Swapnil B, Harshali R, and Snehal C. Prevalence of low mental health among nurses in medical intensive care units. Int J Contemp Med Res 2016; 3(8): 2444–2447.
15. News18 India. India has delayed community transmission, lockdown will help us if rules are followed: ICMR scientist. https://www.news18.com/news/india/india-has-delayed-community-transmission-lockdown-will-help-us-if-rules-are-followed-icmr-scientist-2554139.html. Accessed April 25, 2020.
16. Zwack J and Schweitzer J. If every fifth physician is affected by burnout, what about the other four? Resilience strategies of experienced physicians. Acad Med 2013 Mar 1; 88(3): 382–389.
17. Diwan V, Minj C, Chhari N, et al. Indian medical students in public and private sector medical schools: are motivations and career aspirations different? Studies from Madhya Pradesh, India. BMC Med Educ 2013 Sep 15; 13: 127.
18. Kaur S, Sharma R, Talwar R, et al. A study of job satisfaction and work environment perception among doctors in a tertiary hospital in Delhi. Indian J Med Sci 2009 Apr; 63(4): 139–144.
19. Wilson W, Raj JP, Narayan G, et al. Quantifying burnout among emergency medicine professionals. J Emerg Trauma Shock 2017; 10(4): 199–204.
20. Bajpai V. The challenges confronting public hospitals in India, their origins, and possible solutions. Adv Public Health 2014; 2014: 898502.
21. Cai H, Tu B, Ma J, et al. Psychological impact and coping strategies of frontline medical staff in Huanan between January and March 2020 during the outbreak of coronavirus disease 2019 (COVID-19) in Hubei, China. Med Sci Monit 2020 Apr 15; 26: e924171.
22. Mushtaq R, Shoib S, Shah T, et al. Relationship between loneliness, psychiatric disorders and physical health? A review on the psychological aspects of loneliness. J Clin Diagn Res 2014; 8(9): WE01–WE4.