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Predictors of Perceived Stress Among Healthcare Workers During COVID-19: A Cross-sectional Study from North India

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Abstract

Background: During current pandemic, health care workers (HCWs), found to be a vulnerable group for experiencing psychological and psychiatric difficulties owing to direct or indirect involvement with COVID-19 patients. This study was organized to measure perceived stress and coping styles among HCWs of a tertiary care hospital in Lucknow, Uttar Pradesh.

Methods: A cross-sectional, online self-reported questionnaire-based study was conducted among HCWs. Cohen's perceived stress scale, and Brief COPE were used. Data were analyzed using descriptive statistics and multiple regression analysis.

Results: A total of 298 HCWs responded; most of them perceived a Moderate Stress (63.8%) followed by Low Stress (24.2%) and high stress (12.1%). In terms of severity of perceived stress and coping styles there were significant differences based on gender, marital status, family type, occupation and work status regarding COVID duties. Age and gender predicted perceived stress. Perceived stress also predicted suicidal thoughts but not mania and psychotic symptoms.

Conclusion: A substantial proportion of HCWs perceive moderate to elevated levels of stress during the pandemic which varies based on their gender, family type, marital status, occupation, and work status. Hence, there is a need for routine screening and interventions for HCWs at an early stage before they perform duties as frontline workers.

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Introduction

Global attention is focused upon the current outbreak of COVID-19 infection. The World Health Organization (WHO) has designated it as a pandemic state on March 11, 2020.[1] To this day, this epidemiological crisis remains one of the most pressing health issues worldwide.[2-4] This rapid upsurge in corona cases

has put an extreme burden on the overall health care system and affected health care workers by increasing workload, risk of getting infected and carrying the infection to their family members and friends.[5] Ongoing uncertainties are emerging about the nature of this virus, its treatment protocols, and preventive measures, which keep the HCW in a continuous pressure of getting updated, trained, and adopt new knowledge and practice measures. Apart from this, they faced hurdles like societal stigma, lack of resources, increasing social and political expectations and demands.[6,7] These have been reported worldwide in general and in India detailing the number of HCWs getting infected and even succumbed to severe illness and death.[8-10] Studies have shown that increasing perceived stress may increase the risk of adverse mental health outcomes like depression, post-traumatic stress disorder, sleep problems, anxiety and other psychopathologies.[10-12] A nationwide survey conducted in India revealed that high level perceived stress is present in 3.7% of the healthcare workers and the prevalence of depressive symptoms in 11.4%, and anxiety symptoms in 17.7% of the healthcare workers that require treatment.[7] Additionally, to find the emotional and cognitive responses of the health care workers to the COVID-19 pandemic and the psychopathology caused by it, it has become imperative to observe and detect individual responses and coping strategies which came up during such stressful time. Till now, the researchers have observed and recorded various stress-related responses among the HCWs which are protective and maladaptive.[13-16] These responses can impact psychological well-being, contributing to unfavorable mental-health outcomes.[17] Also, understanding coping strategies and their relationship with mental health outcomes help develop newer and more adaptive measures to be considered for health care workers.

Henceforth, this study was planned to measure perceived stress and different coping styles, among HCWs of tertiary care university hospital at Lucknow, Uttar Pradesh (India), which was among the largest COVID care facilities in the state. The hospital caters to the COVID-19 patients from Lucknow and adjoining districts and receives referrals from other cities of Uttar Pradesh for severe and complicated cases. This study would help in organizing the appropriate and necessary interventions at the initial stage to prevent the detrimental outcome for the HCWs working in COVID care facilities.

Methods

Study Participants

A total of 304 responses were received during the study period (i.e., 1st June to 31st July 2020). All the doctors (faculty, residents, interns), nurses, ward staff involved in triage, screening at fever clinic and sampling booths, diagnosing, and treating COVID-19 patients in COVID wards and ICUs. Those who were exempted for above duties due to lactation, pregnancy, medical co morbidities and incomplete responses were excluded. Hence, finally, a sample of 298 responses was analyzed in the study. This study was approved by the institutional ethics committee vide reference number IInd ECM COVID-19 IB/P7 dated 18-05-2020.

Study Tools

The questionnaire had five sections, namely, description and informed consent, baseline socio-demographic characteristics (Table 1), Perceived Stress Scale (PSS) and Brief COPE inventory. Data were collected anonymously, with only one response permitted per person. To ensure pandemic-specific answers, the pandemic was explicitly described in informed consent in each section of the questionnaires, and the term "during current COVID-19 pandemic scenario" was applied to each question,where it was required. Further to limit inadvertent participation and to assure relevance about the pandemic situation, two specific questions were asked at the end of the questionnaire;first, whether their responses (stress or coping) were experienced during the said pandemic in the study; second whether or not they experience similar symptoms before the epidemic started. At the end of the questionnaire, a helpline number of the department of psychiatry was provided.

The PSS[18] was used to assess stress levels. It is a metric for determining how stressful those circumstances are in one's life. The questions were

Table 1: Sociodemographic details (N = 298)

Variable		*Frequency (%)*
Age (years)	<25	112 (37.6)
	25–50	168 (56.4)
	>50	18 (6)
Gender	Male	161 (54)
	Female	137 (46)
Occupation	Doctors	205 (68.8)
	Nurses	22 (7.4)
	Others	71 (23.8)
Work	Duty (completed/doing)	79 (26.5)
	Expected duty in future	219 (73.5)
Marital Status	Single	186 (62.4)
	Married	112 (37.6)
Family Type	Nuclear	192 (64.4)
	Joint	106 (35.6)

The mean age of the sample was 31.13 ± 9.06 years.

created to gauge how volatile, uncontrollable, and overburdened respondents' lives are. A variety of straightforward questions about current stress levels are also included on the scale. As an example, the PSS asks about feelings and emotions "over the last month," but in this report," within the current COVID pandemic" was used instead. PSS scores ≥10 have a sensitivity of 88% and a specificity of 88% for major Depression and require treatment.

The Brief COPE[19] is made up of 28 items divided into 14 subscales. Problem-focused coping and emotion-focused coping is split into two primary subscales from the 14 subscales. On a four-point Likert scale, each question was to be answered. Specific scores for each subscale and two primary subscales were calculated by adding the scores on both the items of the subscale separately. High scores on the scale mean that a specific coping mechanism is used more often.

Study Design and Procedure

This was a cross-sectional, online self-reported questionnaire-based study utilizing standardized tools conducted among health care workers of our tertiary care hospital. The Ethics committee approved the research at the university. At the start of the questionnaire, all potential participants provided an online written informed consent form. The link to the online questionnaire was distributed on Google forms via emails and WhatsApp groups, to the target population. A printed quick response code linked with the study was put on the institution's notice board so that HCWs could scan the code and download the desired form to their mobile phones. Each month, a maximum of three reminders were sent to all faculty and authorities in all departments via WhatsApp groups and emails. Participants were required to provide informed consent and information regarding their professional qualification, designation, current job in a specified COVID setup. They were also asked whether they had undergone training for performing duties in a COVID facility, whether they were qualified and expected to do duties in the future, whether they were currently performing duties, whether they had completed duty, or they were in post-duty quarantine. People infected with the coronavirus, and conflicting responses were removed from the study.

Statistical Analysis

Data were exported from Google Forms to Microsoft Excel (Microsoft Corporation, Redmond, Washington, USA, 2016) spreadsheet and coded. Descriptive statistics such as frequency and percentages helped in summarizing the demographic characteristics in case of categorical data and mean and standard deviation (SD) in continuous data. Different categories of perceived stress (mild, moderate, and severe), and Symptoms of DSM-5 (mild/Greater) were compared between genders, workgroups, occupation groups, family types, and marital status by using chi-square analysis.

Test of normality was performed for Sociodemographic data, perceived stress, coping styles and psychopathology by Kolmogorov test which suggested that all the data were not normal and hence on various groups comparisons of mean scores of perceived stress and coping styles were performed using non-parametric tests i.e. comparison of mean scores of each sub domain of brief COPE was performed between doctors, nurses and other ward staffs using Kruskal-Wallis test (between group) and post-hoc analysis (within group). Multiple regression

analysis (MRA) was performed to determine the predictors (age, gender, marital status, family type, occupation, work status and coping styles) of perceived stress and symptoms of DSM-5. The study was approved by the institutional ethic committee. Study data were analyzed using international business machine statistical package for social science software (SPSS) version 21.0 for Windows (IBM Corp., Armonk, New York, USA). The differences between the groups were considered significant if p-values were less than 0.05.

Table 2: Comparison of coping styles between males and females and between doctors, nurses and other wards staffs (Asymptotic significance 2-sided value)

	Gender wise (p values)#	*Occupation wise ##*	*Marital status#*
PSS Scores	0.020	0.101	0.0001
Instrumental Support	0.241	0.338	0.065
Active coping	0.378	0.129	0.510
Acceptance	0.743	0.441	0.749
Self-distraction	0.556	0.285	0.081
Denial	0.549	0.331	0.093
Planning	0.018	0.012*	0.643
Humor	0.133	0.000***	0.011*
Self-blaming	0.676	0.208	0.001*
Emotional support	0.034*	0.295	0.190
Behavioural disengagement	0.117	0.745	0.030*
Venting	0.220	0.001*	<.001**
Positive reframing	0.200	0.020*	0.682
Substance use	0.009*	0.0111	0.62
Religion	0.458	0.233	0.523

p values significant at *0.05, **< 0.001 Kruskal Wallis p value, #P values significant at *0.05, **p < 0.001on Mann-Whitney U test.

Results

Percieved Stress

Sociodemographic details are given in Table 1.Most of the HCWs (56.4%) in the study were 25 to 50 years of age, followed by younger age (37.6%) and least (6%) with people of age more than 50 years.

Based on PSS scores, most of the HCWs perceived a moderate stress (63.8%), followed by those who perceived low stress (24.2%), and least number of HCWs perceived high stress level (12.1%).

'Females' perceived higher stress as compared to 'males' (z = -2.35, mean rank M:F =141.62:165.08, p < 0.05)

Those who were 'single' perceived significantly higher stress as compared to those who were 'married'. (Z = -3.67, mean rank of S:M = 163.73:125.88, p < 0.001)

Coping Styles

In gender wise comparisons, 'Males' were more using denial (M:F = 161.78:141.77; p < 0.05) and substance use (M:F = 161.72:141.84; p < 0.05) while 'females' were more 'seeking emotional support'(M:F = 142.96:163.53; p < 0.05).

There were significant differences in the scores of planning (p < 0.05), Humor (p < 0.001), Venting (p < 0.001) and Positive reframing (p < 0.05) between the different "occupation" groups (Table 2). On post-hoc analysis, 'doctors' were using more 'Humor, Venting and positive reframing' as compared to the nurses and ward staffs both, while 'nurses' were

Table 3: Showing comparisons of coping styles (post hoc analysis) between doctors, nurses and ward staffs

		Mann-Whitney U test (p value)								
		Doctors vs. nurses (mean rank)			*Doctors vs. ward staffs (mean rank)*			*Nurses vs. ward staffs (mean rank)*		
Coping styles	*Kruskal-wallis test (p value)*	*Doctors*	*nurses*	*p value*	*Doctors*	*Wards staff*	*p-value*	*Nurses*	*Wards staff*	*p-value*
Planning	0.012*	109.86	152,61	0.002*	138.21	139.34	0.91	58.95	43.30	0.014*
Humor	0.0001**	118.22	74.68	0.001*	145.71	117.68	0.005*	41.41	48.73	0.121
Venting	0.001*	118.15	75.36	0.002*	145.55	118.15	0.008*	41.41	48.73	0.202
Positive reframing	0.020*	117.17	84.50	0.021*	143.83	123.11	0.051*	42.23	48.48	0.322

The table shows post hoc analysis of only those coping styles where there were significant differences on. Kruskal-Wallis Test. N (doctors) = 205, N (nurses) = 22, N (ward staffs) = 71, * Significant at < 0.05 **Significant at < 0.001

using 'planning' more than the doctors and ward staffs (Table 3).

There was no significant difference found in coping styles between work status of those who were expecting duty in near future as compared to those who were doing or completed duty.

On MRA all the factors significantly predicted the perceived stress. (Good fit $p < 0.001$)

Age was found to be the strongest predictor of perceived stress followed by gender. Marital status, family type, type of occupation and work status did not affect it significantly.

After addition of "problem-focused" coping styles; instrumental support had a significant effect on the perceived stress. Self-blaming, emotional support, and denial in "Emotion-focused" coping styles, had a significant effect on the overall variance (Table 4).

Discussion

In our study, a high stress level was reported only in 12.1% and moderate level of stress is reported by the majority (63.8%) of the participants, which is consistent with the previous study conducted in Karnataka which revealed that 47.6% of the healthcare workers involved in COVID-care experience a moderate level of perceived stress.[21] A nationwide survey conducted in India found that high level perceived stress was present in 3.7% of the healthcare workers.[7] This finding of the present study can be attributed to "younger workforce"

Table 4: Multiple regression analysis, coefficients of each factor for perceived stress

Model	*B*	*LL*	*UL*		*SE B*	*Sig.*	R^2	R^2	*F*
(Constant)	20.444	14.491	26.397		3.024	0.000	0.279	0.227	5.363
Age (in years)	-0.170	-0.283	-0.058	-0.225	0.057	0.003			
Gender	1.963	0.471	3.456	0.143	0.758	0.010			
Occupation	-0.308	-1.253	0.637	-0.038	0.480	0.521			
Work status	-0.225	-1.835	1.385	-0.015	0.818	0.783			
Family type	-0.018	-1.582	1.546	-0.001	0.795	0.982			
Marital status	0.914	-1.227	3.055	0.065	1.088	0.401			
Active coping	-0.803	-1.814	0.208	-0.115	0.513	0.119			
Instrumental support	1.171	0.315	2.028	0.171	0.435	0.008			
Positive reframing	-0.326	-1.216	0.563	-0.050	0.452	0.471			
Planning	-0.372	-1.346	0.601	-0.052	0.494	0.452			
Acceptance	-0.812	-1.746	0.122	-0.118	0.474	0.088			
Self-distraction	0.865	-0.024	1.755	0.131	0.452	0.057			
Behavioural disengagement	0.178	-0.688	1.043	0.026	0.440	0.686			
Denial	1.319	0.242	2.396	0.169	0.547	0.017			
Emotional support	-1.273	-2.180	-0.366	-0.182	0.461	0.006			
Venting	0.897	-0.070	1.865	0.121	0.492	0.069			
Religion	-0.321	-1.074	0.432	-0.052	0.382	0.402			
Substance use	0.248	-0.939	1.434	0.027	0.603	0.681			
Self-blaming	1.325	0.181	2.469	0.152	0.581	0.023			
Humor	-0.744	-1.612	0.124	-0.106	0.441	0.093			

Model = "enter method in SPSS statistics." B= Unstandardized regression coefficients, CL=Confidence interval, LL=lower limit, UL= Upper limit, = Standardized Coefficient, SEB=Standard error of coefficient, R^2= Coefficient of determination, R^2= Adjusted R^2,

*p value Significant at < 0.05, ***p < 0.0001

of residents and the "genders differences" in the study populations, discussed further. Apart from reasons discussed above, other possible factors or perceived stress and mental health symptoms may be geographical variations in the number of COVID-19 cases in India, availability of health infrastructure, facilities provided by the government, and the number of workforces available at the time of the study (i.e., June-August 2020). In our study the perceived stress was comparable between doctors, nurses and other ward staff, and between those who were expecting duty in near future as compared to those who were doing or completed duty and between groups with different family types.

Our study found significant differences ($p < 0.05$) in the stress levels between the genders. This finding is consistent with previous studies reporting higher perceived stress among female HCWs (Table 2). Similarly another Indian study found significant differences in the level of stress between male and female HCWs involved in COVID-care.[22] However, other Indian studies revealed no such difference between males and females.[23,24] High scores of anxiety symptoms in females, smoking in males reported in line with previous research.

Most of the HCWs engaged in COVID care in a tertiary teaching hospital are residents under the supervision of the medical faculties; hence, in our study, most participants were young individuals. In this study, age is found to be the strongest predictor of perceived stress irrespective of their gender, occupation, family type, marital status, work status and coping styles (Table 4, $p < 0.05$), though the gender has significant variance in the overall effect in the study model. This finding is in line with recent studies on HCWs during the pandemic. The predictors of higher perception of anxiety are "younger age", "female gender", "unmarried", and medical co morbidities.[7,25] However, there are some studies which indicate opposite findings as well.[22,26] It has been found that emotional exhaustion is low among HCWs with ages less than 23 years.[24] In another Indian study, it was found that stress among the residents posted in COVID management was low in comparison to the professors posted in the duty.[22] However, in our study stress levels were comparable across all the doctors (resident and faculty).

We found a significantly higher level of stress ($p < 0.001$) among the HCWs who were "single" as compared to married people (Table 2). This data agrees with previous studies during COVID-19 which highlighted that being single was predictive of higher psychological distress and higher anxiety[25] and depressive symptoms[27-29] among hospital staff. On regression analysis marital status did not contribute to the variance of perceived stress and we also could not see differences in coping styles between the genders.[30] It is well known that "marital status" is an important social factor in depression among the adult population and this effect is not pronounced with increasing age.[31,32] Newer research also indicates that marital status is associated with major depression prevalence; however, the strength of association may be modified by age and gender.[33] Specifically in context of COVID-19, a link between marital status and depressive symptoms could also occur due to fear of contracting infection to one's spouse.

During COVID pandemic a study on 300 international students[34] from all over the world revealed that not only rumination and worry had significant negative relationships with mental health but also were the significant predictors for mental health. Furthermore, findings revealed that females had more worries with ruminative thoughts during the COVID-19 pandemic Outbreak. Additionally, we observed that those who were 'single' have reported "greater" scores on sleep problems, suicidal thoughts, and symptoms of compulsion and dissociation which might be secondary to their level of perceived stress with varied use of self-distraction, planning, using substance, seeking emotional support and self-blaming. However, we have also observed the effect of occupation on these mental health symptoms showing different workloads, roles and responsibility sharing during COVID-care.

In the present study, nearly one-third of the participants reported "greater" anxiety and depressive symptoms. Common factors seen for these symptoms are higher perception of stress, and combinations of using active coping, self-blaming, self-distraction, substance use and seeking emotional support. Studies suggest that people use emotion-focused coping and problem-focused coping styles in varied and dynamic ways

to manage their negative affect.[35] In a systematic review, it was reported that coping strategies varied amongst the contrasting sociocultural settings and appeared to differ amongst doctors, nurses and other HCWs. Most of the studies assess coping strategies, such as acceptance, resilience, active coping and positive framing being used to cope with pandemic related stress. Doctors were significantly more likely than nurses and healthcare assistants (HCAs) to use planning as a coping strategy, while nurses were more likely than doctors to use behavioral disengagement, and HCAs were more likely than doctors to use self-distraction.[36] However, in our study there is contrasting significant differences in the coping styles of doctors, nurses, and other healthcare workers. Doctors were using more 'humor, venting and positive reframing' as compared to the nurses and ward staffs both, while 'nurses' were using 'planning' more than the doctors and ward staffs (Tables 2 and 3).

One systematic review and meta-analysis done recently, has observed high prevalence of depressed mood (22.8%), anxiety (23.2%), and insomnia (34.3%) among HCWs during the COVID-19 pandemic. Also, being female and frontline deliveries of their responsibilities seem to be the main factors associated with an enhanced risk of developing these mental disorders.[37] The likelihood of HCWs developing psychotic symptoms as a result of the psychological distress owing to pandemic has been found in few studies.[38] However, its severe nature and high risk pathology requires researcher's attention. The low effect of perceived stress of COVID pandemic indicates higher chances of pre-existing (biological) vulnerabilities than the contextual factors in causation of severe mental illness.[39]

The present study's findings indicated that HCWs with higher perceived stress reported more use of instrumental support, denial, self-blaming, behavioral disengagement, venting, and substance use more significantly, whereas significantly lesser use of coping strategies like positive reframing and acceptance. The study also found that self-distraction, self-blaming, emotional support, and denial had significantly predicted high stress among HCWs. Evidence supports that Depression and anxiety are seen among people who were unsure about coping and had difficulty coping.[40] Healthcare Workers use many ways to combat the stress they encounter during COVID-care. A study among US healthcare workers revealed that exercise and physical activity are the most common coping behavior.[37] Similarly, an increased sense of meaning and finding a purpose(positive reframing) in life has been reported in many healthcare workers, which help them cope during the COVID-19 pandemic.[37] Exercise was observed to be the most generally used coping strategy (59%) in 657 American HCWs, and access to the individual therapist with online self-guided counseling (33%) generated the most interest.[37] Support from supervisors and colleagues was found to be a significant negative predictor for psychiatric symptoms and PTSD.[41] There was not much difference in the coping styles between male and female HCWs in our study and between the HCWs with different work status.

In a factor analysis of the psychological impact of COVID-19 among HCWs, it was found that doctors experience the highest level of anxiety among the healthcare professionals.[25] A meta analysis found that nurses involved in COVID-care commonly experience mental health issues like sleep disturbances, anxiety, depression, stress, and post-traumatic stress disorder.[42] Factors like female gender, poor resilience, low social support, and those having symptoms of COVID-19 were found to be predictive of such findings.[42] In our study, people who belonged to "nuclear families" reported greater somatic symptoms and substance use than those who belong to joint families. These findings suggest the role of family and being married as a "support system" causing "better coping" and resilience and lesser manifestation of mental health symptoms.[42]

Strengths and Limitations

Although, during the pandemic limitations, anonymous self-reported data collection gives more reliable results, we collected the data using standard and structured questionnaires. The study has a good sample and provides a reflection about the level of stress, coping styles and psychological symptoms of HCWs. Still, our study has a few limitations.

- The study is limited to the HCWs of a single institute. The resources, infrastructures and workload of institutes involved in COVID-care

vary across the country, which may contribute to differential perception of psychological disturbances. Hence, the study findings cannot be generalized to another setting/region/ or whole of India.

- By the very nature of the study and other practical limitations, randomization in the sample collection could not be done. The findings of this study should be considered in this light that it was a self-report survey not a clinical evaluation.

Summary

Given the high reports of severe to moderate levels of perceived stress, in combination with maladaptive coping style may put HCWs at higher risk of developing various psychopathologies like depression, anxiety, somatic symptoms, sleep problems commonly and even the risk of psychotic symptoms. Hence the HCWs or supposed to be work as frontline workers, should be screened for psychopathologies and timely psychological interventions should be planned, which may be provided via telemedicine.[43] Also, there should be adequate training in techniques for reducing stress, using healthy coping styles to prevent serious psychopathologies. Furthermore, multicentric studies and longitudinal studies are needed to look for development of serious psychopathologies in high-risk population of health care workers.

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