Original Research Article

Psychological impact of the second wave of the COVID-19 pandemic on non-frontline healthcare workers: results of a cross-sectional study in a tertiary care hospital in India

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ABSTRACT

Background: The first wave of the COVID-19 pandemic affected millions of people physically and many more psychologically. Health care workers (HCWs) are amongst those bearing the brunt of the pandemic-induced psychological trauma. This study was one of the first to analyze the psychological effects of the second pandemic wave in India on non-frontline HCWs, a group that has not received much consideration so far.
Methods: A cross-sectional survey-based study was performed on a cohort of 139 HCWs involved in non-covid services during the early phase of the second pandemic wave. In addition to information on demographics and other baseline characteristics, the survey included questions from the depression, anxiety, and stress scale-21 items (DASS-21).
Results: The prevalence rates of depression, anxiety and stress in the cohort were 14.33%, 15.82% and 12.23% respectively. Clinical HCWs had higher mean anxiety scores than the non-clinical group (p=0.01), while the depression and stress scores were similar across all groups (p=0.23 and 0.21, respectively). Multivariate analysis demonstrated correlation of multiple factors with the DASS-21 scores, of which covid positivity and a longer time spent on covid-related information correlated well with all the DASS-21 scale scores (p<0.05).
Conclusions: This study demonstrates reasonable prevalence rates of depression, stress and anxiety amongst non-frontline HCWs in the setting of the second covid wave in India. Clinical HCWs seem to be more prone to pandemic-induced anxiety during this wave. There is an urgent need for promoting psychological coping strategies amongst all classes of HCWs.

Keywords: COVID-19, Psychological effects, Second wave, Non-frontline, Health care workers

INTRODUCTION

Infectious disease outbreaks are known to have psychological impact on the general population and more specifically, on HCWs. Prominent examples of this are the psychological sequelae observed during the severe acute respiratory syndrome (SARS) outbreak in 2003, the H1N1 influenza in 2009 and the middle east respiratory syndrome coronavirus (MERS-CoV) in 2012.[1] A similar trend is being observed in the SARS-CoV-2, also known as coronavirus 2019 (COVID-19) pandemic that infected 130,422,190 million individuals within a year of its outbreak in March 2020. The WHO has formally recognized the risk of pandemic-related stress and

burnout (emotional exhaustion) in HCWs and has released guidelines related to the psychosocial considerations during COVID-19.[2] In India, the first wave of the COVID-19 pandemic proved to be deleterious to the psychological status of HCWs, with multiple studies across the country documenting varying degrees of acute stress reactions, depression, anxiety and burnout.[3-9] Towards the end of 2020, statistical projections predicted India to be one of the rare countries that would experience only a single wave of the pandemic. A nation-wide growing sense of false optimism was however, truncated soon after with the onset of a deadly, second wave of the pandemic. In April 2021, India found itself in the grip of the largest COVID-19 surge in the world. The current study is amongst the first few studies to analyze the psychological effects of the second wave of the pandemic in India across different subgroups of HCWs. While most of the previous studies focused on frontline HCWs directly involved in covid duties, this study screened exclusively for psychological impairment in non-frontline HCWs (those involved in non-covid services). The first wave of the pandemic took a significant toll on the psychological status of both, frontline and non-frontline HCWs, an effect that was reported by some studies to be worse in the non-frontline group.[10-15]

METHODS

Study population and data collection

An anonymous, cross-sectional study was performed using a structured, self-administered, online survey in the second week of April 2021, in the setting of the ongoing second wave of the COVID-19 pandemic in India. The survey was conducted using google forms (Google LLC, CA) and was distributed through electronic mail and/or whatsapp to HCWs employed at a tertiary care hospital in South India. The HCWs included clinical staff (doctors, nurses, technicians and paramedical staff) and non-clinical staff (managers, administrators and office executives), all of whom were involved in non-frontline (non-covid) work at the time of the study. The study was conducted after obtaining approval from the institutional scientific and ethics committees.

Participation in the study was voluntary in nature. The introduction to the survey contained the consent statement that included the objective of the survey and a mention about risk and confidentiality. In the eventuality that the participant experienced emotional distress related to the questions in the survey, a distress protocol was also included in the introduction. This included information regarding the availability of psychological services for back-up counseling services, if required. In addition to information on demographics and various baseline characteristics, the survey included questions from the DASS-21.[16]

DASS-21

The DASS-21 is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress.[16] Each of the three DASS-21 scales contains 7 items divided into subscales with similar content. Scores for depression, anxiety and stress are calculated by summing the scores for the relevant items and multiplying the same by 2 to calculate the final score. The DASS-21 has been validated previously in the Indian population and has been found to be a robust indicator of psychological dysfunction.[17,18]

Sample size

The sample size was calculated to be 74 using the formula,

$$N = \frac{z^2 pq}{d^2},$$

Where,

z=level of confidence (1.96),

p=prevalence of pandemic-related anxiety in HCWs taken as 26.57% from a previous study,[9]

q=(1-p),

d=precision limit (taken as 10%).

Smaller sample sizes were obtained on using the prevalence values of stress and depression from the same study, keeping other assumptions constant.[9] Considering the largest value among the three sample sizes and assuming around 10% of the questionnaires to be incomplete, the minimum sample size for the study was calculated to be 82.

Statistical analysis

Data was entered in an excel spreadsheet (Microsoft Inc.) and analyzed using IBM SPSS statistics for Windows (version 20.0. Armonk, NY: IBM Corp). Variables measured on the nominal scale were summarized using proportions. The prevalence and degree of stress, anxiety and depression in each subgroup were calculated as percentages. Shapiro-Wilk test was performed to evaluate the normality of the data. Differences between the scores of various HCW subgroups were analysed using the Kruskal-Wallis and Mann-Whitney U tests. In addition to descriptive statistics, univariate analysis was performed to explore correlations between various factors and the DASS-21 scale scores. Multivariate linear regression (LR) analysis was then performed using variables with p

values <0.2 in the univariate analysis to identify the unique contribution of relevant factors on the DASS-21 scale scores.

RESULTS

Demographics and other baseline characteristics

The final study cohort included a total of 139 HCWs who turned in completed online surveys. Table 1 lists various baseline characteristics of the study cohort. The male-female ratio of the study cohort was 48:91 and the mean age was 37.76±11.21 years. The cohort included 104 clin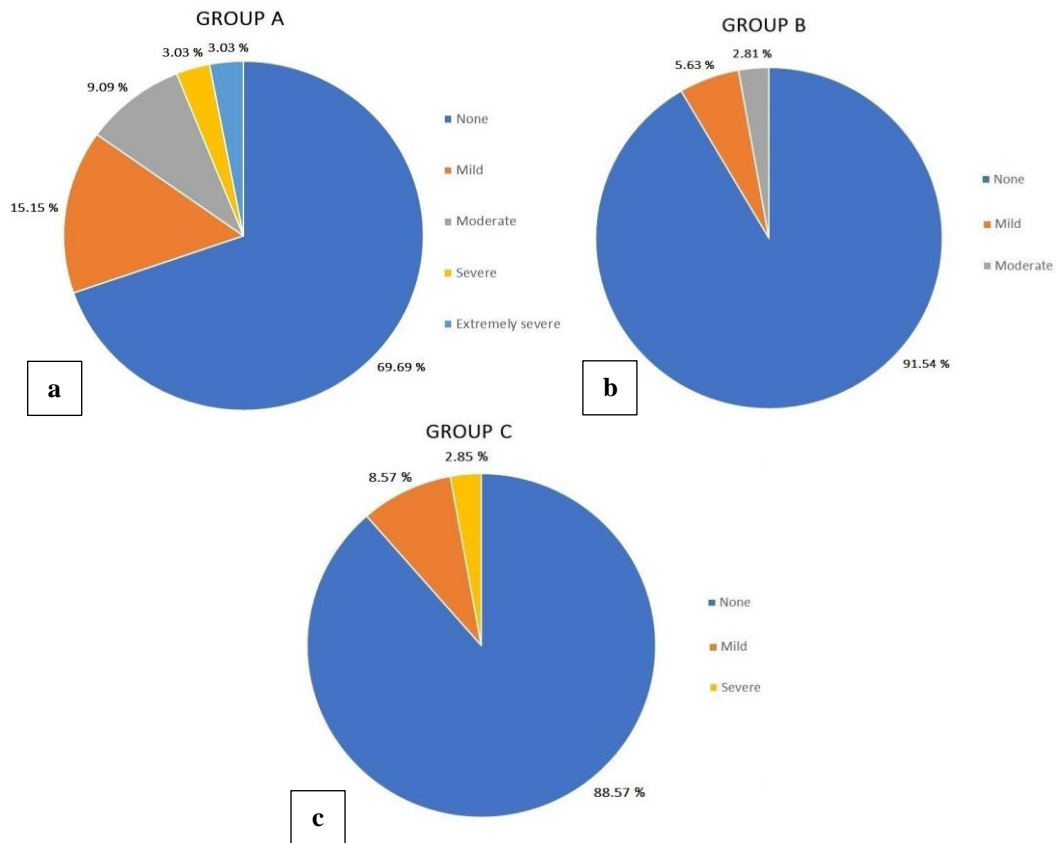ical staff (doctors, nurses and technicians) and 35 non-clinical staff (adminis-trators/managers/office executives). Around one-fifth of the subjects had associated co-morbidities. One-third of them reported history of covid-positivity (in the HCW or a family member) in the past.

Overall prevalence of depression, stress and anxiety

The overall prevalence rates of depression, anxiety and stress in the study cohort (n=139) as measured by the DASS-21 scores were 14.33%, 15.82% and 12.23% respectively. The frequency distribution of the respective DASS-21 scale scores is shown in Figure 1. The scores in all the three scales had a non-parametric distribution.
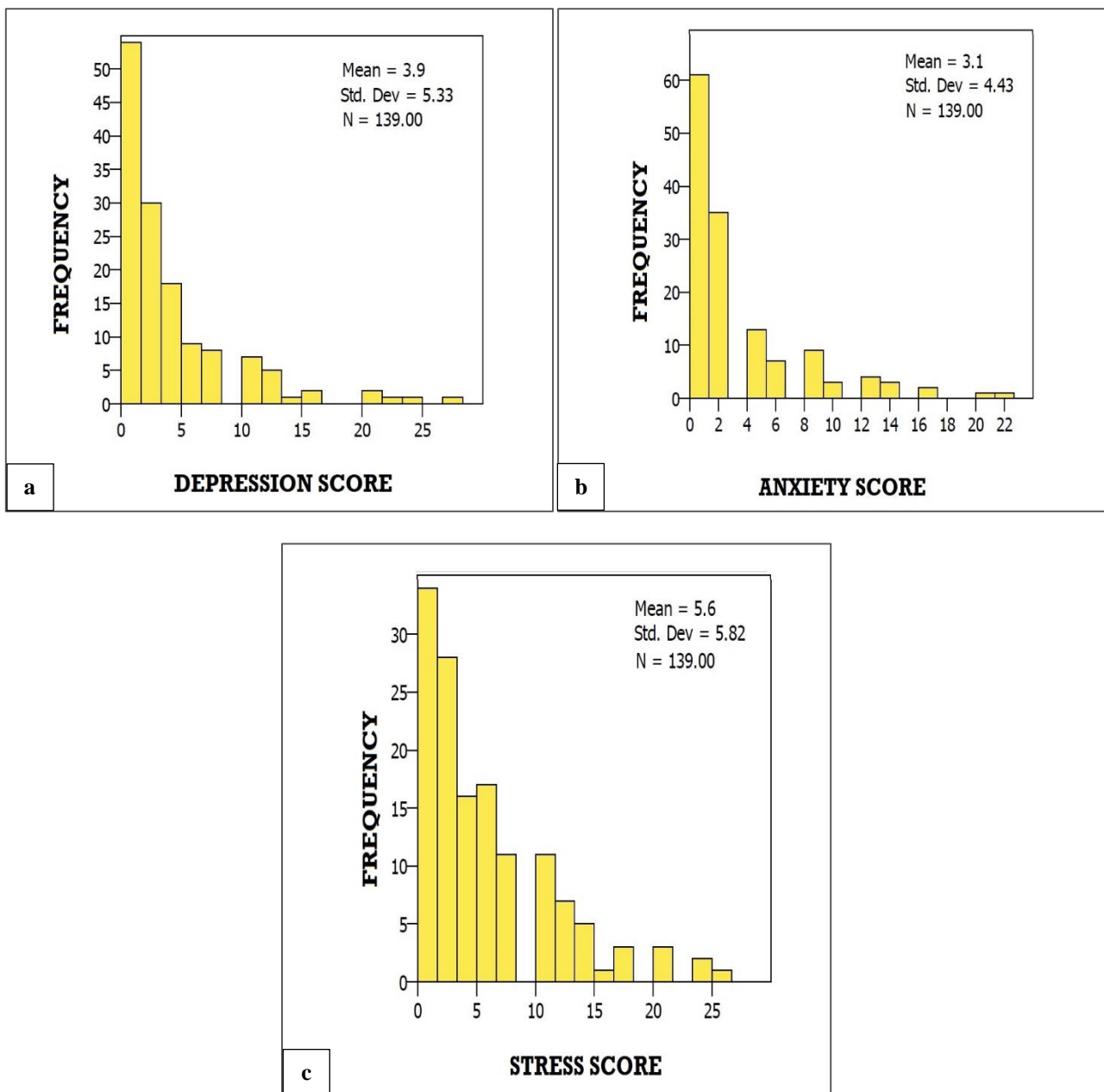
Figure 1 (a-c): Frequency distribution of the DASS-21 depression, anxiety and stress scale scores in the entire study cohort (n=139).

GROUP A

3.03 % 3.03 %
9.09 %

15.15 %

- None
- Mild
- Moderate
- Severe
- Extremely severe

69.69 %

a

GROUP B

5.63 % 2.81 %

- None
- Mild
- Moderate

91.54 %

b

GROUP C

8.57 % 2.85 %

- None
- Mild
- Severe

88.57 %

c

Figure 2 (a-c): Degree of depression amongst different groups of HCWs (group A=doctors; group B=nurses/technicians; group C=administrators/managers/office executives).

GROUP A

3.03 %
15.15 %

6.06 %

- None
- Mild
- Moderate
- Extremely severe

75.75 %

a

GROUP B

2.81 % 1.40 %
5.63 %
5.63 %

- None
- Mild
- Moderate
- Severe
- Extremely severe

84.50 %

b

GROUP C

8.57 %

- None
- Mild

91.42 %

c
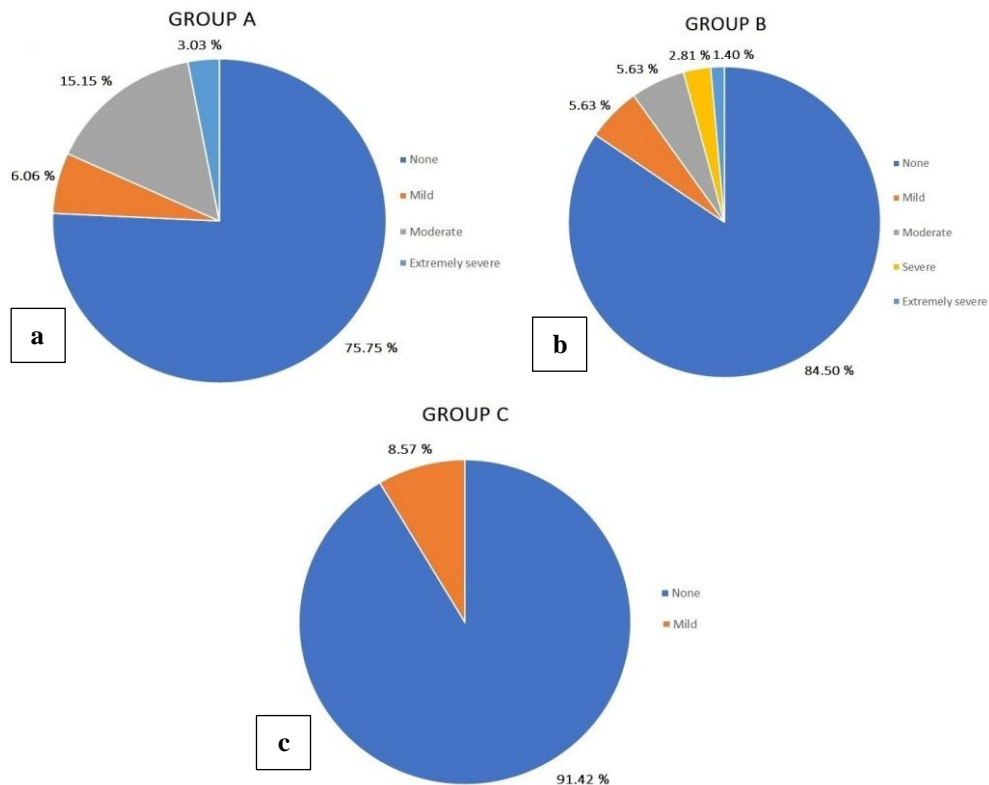
Figure 3 (a-c): Degree of anxiety amongst different groups of HCWs (group A=doctors; group B=nurses/technicians; group C=administrators/managers/office executives).
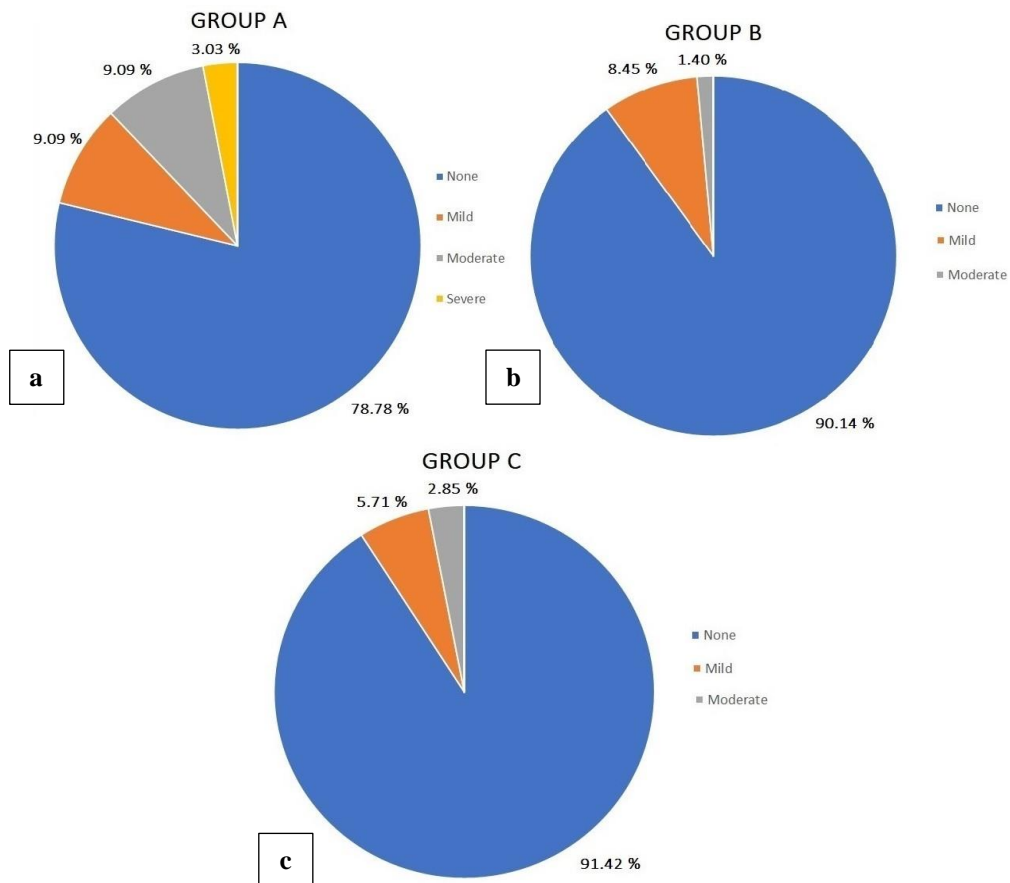
Figure 4 (a-c): Degree of stress amongst different groups of HCWs (group A=doctors; group B=nurses/technicians; group C=administrators/managers/office executives).
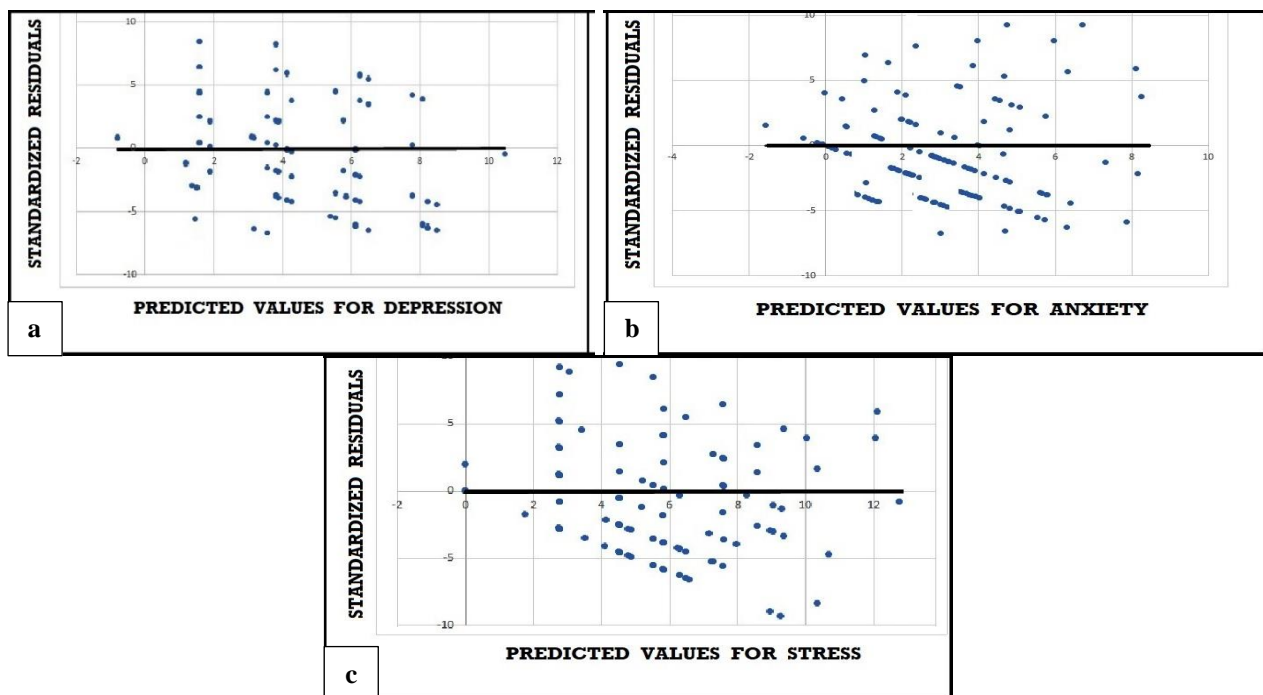
Figure 5 (a-c): Distribution of the predicted values for the DASS-21 depression, anxiety and stress scores against the respective standardized residual values.

Table 1: Baseline characteristics of the study COHORT (n=139).

Variables	N (%)
Mean age (in years)±SD	37.76±11.21
Sex	
Male	48 (34.53)
Female	91 (65.46)
Marital status	
Single	48 (34.53)
Married	91 (65.46)
Education status	
Graduation	80 (57.55)
Post-graduation	59 (42.44)
Occupation	
Doctor	33 (23.74)
Nurse	62 (44.60)
Technician	9 (6.47)
Non-clinical staff	35 (25.17)
Work experience (in years)	
<10	56 (40.28)
>10	83 (59.71)
Members at home	
Stays alone	28 (20.14)
With spouse	32 (23.02)
With spouse and parents/ children	79 (56.83)
Co-morbidities	
Hypertension	7 (5.03)
Diabetes mellitus	7 (5.03)
Ischemic heart disease	5 (3.59)
Asthma	5 (3.59)
Others	10 (7.19)
History of mental illness	
Yes	1 (0.71)
No	138 (99.28)
Time spent daily on COVID-related information (in hours)	
Less than ½	76 (54.67)
0.5-1	41 (29.49)
More than 1	22 (15.82)
History of COVID-19 positivity (self or family member)	
Yes	46 (33.09)
No	93 (66.90)

Table 2: Comparison of the mean DASS-21 depression, anxiety and stress scale scores across various groups of HCWs.

Mean DASS-21 subscale score	Group A (n=33)	Group B (n=71)	Group C (n=35)	P value Kruskal-Wallis H test	Mann-Whitney U test
Depression score	6.00±7.47	3.15±4.09	3.37±4.75	0.23	-
Anxiety score	4.48±5029	3.21±4.54	1.54±2.52	0.01	0.13 (A, B); 0.04 (B, C); 0.002 (A, C)
Stress score	8.00±8.11	4.96±4.68	4.63±4.80	0.21	-

(Group A=doctors; group B=nurses/technicians; group C=non-clinical staff-administrators/managers/office executives).

Table 3: Results of the univariate and multivariate analysis to check for correlations between different variables and the DASS-21 depression, anxiety and stress scale scores respectively.

Variables	P value		
	Depression score	Anxiety score	Stress score
Age (years)	0.33	0.02[α,*]	0.25
Sex	0.02[α,*]	0.09	0.06 *
Marital status	0.26	0.39	0.31
Education status	0.02[α,*]	0.36	0.06 *
Occupation	0.13	0.001[α,*]	0.05
Work experience	0.49	0.15	0.32
Household status (members at home)	0.31	0.23	0.17
Co-morbidities	0.20	0.14 *	0.11 *
History of mental illness	0.35	0.47	0.17
Time spent daily on COVID-19 related information	0.001[α,*]	0.001[α,*]	0.004[α,*]
History of COVID-19 positivity (self or family member)	0.02[α,*]	0.002[α,*]	0.001[α,*]

([α] denote significant p values in the univariate analysis, * denotes variables that were significant in the multivariate analysis).

Comparison of DASS-21 scores across different HCW subgroups

For the analysis, the study cohort was divided into 3 groups. Group A consisted of doctors (n=33); group B of nurses and technicians (n=71) and group C of non-clinical staff (n=35). The mean DASS-21 depression and stress scores were not significantly different across the three groups, while the mean DASS-21 anxiety scores were significantly more in groups A and B than in group C (Table 2). Figures 2-4 shows the comparison of the distribution of the various degrees of depression, anxiety and stress in the three groups. A majority of the HCWs in groups A and B had mild to moderate DASS-21 scale scores for depression, anxiety and stress, while most of the HCWs in group C had mild scores for the same.

Univariate and multivariate analysis

All the demographic and other baseline characteristics of the study cohort were analysed for individual correlations with the DASS-21 depression, anxiety and stress scales (Table 3). Multivariate linear regression analysis demonstrated the unique correlation of multiple factors with the DASS-21 scores. Factors such as a lower education status, female gender, COVID-19 positivity and longer time spent daily on COVID-19 related information correlated well (p<0.05) with both, the DASS-21 depression and stress scale scores. The last two factors, along with increasing age, clinical nature of work and associated co-morbidities correlated well with higher DASS-21 anxiety scores (Table 3). The LR models for all the three DASS-21 scale scores were significant (p<0.001 for all the models) and fitted the data well. Residual analysis indicated that the LR models were appropriate for the data (Figure 5).

DISCUSSION

Psychological effects of the first COVID-19 wave on HCWs

Studies from across the world during the first wave of the COVID-pandemic reported varying degrees of psychological impairment in HCWs ranging from mild behavioural changes and lower perceived health to more serious issues like health risk behaviour and frank mental health disorders (depression, anxiety and stress).[1,3-10,19-29] Prevalence rates of these symptoms ranged from values of less than 10% to values as high as 50% or more.[4,7,8,19,20] A meta-analysis of 13 studies with a total of 33,062 HCWs reported pooled prevalence rates of 23.2%, 22.8% and 38.9% for anxiety, depression and insomnia respectively.[28] Some psychological symptoms have even been reported to be significant enough to present with concurrent physical symptoms.[21]

Various factors have been cited to trigger the above psychological dysfunction in HCWs. These include decline in professional fulfilment, change in work-pattern or working hours, risk of contracting the infection, the need to wear personal protective equipment (PPE), fear related to stigmatization, requirement of quarantine if exposed or infected, feelings of uncertainty about the future and inadequate support of the family.[7,26]

In the Indian context, a cross-sectional, nation-wide study on 433 frontline HCWs reported the overall prevalence of stress, depression and anxiety symptoms to be at par with what was seen globally.[3] A multi-centric study on 777 doctors involved in frontline COVID-19 duty found that around half of those with psychological impairment had moderate to severe degrees of depression, anxiety, stress and insomnia.[9] Other studies on smaller cohorts of Indian HCWs reported relatively high prevalence rates of

depression, anxiety and stress and identified various factors correlating with psychological outcomes.[4,7,8]

Effects of the pandemic on non-frontline HCWs

One would intuitively expect frontline HCWs handling COVID-19 patients to have higher psychological impairment than their non-frontline counterparts managing non-COVID patients. Although this has been backed by a few studies, other studies have demonstrated similar degrees of burnout, insomnia, depression and anxiety in both the groups of HCWs.[10,12,13,19,25] Interestingly, a few studies have also reported non-frontline HCWs to be more prone to anxiety, burnout and vicarious traumatization than frontline workers.[11,14,27] This has been attributed to the non-frontline HCWs having lesser access to first-hand information about COVID-19 and having poorer overall skills and confidence in fighting the pandemic.[11,30,31] Studies have demonstrated that better knowledge about COVID-19 resulted in a more positive attitude and lesser psychological impairment amongst HCWs.[32] Any hospital COVID or non-COVID is technically a red zone for COVID-19 given the reported false-negative rates of the diagnostic gold standard (reverse transcription-polymerase chain reaction; RT-PCR), the incubation period of the infection and the significant number of patients who are asymptomatic yet infectious.[33] This translates to the non-frontline HCWs (who are less-intensively trained with respect to PPEs and infection control) being aware that they too are subject to the risks of nosocomial transmission as well as transmitting the infection to their families.[20] Additionally, non-frontline HCWs are in no way immune to stigmatization and discrimination that their frontline counterparts face in their communities.[34] Given the above, it therefore stands to reason that the non-frontline HCWs need to be targeted further, both in pandemic-related psychological research and preemptive resilience strategies. This in fact formed the basis of the selection of our study cohort.

Variations in psychological outcomes across different groups

Studies during the pandemic have compared psychological outcomes between HCWs and non-healthcare personnel and also between subgroups of HCWs.[5-7,19,22-24] Barzelay et al found greater levels of anxiety and depression in HCWs compared to non-healthcare personnel.[22] This was attributed to the perceived risk of the HCWs transmitting the infection to their family members. At variance with the findings of this study, a meta-analysis by Luo et al reported a similar prevalence of anxiety and depression in both, HCWs and the general population.[23] Que et al reported anxiety and depression to occur more in nurses and public health professionals respectively and to a lesser extent in medical residents.[19] Nurses were cited to be more susceptible to mental problems because of factors such as a higher workload, greater risk of direct exposure to

COVID-19 patients and precautionary separation from family members.[35] While all these factors applied to physicians as well, the coping skills of physicians were reportedly better than in nurses.

In a study conducted in India, Chatterjee et al analyzed stress and insomnia amongst 140 Indian HCWs.[6] Doctors were found to be most anxious, while both, doctors and nurses demonstrated increased irritability than the other HCWs. The other subgroups of HCWs, on the other hand, were more likely to experience insomnia. In another Indian study, clinical HCWs were noted to have significantly higher prevalence rates of depression, stress and anxiety than the administrative staff.[8] Such variances of mental health problems across various categories of HCWs are attributed to differences in work profiles, risk of contracting COVID-19 and the degree of familial dysfunction.[8,35]

Key findings and implications of our study

Our study is one of the first few to have been conducted on Indian HCWs during the early phase of the second wave of the pandemic. While we found significant psychological symptoms in some of our study subjects, the overall prevalence rates of depression, anxiety and stress were found to be relatively less compared to those reported by most studies during the first wave of the pandemic. This could be because of factors like the non-frontline nature of work at the time of the study, post-vaccination status or the psychological resilience that the HCWs may have developed after the first wave of the pandemic. Additionally, HCWs in a resource-limited country like India are inherently accustomed to strenuous professional lifestyles and burnout right from their training days.[36,37] This itself may have contributed to them being relatively less affected in psychologically demanding situations. This hypothesis will need further exploration in multi-centric studies that include frontline HCWs as well, and at a period closer to the peak of the second wave. Interestingly, though most of the non-clinical HCWs in our cohort experienced a milder degree of psychological symptoms than the clinical group, the mean DASS-21 scores for depression and stress were similar across both the groups. The mean anxiety scores were, however, significantly higher in doctors and nurses- a finding that was borne out in previous studies.[6,8,19] Higher anxiety levels in the clinical HCWs could be attributed to them being more aware of the highly evolving nature of the COVID-19 infection, with its increasing number of variants, changing infectivity rates and myriad clinical presentations, all resulting in a sense of uncertainty and fear of the unknown.

Some of the baseline characteristics that correlated with psychological dysfunction in our study such as a lower age, female gender, presence of comorbidities and history of COVID positivity in the HCW or a family member-have been reported previously.[1,21] A lower education status possibly predisposed the HCWs to depression and

stress by making them more vulnerable to misconceptions and fear. Longer time spent daily on thinking about or gathering COVID-19 related information correlated well with depression and stress scale scores, a finding that has been previously established in the general population.[38] Rumination is associated with the internalization of psychopathology and is a well-established risk factor for depression and anxiety.[39] In the setting of the pandemic, this finding suggests the need for HCWs to device methods of self-distraction or including elements of mindfulness practice in their daily routines.

CONCLUSION

This study demonstrates reasonable prevalence rates of depression, stress and anxiety amongst non-frontline HCWs in the setting of the second COVID wave in India. Studies like this bring to light an urgent need for promoting resilience and self-curated coping strategies amongst HCWs for them to be able to brave the pandemic without being weighed down psychologically. The pandemic will subside in the course of time, but its psychological scars on all classes of HCWs, frontline or non-frontline, need to be minimized by providing appropriate and timely psychological support and mental health support services.

REFERENCES

1. Cabarkapa S, Nadjidai SE, Murgier J, Ng CH. The psychological impact of COVID-19 and other viral epidemics on frontline healthcare workers and ways to address it: A rapid systematic review. Brain Behav Immun Health. 2020;8:100144.
2. World Health Organization. Mental health and psychosocial considerations during the COVID-19 outbreak, 18 March 2020. World Health Organization; 2020. Available at: https://www.who.int/docs/default-source/coronaviruse/ mental-health-considerations.pdf. Accessed on 01 May 2021.
3. Wilson W, Raj JP, Rao S, Ghiya M, Nedungalaparambil NM, Mundra H, et al. 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):353-8.
4. Suryavanshi N, Kadam A, Dhumal G, Nimkar S, Mave V, Gupta A, et al. Mental health and quality of life among healthcare professionals during the COVID-19 pandemic in India. Brain Behav. 2020;10(11):01837.
5. Khasne RW, Dhakulkar BS, Mahajan HC, Kulkarni AP. Burnout among healthcare workers during COVID-19 pandemic in India: results of a questionnaire-based survey. Indian J Crit Care Med. 2020;24(8):664-71.
6. Chatterjee SS, Chakrabarty M, Banerjee D, Grover S, Chatterjee SS, Dan U. Stress, sleep and psychological impact in healthcare workers during the early phase of COVID-19 in India: a factor analysis. Front Psychol. 2021;12:611314.
7. Raj R, Koyalada S, Kumar A, Kumari S, Pani P, Nishant, et al. Psychological impact of the COVID-19 pandemic on healthcare workers in India: An observational study. J Family Med Prim Care. 2020;9(12):5921-6.
8. Sharma R, Saxena A, Magoon R, Jain MK. A cross-sectional analysis of prevalence and factors related to depression, anxiety, and stress in health care workers amidst the COVID-19 pandemic. Indian J Anaesth. 2020;64(4):242-4.
9. Selvaraj P, Muthukanagaraj P, Saluja B, Jeyaraman M, Anudeep TC, Gulati A, et al. Psychological impact of COVID-19 pandemic on health-care professionals in India-a multicentric cross-sectional study. Ind J Med Sci. 2020;72(3):141-7.
10. Tiete J, Guatteri M, Lachaux A, Matossian A, Hougardy JM, Loas G, et al. Mental health outcomes in healthcare workers in COVID-19 and non-COVID-19 care units: a cross-sectional survey in Belgium. Front Psychol. 2021;11:612241.
11. Noor MN, Yusof CR, Yacob MA. Anxiety in frontline and non-frontline healthcare providers in Kelantan, Malaysia. Int J Environ Res Public Health. 2021;18(3):861.
12. Cai Q, Feng H, Huang J, Wang M, Wang Q, Lu X, et al. The mental health of frontline and non-frontline medical workers during the coronavirus disease 2019 (COVID-19) outbreak in China: a case-control study. J Affect Disord. 2020;275:210-5.
13. Alshekaili M, Hassan W, AlSaid N, AlSulaimani F, Jayapal SK, Al-Mawali A, et al. Factors associated with mental health outcomes across healthcare settings in Oman during COVID-19: frontline versus non-frontline healthcare workers. BMJ Open. 2020;10(10):042030.
14. Tan BY, Chew NW, Lee GK, Jing M, Goh Y, Yeo LL, et al. Psychological impact of the COVID-19 pandemic on health care workers in Singapore. Ann Inter Med. 2020;173(4):317-20.
15. Li Z, Ge J, Yang M, Feng J, Qiao M, Jiang R, et al. Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. Brain Behav Immun. 2020;88:916-9.
16. Lovibond SH, Lovibond PF. Manual for the depression anxiety stress scales. Sydney, N S W: Psychol Foundat Australia; 1995.
17. Singh K, Junnarkar M, Sharma S. Anxiety, stress, depression,and psychosocial functioning of Indian adolescents. Indian J Psychiatry. 2015;57(4):367-74.
18. Thomas AB, Dubey SK, Samanta MK, Alex A, Jose SP. Assessment of psychological stressors of

depression and anxiety using depression anxiety stress scale-21 in South Indian healthy volunteers. Int J Pharm Pharm Sci. 2016;8(5):288-95.

19. Que J, Shi L, Deng J, Liu J, Zhang L, Wu S, et al. Psychological impact of the COVID-19 pandemic on healthcare workers: a cross-sectional study in China. Gen Psych. 2020;30:100259.

20. Tan BYQ, Chew NWS, Lee GKH, Jeng M, Yeo LLL, Zhang K, et al. Psychological impact of the COVID-19 pandemic on health care workers in Singapore. Ann Int Med. 2020.

21. Chew NWS, Lee GKH, Tan BYQ, Jing M, Goh Y, Ngiam NJH, et al. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. Brain Behav Immun. 2020;88:559-65.

22. Barzelay R, Moore TM, Greenberg DM, DiDemenico GE, Brown LA, White LK. Resilience, COVID-19-related stress, anxiety and depression during the pandemic in a large population enriched for healthcare providers. Transl Psychiatry. 2020;10:291-9.

23. Luo M, Guo L, Yu M, Jiang W, Wang H. The psychological and mental impact of coronavirus disease 2019 (COVID-19) on medical staff and general public- a systematic review and meta-analysis. Psychiatry Res. 2020;291:113190.

24. Kuo FL, Yang PH, Hsu HT, Su CY, Chen CH, Yeh IJ, et al. Survey on perceived work stress and its influencing factors among hospital staff during the COVID-19 pandemic in Taiwan. Kaohsiung J Med Sci. 2020;36(11):944-52.

25. Milgrom Y, Tal Y, Finestone AS. Comparison of hospital worker anxiety in COVID-19 treating and non-treating hospitals in the same city during the COVID-19 pandemic. Isr J Health Policy Res. 2020;9(1):55.

26. Spoorthy MS. Mental health problems faced by healthcare workers due to the COVID-19 pandemic- a review. Asian J Psychiatr. 2020;51:102119.

27. Wu Y, Wang J, Luo C, Hu S, Lin X, Anderson AE, et al. A Comparison of Burnout Frequency Among Oncology Physicians and Nurses Working on the Frontline and Usual Wards During the COVID-19 Epidemic in Wuhan, China. J Pain Symptom Manage. 2020;60(1):e60-5.

28. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsi E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. Brain Behav Immun. 2020;88:901-7.

29. Shigemura J, Ursano RJ, Morganstein JC, Kurosawa M, Benedek DM. Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: mental health consequences and target populations. Psychiatry Clin Neurosci. 2020;74(4):281-2.

30. Zhang M, Zhou M, Tang F, Wang Y, Nie H, Zhang L, et al. Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. J Hosp Infect. 2020;105(2):183-7.

31. Si MY, Su XY, Jiang Y, Wang WJ, Gu XF, Ma L, et al. Psychological impact of COVID-19 on medical care workers in China. Infect Dis Poverty. 2020;9(1):113.

32. Huynh G, Nguyen TN, Vo KN, Pham LA. Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City. As Pac J Trop Med. 2020;13(6):260.

33. Xiao J, Fang M, Chen Q, He B. SARS, MERS and COVID-19 among healthcare workers: a narrative review. J Infect Public Health. 2020;13:843-8.

34. Aghili SM, Arbabi M. The COVID-19 pandemic and the health care providers; what does it mean psychologically? Adv J Emerg Med. 2020;4:63.

35. Maunder RG, Lancee WJ, Rourke S, Hunter JJ, Goldbloom D, Balderson K, et al. Factors associated with the psychological impact of severe acute respiratory syndrome on nurses and other hospital workers in Toronto. Psychosom Med. 2004;66(6):938-42.

36. 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;88(3):382-9.

37. Diwan V, Minj C, Chhari N, DeCosta A. 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;13(1):1-6.

38. Ying Y, Ruan L, Kong F, Zhu B, Ji Y, Lou Z. Mental health status among family members of health care workers in Ningbo, China, during the coronavirus disease 2019 (COVID-19) outbreak: a cross-sectional study. BMC Psychiat. 2020;20(1):379.

39. Michl LC, McLaughlin KA, Shepherd K, Nolen-Hoeksema S. Rumination as a mechanism linking stressful life events to symptoms of depression and anxiety: longitudinal evidence in early adolescents and adults. J Abnormal Psychol. 2013;122(2):339.