ORIGINAL ARTICLE

Mental health impact of COVID-19 among health-care workers: An exposure-based cross-sectional study

ABSTRACT

Background: Health-care workers (HCWs) in COVID-19 pandemic have faced the major impact in providing care to infected persons. Most of the studies on mental health impact among HCW have not incorporated paramedical staff. Furthermore, they have not compared psychological morbidity among HCW on the basis of high COVID exposure (HCE) and low COVID exposure (LCE). To address the above gap, this study aimed at evaluating mental health impact among HCW and its associated risk factors. Materials and Methods: Consecutive 200 HCWs each in the HCE and LCE groups (between the age group of 18 and 60 years) were enrolled from two tertiary care hospitals providing COVID-19 treatment from August 1, 2020. After collection of sociodemographic data, participants were administered Impact of Event Scale-Revised, Patient Health Questionnaire-9, and Generalized Anxiety Disorder-7 Scale. Results: The difference in stress, depression, and anxiety symptom scores between the HCE and LCE groups was not statistically significant. Multiple regression analysis revealed that female sex was associated with higher scores in all the three domains. The effect remained significant even after adjusting for effect of other risk factors. Conclusion: HCE or LCE was associated with similar impact in terms of stress, depression, and anxiety among HCWs. Female HCWs had a higher prevalence of stress, depression, and anxiety. Doctors, nurses, and paramedics had a similar prevalence of stress, depression, and anxiety when odds were adjusted.

Keywords: COVID exposure, health-care workers, mental health, paramedics

The World Health Organization (WHO) on January 30, 2020, identified COVID-19 as a Public Health Emergency of International Concern.[1] With increase in number of cases, number of deaths, and the number of countries affected globally, the WHO announced COVID-19 as a pandemic on March 11, 2020.[2] India was placed under the first lockdown on March 25, 2020.[3] In epidemics, the prevalence of psychological morbidity tends to be higher than normal.[4] Frontline health-care workers (HCWs) are “health workers who play a crucial role in providing care to infected persons.”[5] HCWs have to work round the clock, beyond the call of duty in an environment, where the chances of contracting the disease are very high. This makes them vulnerable to mental health problems.[6] Uncertainty about the disease course, inadequate personal protection, absence of evidence-based treatment, greater incidence of disease among HCWs, and the associated risk factors among HCW need to be evaluated. To address the above gap, this study aimed at evaluating mental health impact among HCW and its associated risk factors.

Materials and Methods: Consecutive 200 HCWs each in the HCE and LCE groups (between the age group of 18 and 60 years) were enrolled from two tertiary care hospitals providing COVID-19 treatment from August 1, 2020. After collection of sociodemographic data, participants were administered Impact of Event Scale-Revised, Patient Health Questionnaire-9, and Generalized Anxiety Disorder-7 Scale. Multiple regression analysis revealed that female sex was associated with higher scores in all the three domains. The effect remained significant even after adjusting for effect of other risk factors. Conclusion: HCE or LCE was associated with similar impact in terms of stress, depression, and anxiety among HCWs. Female HCWs had a higher prevalence of stress, depression, and anxiety. Doctors, nurses, and paramedics had a similar prevalence of stress, depression, and anxiety when odds were adjusted.

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apprehension about infecting family members, and high mortality are factors identified, which predispose HCWs to higher rate of psychological problems. Studies during and after the 2003 SARS outbreak had revealed mental health issues among HCWs [8-11]. HCWs feared transmitting infections to family members, reported stigma, feeling of inadequacy, stress, anxiety, and depression. Similar mental health issues are emerging in the current pandemic.

A meta-analysis of psychological effects of COVID-19 pandemic on HCWs and non-HCWs revealed that both the groups suffered in equal measure except for insomnia (high among HCW). The study done by us during the first phase of COVID pandemic (April 2020) among adult population revealed prevalence of anxiety to be 30.1%. Another meta-analysis of 50 studies reported prevalence rate of psychological morbidity including insomnia (30%), stress symptoms (27%), anxiety (26%), and depression (26%). It was highest among COVID-19 patients, followed by HCWs and general population. An online survey of 1257 HCWs in January–February 2020 at 34 hospitals in China during the COVID-19 pandemic revealed depression in 50.4%, anxiety in 44.6%, insomnia in 34%, and distress in 72% of HCWs. HCWs working in close contact with the patients were found to have higher psychological problems. An online survey of 350 Indian HCWs involved in COVID-19 care found the prevalence of high-level stress to be 3.7%, depressive symptoms 11.4%, and anxiety symptoms 17.7%.

There is literature available on mental health impact among doctors and nurses. However, most of the studies have not incorporated paramedical staff, while studying psychological impact among HCWs. Most of the studies have not compared psychological morbidity of HCWs working in high COVID exposure (HCE) and low COVID exposure (LCE) situations. These data will be required for the effective utilization of mental health resources. To address this gap in the knowledge, this study was carried out to determine the prevalence of stress, depression, and anxiety among HCWs employed in HCE and LCE situations and to identify associated risk factors.

MATERIALS AND METHODS

The study population was HCWs of two large tertiary care hospitals providing COVID-19 treatment. The study proposal was approved by the Institutional Ethics Committee. Stress is defined as a process whereby an individual perceives and responds to events appraised as overwhelming or threatening to one’s well-being. A cutoff of 33 and above on Impact of Event Scale-Revised (IES-R) was taken as having stress symptoms in the study. HCWs (doctors, nurses, and paramedical staff) who had worked in COVID-19 wards/intensive care unit, fever/flu clinics, or emergency room, where contact with COVID-19 patients is likely often and intense, over the last 14 days, were considered to have HCE. HCWs working in outpatient departments/wards in both the hospitals, not in contact with confirmed COVID-19 patients over the last 14 days, were considered to have LCE.

The study design was cross sectional. The inclusion criteria were all HCWs working during COVID-19 outbreak in two tertiary care hospitals (between the age group of 18 and 60 years). The exclusion criteria included HCWs with past history of depressive episode, anxiety disorder, substance use disorder, and major neurological illness. Sample size for each category was calculated taking 50% prevalence of stress, depression, and anxiety among HCW due to COVID-19 pandemic with 95% confidence interval and keeping absolute degree of precision to be 7%. The sample size obtained is 196 in each group, however, the investigators decided to study 200 consecutive HCWs in each group, from August 1, 2020, to December 31, 2020.

Informed consent from all the participants was taken. Sociodemographic data were collected. Participants were administered IES-R for evaluating stress symptoms, Patient Health Questionnaire (PHQ)-9 for depression symptoms, and Generalized Anxiety Disorder-7 (GAD-7) Scale for anxiety symptoms. IES-R has been validated in assessing stress due to COVID pandemic with Cronbach’s α of 0.75. In PHQ-9, a cutoff score of 10 and above has 88% sensitivity and specificity for major depression. In GAD-7, a cutoff score of 10 or more has been recommended for clinical evaluation. The prevalence of stress, depression, and anxiety was calculated among both the HCE and LCE groups. Subsequently, logistic regression analysis was carried out to ascertain risk factors associated with psychological morbidity among HCW. Data were tabulated and statistically analyzed using the Statistical Package for the Social Sciences (SPSS) program version 23 (IBM Corporation, Armonk, New York, USA).

RESULTS

The mean age of the sample was 31.74 years; the mean age of the HCWs in the high exposure group was 29.80 ± 6.02 years and in the low exposure group was 33.69 ± 7.98 years. The difference was statistically significant. The study had higher number of males (64.5% in HCE and 63% in LCE) compared to females (35.5% in HCE and 37% in LCE). Among the participants in the HCE group, around 35% were doctors, 23.5% were nurses, and 41.5% were paramedical staff. Among
HCW in the LCE group, 53.5% were doctors, 26% were nurses, and 19.5% were paramedical staff. Majority of the participants among both the groups were either graduates/postgraduates. Most of the HCWs in both the groups (HCE – 77% and LCE – 60.5%) had ≤10 years of experience [Table 1].

Among the participants, stress symptoms were present in 47 (23.5%) in HCE and 37 (18.5%) in LCE [Figure 1]. Depressive symptoms were present among 34 (17%) in HCE and 31 (15.5%) in LCE [Figure 2]. Anxiety symptoms were present in 21 (10.5%) in HCE and 16 (8%) in LCE [Figure 3]. The difference between the HCE and LCE groups for stress, depression, and anxiety symptoms was not statistically significant. Multiple regression analysis revealed that female sex was associated with higher scores in all the three domains. The effect remained significant even after adjusting for effect of other factors. Doctors and nurses had statistically significantly higher scores compared to paramedics in IES-R, PHQ-9, and GAD-7 scales, when risk factors of age, sex, education, years of experience, and COVID exposure were considered. However, when the effect of the above risk factors was adjusted, this was no longer statistically significant [Table 2].

**DISCUSSION**

This study has attempted to assess the mental health impact of COVID-related work among HCWs. The differential impact across genders and health-care occupations (doctors, nurses, and paramedics) was assessed. The mean age of the HCE group was significantly lower than among the LCE. This could be because younger HCWs were employed in HCE duties in the first wave of the pandemic, as they have comparative lesser risk of COVID-19 complications. The mean age of the participants in this study was 31.74 years, which was comparable to that in other studies.[16] In this study, the number of males employed in HCE and LCE areas was more than females. This is in contrast to some studies, which have reported a greater number of females.[15,22] The probable reason for this may be inclusion of paramedical staff in our study, who are predominantly males in India.[23] This study had 30.5% of paramedics among HCWs, which is much more than of 12% reported in another Indian study.[24] Most of the HCWs in both the groups (HCE – 77% and LCE – 60.5%) had up to 10 years of experience. This was similar to another Indian study of Wilson _et al._[16] This points to the relatively greater utilization of HCWs with fewer years of experience in the COVID pandemic.

Our study found stress symptoms in 23.5% among the HCE group and 18.55% in the LCE group. The difference is not statistically significant. These findings are similar to a meta-analysis by Li _et al._ of 65 studies between December 2019 and August 2020 involving 21 countries, which revealed a prevalence of stress symptoms in 21.7%.[25] However, Lai _et al._ reported that stress symptoms in frontline HCWs (40%) were significantly higher than among
second-line HCWs (30%).\(^9\) This variance from our findings might be due to the fact that their study was conducted in the very early part of pandemic, when perception of danger of COVID-19 was much higher and few techniques of precautions and management had been proven.

Our study detected depressive symptoms in 17% of the HCE group and 15.5% of the LCE group. This difference is not statistically significant. Wang et al., in a survey of 1897 HCWs, reported a difference in depressive symptoms in 20.7% of frontline HCWs as compared to 10.7% of

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### Table 1: Sociodemographic characteristics

| Variables       | Categories | Frequency (%) | \(\chi^2\) | \(P\) |
|-----------------|-----------|---------------|-----------|------|
|                 |           | High exposure (n=200) | Low exposure (n=200) |
| Age             |           |               |           |      |
| 20‑29           |           | 107 (53.5)    | 71 (35.5) | 19.54 | 0.001** |
| 30‑39           |           | 80 (40)       | 93 (46.5) |       |        |
| 40‑49           |           | 12 (6)        | 30 (15)  |       |        |
| >50             |           | 1 (0.5)       | 6 (3)    |       |        |
| Sex             |           |               |           |      |
| Male            |           | 129 (64.5)    | 126 (63) | 0.09  | 0.75   |
| Female          |           | 71 (35.5)     | 74 (37)  |       |        |
| Marital status  |           |               |           |      |
| Married         |           | 102 (51)      | 135 (67.5)| 11.27 | 0.001**|
| Unmarried       |           | 98 (49)       | 65 (32.5)|       |        |
| Education       |           |               |           |      |
| Postgraduate    |           | 38 (19)       | 54 (27)  | 4.47  | 0.12   |
| Graduate        |           | 130 (65)      | 122 (61) |       |        |
| Up to 12        |           | 33 (16.5)     | 24 (12)  |       |        |
| Occupation      |           |               |           |      |
| Doctor          |           | 70 (35)       | 107 (53.5)| 15.48 | 0.001**|
| Nurse           |           | 47 (23.5)     | 26 (13)  |       |        |
| Paramedical staff|        | 83 (41.5)     | 33.5 (33.5)|       |        |
| Years of experience |     |               |           |      |
| 1‑10            |           | 154 (77)      | 121 (60.5)| 22.08 | 0.001**|
| 11‑20           |           | 38 (19)       | 43 (21.5)|       |        |
| >20             |           | 8 (4)         | 36 (18)  |       |        |

**\(P<0.05\) is considered as statistically significant

### Table 2: Unadjusted and adjusted odds ratio

| Characteristic | Categories | n (% | Unadjusted OR (95% CI) | Adjusted OR (95% CI) | \(\chi^2\) | \(P\) |
|---------------|-----------|------|----------------------|----------------------|-----------|------|
| Age           |           |      |                      |                      |           |      |
| 20‑29         |           | 107 (53.5) | 0.99 (0.99‑1)   | 1 (0.9‑1.03)   | 19.54    | 0.001** |
| 30‑39         |           | 80 (40)    | 0.99 (0.96‑1)   | 1 (0.9‑1.03)   |       |      |
| 40‑49         |           | 12 (6)     | 0.99 (0.96‑1)   | 1 (0.9‑1.03)   |       |      |
| >50           |           | 1 (0.5)    | 0.99 (0.96‑1)   | 1 (0.9‑1.03)   |       |      |
| Sex           |           |            |                      |                      |           |      |
| Female        |           | 145 (36.3) | 0.5 (0.3‑0.8)**  | 0.5 (0.3‑0.9)**  | 0.09    | 0.75  |
| Male          |           | 255 (63.7) | Ref                | Ref                | 0.75    | 0.12  |
| Marital status|           |            |                      |                      | 0.09    | 0.75  |
| Married       |           | 102 (51)   | 1.2 (0.7‑2.1)    | 1.2 (0.7‑2.1)    | 11.27   | 0.001**|
| Unmarried     |           | 98 (49)    | 1.2 (0.7‑2.1)    | 1.2 (0.7‑2.1)    |       |      |
| Education     |           |            |                      |                      | 0.09    | 0.75  |
| Postgraduate  |           | 38 (19)    | 1.4 (0.7‑2.6)    | 1.4 (0.7‑2.6)    |       |      |
| Graduate      |           | 130 (65)   | 2.7 (0.6‑11.6)   | 2.7 (0.6‑11.6)   |       |      |
| Experience (years) |     |            |                      |                      | 0.09    | 0.75  |
| 1‑10          |           | 78 (39.5)  | 2.7 (0.6‑11.6)   | 2.7 (0.6‑11.6)   |       |      |
| 11‑20         |           | 43 (20.7)  | 2.7 (0.6‑11.6)   | 2.7 (0.6‑11.6)   |       |      |
| >20           |           | 8 (4)      | 3.0 (1.0‑10)     | 3.0 (1.0‑10)     |       |      |
| Occupation    |           |            |                      |                      | 0.09    | 0.75  |
| Doctor        |           | 70 (35)    | 1.2 (0.7‑2.1)    | 1.2 (0.7‑2.1)    |       |      |
| Nurse         |           | 47 (23.5)  | 2.7 (0.6‑11.6)   | 2.7 (0.6‑11.6)   |       |      |
| Paramedical staff|      | 83 (41.5)  | 2.7 (0.6‑11.6)   | 2.7 (0.6‑11.6)   |       |      |
| Years of experience |     |            |                      |                      | 0.09    | 0.75  |
| 1‑10          |           | 154 (77)   | 2.7 (0.6‑11.6)   | 2.7 (0.6‑11.6)   |       |      |
| 11‑20         |           | 38 (19)    | 2.7 (0.6‑11.6)   | 2.7 (0.6‑11.6)   |       |      |
| >20           |           | 8 (4)      | 3.0 (1.0‑10)     | 3.0 (1.0‑10)     |       |      |

\(\*P<0.05\), \(**P<0.01\), \(***P<0.001\). Interpretation: Female sex has higher score in all the three scales. Doctors and nursing officers also have higher scores in unadjusted OR, however, the effect is not seen when adjusted. Ref – Reference for logistic regression; OR – Odds ratio; CI – Confidence interval; IES-R – Impact of Event Scale-Revised; PHQ-9 – Patient Health Questionnaire-9; GAD-7 – General Anxiety Disorder-7
second-line HCWs. This variation again may be due to the period (January 29 to February 9, 2020, early part of the pandemic) in which the study was conducted. Indian studies have reported prevalence of depressive symptoms among HCWs ranging from 11.4% to 31.4%. Gupta et al. reported that HCWs working at primary care hospitals (screening centers), which has higher COVID exposure owing to larger load of patients, has 1.5 times higher risk of depressive symptoms than HCWs at tertiary care hospitals, which has lesser patient load and thus low COVID exposure. This variation from our findings may be due to their not defining the criteria for HCE and LCE and also it was conducted during the first phase (April 2020) of the pandemic.

This study detected anxiety symptoms in 10.85% among the HCE group and 8% of the LCE group with no significant difference. Wang et al., in a survey in January–February 2020, reported anxiety symptoms in 38.5% of frontline HCWs as compared to 19.8% in second-line HCWs. Indian studies have reported prevalence of anxiety symptoms among HCWs ranging from 17.7% to 37.2%. In a meta-analysis by Singh et al. of five Indian studies on HCWs reported prevalence of anxiety symptoms to be 35.4%. This meta-analysis remarked that inclusion of mild anxiety symptoms leads to reporting of higher anxiety prevalence score. The lower prevalence of anxiety in our study was possibly as it captured the later part of the pandemic, by which time infrastructure, personal protective equipment, etc., were provided and greater understanding of the disease process had been achieved.

Logistic regression analysis was carried out to delineate factors associated with increased odds of stress, depression, and anxiety symptoms. Factors analyzed were age, sex, marital status, COVID exposure (HCE/LCE), education, and occupation. The study revealed that female sex was associated with higher scores for stress, depression, and anxiety. The effect remained significant even after adjusting for other factors. The same was reported by Lai et al. and Gupta et al. This is probably due to burden of additional domestic and other responsibilities shoulder more by women in India. Further, in our study, doctors and nurses also had higher unadjusted odds for stress, depression, and anxiety than paramedics. However, the effect did not remain significant after adjusting for other factors. A similar finding has been reported in previous studies. This indicates that all categories of HCWs reported increased psychological morbidity.

The strength of our study is inclusion of paramedical staff, collation of wide range of probable risk factors and analyzing psychological impact based on level of covid exposure. The limitation of our study was that we studied participants from a government tertiary care hospital where most of the staff were permanently employed with no major financial burden. We did not study participants from private sector, who may have different challenges while caring for COVID patients, affecting their psychological morbidity. Further, we did not study the perceived causes of distress in the HCWs, which may also have implications in planning mental health care for this group. Furthermore, factors perceived as important in reducing stress like resilience were also not studied.

CONCLUSION

HCE and LCE among HCWs led to similar impact in terms of stress, depression, and anxiety. Female HCWs had a higher prevalence of stress, depression, and anxiety. Doctors, nurses, and paramedics had a similar prevalence of stress, depression, and anxiety when odds were adjusted. These findings call for appropriate mental health measures for this vulnerable population. Screening for psychological morbidity and providing appropriate psychological intervention will go a long way in keeping frontline warriors effective and healthy.

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Conflicts of interest
There are no conflicts of interest.

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