Impact of COVID-19 Pandemic on Mental Health of Health Care Workers and Its Determining Factors: A Systematic Review

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ABSTRACT

Background: Since the outbreak of COVID-19, the global pandemic has taken a toll on the mental well-being of people around the world, especially health care workers. Health care workers have a heavy work burden and are compelled to isolate themselves. Their mental health has worsened with increased symptoms of anxiety and depression affecting their quality of life. This review aims to identify the magnitude of psychological distress in health care workers and their major contributing factors during the COVID-19 pandemic for strengthening their mental health in the present and upcoming pandemics.

Methods: The search databases such as ScienceDirect, Embase, Cochrane Library, PubMed, and Google scholar were used for finding favorable studies. The search was conducted until 16th May 2020, and articles from 1st February 2020 to 20th April 2021 were included in the review.

Results: A total of 2879 articles were identified and 18 studies were selected for the review. The psychological impact in the studies-anxiety and depression were prevalent in range from 10-90 percentage of total participants. Insomnia and stress were also commonly reported with maximum prevalence of 98.5% of total participants. These impacts were often associated with nursing profession and females, further aggravated by inadequate personal protective equipment, stigmatization and self-isolation.

Conclusion: Various mediators such as female gender, young adulthood, comorbidity, nursing profession, previous history of mental illness, stigmatization, and employment in high risk areas, heavy workload, and poor infection control practices are major contributing factors for poor mental outcome in health care workers during COVID-19 pandemic. This raises the necessity of consideration of psychological health of health care workers and its promotion through supportive work environment, psychological preparedness and material adequacy.

Keywords: COVID-19, mental health, psychological disorders, health care workers, depression, anxiety

BACKGROUND

COVID-19 is a condition caused by SARS-CoV-2 which mainly infects lung tissues and ultimately leads to acute respiratory distress syndrome (ARDS).[1] Since it's outbreak from Wuhan in 2019, it has emerged as a major concern for people and has been declared a global pandemic by the World Health Organization (WHO).[2] Based on a review, the prevalence of Covid-19 infection in clinical workforce varied from 0.4% in Spain to 57.06% in New York City.[3] With new variants of viruses B.1.1.7 and B.1.617 sub lineages detected, there has been a rapid surge in new reported cases and deaths in countries like Brazil, India and United States referred to as second wave.[4,5] In the first wave, the virus mainly affected people of old age or the ones with co-morbidities but the second wave has been a major hit for young adults.[4,5] New variants are believed to be more transmissible resulting in resurgence of COVID-19 cases around the world.[4]

Mental health has been a topic of concern ever since the pandemic has flared up attacking almost every country out there. Stress, anxiety and depression have become a major challenge to psychiatrists and psychologists. People with depression experience extreme sadness, hopelessness, helplessness, insomnia and in severe cases, harbor suicidal ideation. According to WHO, major depression is the most deadly cause for disability around the world.[6] Depression is often associated with anxiety where a person feels restless and has palpitations when triggered. These conditions affect the logical thinking, decision capacity and concentration of affected individuals according to Diagnostic and Statistical Manual of Mental Disorders-V (DSM-V) criteria.

The pandemic within a short period of time forced countries to undergo lockdown, resulted in the downfall of national economy and posed a threat towards survival of people with widespread mental pressure. Physical distancing, inadequate safety equipment and loss of income have further subjected families to mental exhaustion. With rapid transmission and limited health facilities, mental tension has risen among policy makers and citizens, mainly health care professionals. According to a study conducted in Pakistan, work stress was highest among nurses with highest score of anxiety and depression followed by bankers before pandemic.[7] Especially in this pandemic where crisis management has fallen completely over the shoulders of health care workers (HCWs), heavy workload has further exposed them to stress, anxiety and depression.

Frontline health care workers are involved in direct care and treatment of patients infected with the virus. Thus, they are at major risk for infection. Working hours have been extended and some are deployed to COVID care units or community centers. Being away from family working in high risk areas with heavy workload has affected their sleep pattern and predisposed them to increased stress level.[8] Those without enough experience tackling the pandemic and special infection control training seemed to have higher degrees of anxiety.[9] Unavailability of adequate personal protective devices (PPE) and proper infection control policy in hospitals are also major stressors.[10]

Hospitals have adopted safety measures such as provision of PPE and incentives , infection control special training for staffs and quarantine facilities have been provided to HCWs to contain the virus. Mentally and physically able medical personnel can make effective decisions providing optimum level of quality care. Various measures are to be carried out for maintaining the mental health of health professionals ensuring better clinical performance and response to emergency situations. This review aims to study the impacts of COVID-19 pandemic over psychological status of frontline health care workers and the determining factors infuriating such conditions to help provide an overview for formulation of hospital policies on national level targeted towards improving mental health of physicians and nurses as the second wave has been overwhelming for most of the countries around the world.

METHODS

Study protocol: Systematic review was conducted based on the Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) guidelines[11]. According to the guidelines, the reference list was checked manually first to optimize the comprehensiveness of the study and duplicate studies among different databases were removed. A list of remaining references were put together to guide the study. In the first stage screening, studies were thoroughly examined according to titles and abstract using Microsoft Excel 2013 (windows version) and irrelevant studies were removed. In second stage eligibility evaluation, full text of the remaining articles were examined manually and based on inclusion/ exclusion criteria, further studies were filtered. References of the included articles were also searched manually. In case of partial information regarding these studies, we mailed the corresponding author and extracted relevant information. (Figure 1).

Search strategy: Search for relevant studies was conducted through search databases such as ScienceDirect, Embase, Cochrane library, PubMed, and Google scholar. The search went on until 16th May, 2020 with no lower time limit and articles from 1st February 2020 to 20th April 2021 were chiefly among the databases. The keywords mainly composed of "health care workers", "frontline health care workers", "medical personnel", "nurses", "physicians", "COVID-19", "mental health", "mental issues", "sleep disturbances", "stress", "depression", "anxiety", "psychological disorders" and Boolean operators such as "and" "or" connectors were used while undergoing review of literature through above databases. **Inclusion criteria**

- Studies conducted in health care workers involved in care of Covid-19 infected patients
- Studies identifying the prevalence of sleep disturbances, stress level, anxiety and depression in health care workers

- Studies investigating various determinants of psychological state using quantitative outcomes
- Studies with diagnostic criteria SDS, SRQ, SAS, DASS-21, ISI, CAS, PHQ-4, HAD, AIS, PHQ-9, GAD-7, PSS-10 and EASE scale for assessment of mental status
- Cross sectional and longitudinal studies
- Online or hospital based surveys

Exclusion criteria

- Studies conducted in general population or other occupational groups
- Case studies, case reports, case control studies, cohort studies, review papers, interventional studies
- Articles in languages other than English.

Data extraction: Two authors (NB and SS) extracted the data from the included studies and the studies and were recorded as follows:

Name of author, year of publication, type of study, site of study, study population, sample size, diagnostic criteria, demographic data, and prevalence of mental health issues along with their mean values, and determinants of mental health. Extracted data was checked by another author (BSP) and disagreement was resolved by discussion with other authors (BSP and SKS) by consensus.

Data synthesis and analysis: Data were summarized using descriptive statistics. We used means for continuous variables, and frequencies and percentages for dichotomous variables.

Quality assessment: Two reviewers (NB and SS) independently judged the methodological quality of studies included in the systematic review using a modified version of the "NIH tools for observational and cross sectional studies[12]" Quality of studies was evaluated in fourteen different domains: research question, study population, groups recruited from the same population and uniform eligibility criteria , sample size justification, exposure assessed prior

to outcome measurement, sufficient timeframe to see an effect, different levels of the exposure of interest, exposure measures and assessment, repeated exposure assessment, outcome measures, blinding of outcome assessors, follow-up rate, and statistical analyses. According to the total number of points assigned, each study was judged to be good, fair, or poor quality. Any discrepancies concerning the author's judgments were referred to a third reviewer (RTC) and resolved by consensus.

Fig 1: PRISMA flowchart of study selection
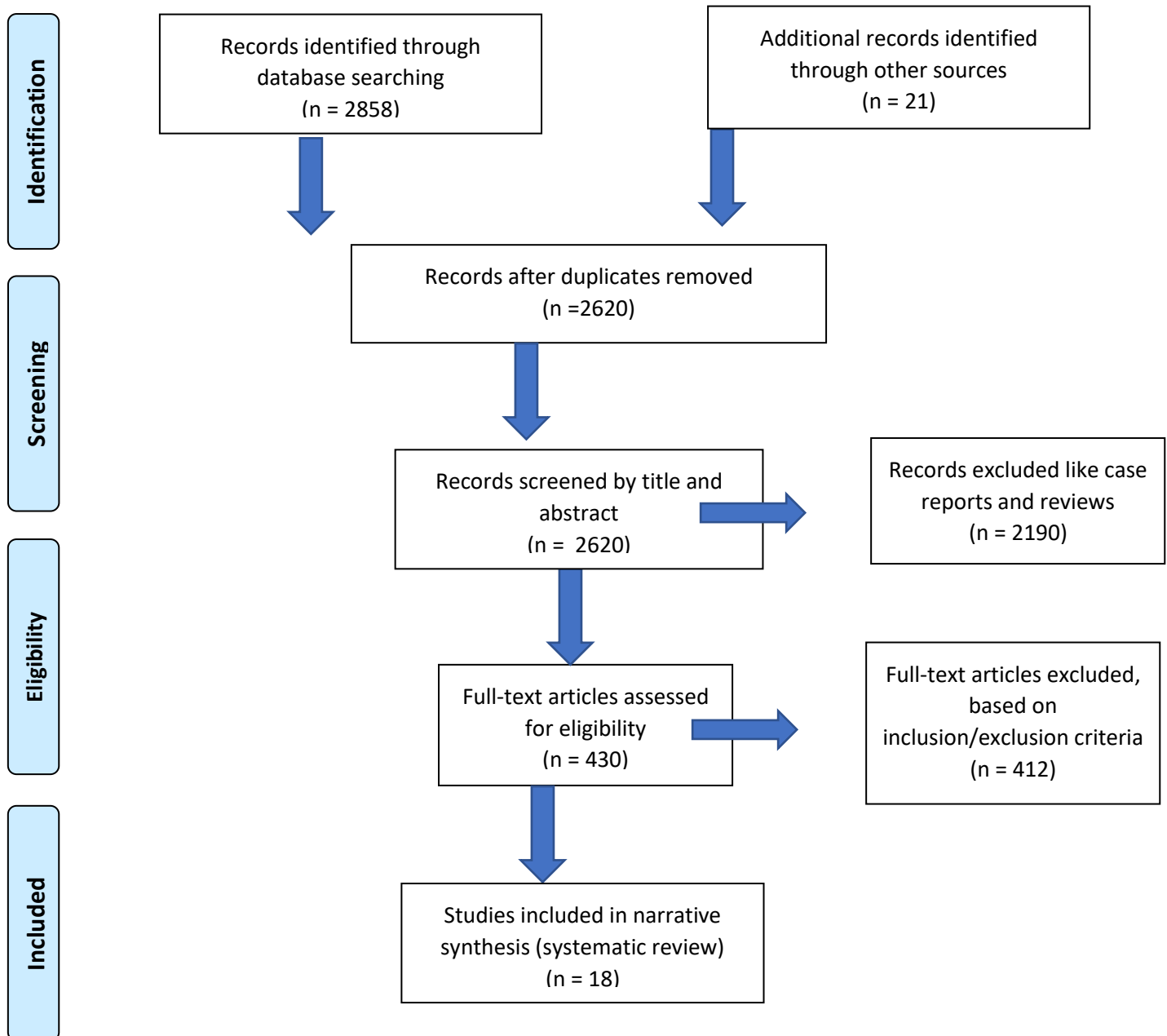
RESULTS

Study selection

At the identification stage, 2858 of articles were identified through various search databases such as ScienceDirect, Embase, Cochrane library, PubMed, and Google scholar and transferred into the EndNote bibliography management software. Another 21 studies were included following the examination of list of sources and gray literature. 259 duplicate articles among a total of 2879 studies were found and removed. In the screening stage, the remaining 2620 articles were examined by title and abstract and 2190 articles were removed. In the eligibility evaluation stage, 430 articles were evaluated based on full text and inclusion/exclusion criteria and 18 studies were finalized to include in systematic review. The process is shown in detail through figure 1.

Characteristics of included studies

All of the included studies were cross-sectional studies except one longitudinal study.[13–21] Most of these studies were based on self-reporting questions except one study by Ranier J. which collected information on mental status of nurses through mental screening.[13–21] Data had been collected online through survey questionnaires distributed as Google forms.[13–17,19] However two studies were hospital based surveys.[20,21] All the studies included health care workers over 18 years of age. 12 studies were conducted among clinical and administrative health care workers collectively, two in only physicians and nurses and one in physicians, general

practitioners, nurses and neurosurgeons respectively. Prevalence of sleep disturbances was studied in six, stress in seven, anxiety was studied in 13 studies and depression in 15 studies. [13–21] Assessment of insomnia was done in the studies through ISI and AIS.[9,15,18,22,23] Scales such as GAD-7, CAS and SAS were commonly used for assessing anxiety levels whereas PHQ-9, SAS, SDS were used in studies to assess depression.[17–19,21–23] HAD scale and PHQ-4 were also used in few studies to assess anxiety and depression subsequently.[24] DASS-21 and EASE scale measured stress level, anxiety and depression collectively.[14,20,25,26] The average score was 10.05 as assessed by NIH quality assessment scale suggesting of good quality.

Impact of COVID-19 pandemic on psychology of health professionals

The selected studies showed that health care workers are constantly subjected to stressors such as workload, inadequate personal protective equipment (PPE) and death of their patients.[8,10] With the extension of physical isolation and inability to contain the virus, health professionals are at the verge of mental and physical exhaustion. Mental exhaustion is exhibited in forms of stress and anxiety. Many health care workers (HCWs) have shown signs of depression with alteration in sleep patterns as well. A study conducted in tertiary health care centers of Nepal showed that 33.9% of total participants had sleep disturbances whereas 41.9% of them showed anxiety symptoms.[27] The magnitude of psychological deterioration of health workforce is elaborated in table 1.

Table 1: Prevalence of psychological disorders in health professionals

First autho, year	Method of sample collection	Country	Profession	Age	Sample size	Assessment	Prevalence in percentage (%)			
							Insomnia	Stress	Anxiety	Depression
Aly HM, 2021	Cross-sectional online-based study	Egypt	Physicians and nurses	33.4±5.9	316	PSS-10 GAD-7 PHQ-9	_	98.5	90.5 Severe in 18.5	80 Severe in 14
Alenko A.,2021	Cross-sectional online-based study	Ethiopia	Health care workers	31.3 ±4.80	277	CAS PHQ-9	_	_	20.2	28.9 Severe in 7.6
Abu-Elenin MM., 2021	Cross-sectional online-based study	Egypt	Physicians	38.2 ± 6.2	237	GAD-7 PHQ-9	_	_	78.9	43.8
Ranieri J., 2021	Longitudinal study based on mental screening by clinical psychologists.	Italy	Nurses	37.3 ± 10.3	69	DASS-21	_	_	77.3 (March) 100 (September)	_
Collantoni E., 2021	Cross-sectional online-based study	Italy	Health care workers	20-50	996	GAD-7 PHQ-9 ISI	42.6 severe in 3.4	_	59.9 Severe in 9.7	42.3 severe in 3.7
Chew N W.S., 2020	Cross-sectional study	Singapore and India	Health care workers	29	906	DASS-21	_	5.2	15.7	10.6
Parthasarathy R., 2021	Cross-sectional study	India	Health care workers	36± 8.3	3083	PHQ-4	_	_	23.9	20
Amerio A., 2020	Cross-sectional online-based study	Italy	General practitioners	52.31 ± 12.24	131	GAD-7 PHQ-9 ISI	_	_	_	22.9
Khanal P., 2020	Cross-sectional online-based study	Nepal	Health care workers	28.20 ±5.80	475	ISI: 0–28 HADS: 0–21	33.9	_	41.9	37.5
Que J., 2020	Cross-sectional online-based study	China	Health care workers	33.69±7.44	2285	GAD-7 PHQ-9 ISI	28.75	_	46.04	44.37
Sharma V.,2020	Cross-sectional study	Singapore	Health care workers	31	470	DASS-21	_	6.6	14.5	8.9
Xiao X., 2020	Cross-sectional online based study	China	Health care workers	_	958	PSS-14 HAD scale	_	55.1	54.1	57.3
Weilenmann S.,2021	Cross-sectional online based study	Switzerland	Health care workers	34	1406	GAD-7 PHQ-9	_	_	25.9	20.6
Abdulah DM.,2020	Cross-sectional online based study	Iraq	Health care workers	35.06±7.61	268	AIS	68.3	93.7	_	_
Sharif S., 2020	Cross-sectional	Asia	Neurosurgeons	_	375	SRQ-20	25	_	_	13.9

	online based study									
Zhu J., 2020	cross-sectional online study	China	Doctors	34.16 ± 8.06	79	SAS SDS	_	_	11.4	45.6
Zhu J., 2020	cross-sectional online study	China	Nurses	34.16 ± 8.06	86	SAS SDS	_	_	27.9	43
Mira JJ., 2020	cross-sectional online study	Spain	Health care workers	_	685	EASE scale	_	4.5	_	_
Zhang C., 2020	cross-sectional online study	China	Health care workers	_	1563	ISI GAD-7 PHQ-9	36.1	73.4	44.7	50.7

PSS: Perceived Stress Scale	SAS: Self rating anxiety scale
GAD-7: Generalized Anxiety Disorder 7-item questionnaire	CAS: Corona virus anxiety scale
PHQ-9: Patient Health Questionnaire 9-item	SRQ: Self reporting questionnaire
PHQ-4: Patient Health Questionnaire 4-item	EASE scale: Examination of anomalous self-experience
ISI: Insomnia severity index	HAD scale: Hospital anxiety/ depression scale
AIS: Athens Insomnia Scale	DASS-21: Depression anxiety stress scale-21
SDS: Self rating depression scal	

Determining factors

Table 2 highlights various factors that have affected mental health of HCWs. These provide an overview on socio-demographic, psychological as well as occupational factors responsible for the degradation of mental health in HCWs and the measures to control them. These determinants have been elaborated below.

Socio-demographic determinants

Socio-demographic factors include determinants such as age, gender, educational status, profession, job experience, marital status, offspring, exercise and comorbidity.

Age: Young adults were considered to be at risk in most of the studies.[9,19,20] One of the study yielded a result where anxiety was more common in HCWs of age 30-36 years and another study found that insomnia was more common in the age group 18-25 years.[15,28] However, a few studies pointed out that older HCWs were most affected by the pandemic psychologically.[21,27,29]

Gender: Most studies pointed out that female HCWs were more likely to develop stress, anxiety and depression during pandemic.[8,21,22,24] One study revealed that female HCWs were more associated with insomnia.[9]

Educational status: HCWs with low educational level seemed to be affected by insomnia whereas one study showed that HCWs with higher education were most affected by anxiety in comparison to those with diplomas.[15,28]

Profession: Most studies showed that frontline workers who worked in direct contact with infected individuals were more likely to develop anxiety, depression and insomnia.[8,9,22] Frontline workers had higher anxiety and depression levels than the administrative staff.[8,21] With exception, one study showed severe anxiety symptoms in non-medical staffs compared to clinical staffs.[26] Nurses were more likely to be affected by anxiety, depression as well as post-traumatic stress disorder (PTSD) symptoms than physicians.[8,13–15,18,22]

Job experience: Our study pointed out that physicians with less experience were more associated with insomnia whereas one study showed that HCWs with work experience of

more than 5 years were mostly affected by insomnia.[9,27]

Marital status: Married HCWs were more likely to be associated with anxiety and depression.[24,28] On the other hand, few studies noted that unmarried HCWs perceived elevated anxiety symptoms.[20,21] One study showed that married HCWs had higher stress levels while single HCWs had higher anxiety scores.[19]

Offspring: In our study, physicians with children were more likely to develop anxiety.[17] Also, HCWs living with school-age children or elderly parents had greater score for anxiety.[22] One study recorded greater value of anxiety in HCWs with pregnancy.[24]

Exercise: Exercise is regarded as a mood enhancer which helps to reduce stress and promote sleep. HCWs with sedentary lifestyle were associated with elevated levels of stress and anxiety.[18,21]

Co-morbidity: Pre-existing comorbidity complicates COVID-19 infection and also limits the performance of clinical staff. Thus, HCWs with pre-existing comorbidities were at major risk for anxiety and depression.[29]

Occupational determinants

Occupational determinants revolve around the factors that are controlled by employer or hospitals such as high risk areas, contact with infected individuals, work environment, infection control measures, workload, quarantine and incentives.

High risk areas: A study showed that 41% of the physicians working at isolation centers had been a victim of social stigmatization which was a major factor for stress and anxiety.[17] Our study showed that HCWs working in isolation units or COVID-19 special units had fears of getting infected or infecting others.[8,15,22] Also, they showed sleep disturbances with higher score of anxiety, depression and PTSD symptoms whereas one

study showed that physicians working in teaching hospitals were more affected by anxiety than those working at isolation hospitals.[17] HCWs deployed in areas with high death toll yielded greater anxiety level.[14]

Contact with infected: HCWs working in contact with infected or suspected individuals were more prone to develop stress and anxiety.[8,15,24] Also, our study showed that HCWs who had been infected before or had colleagues with infection had higher values of stress, depression and insomnia.[9,22]

Work environment: Our study highlighted support from colleagues and supportive work environment as positive reinforcements for mental wellbeing of nurses.[22] Good support from employer and availability of required infection control equipment perceived by HCWs was also considered a protective factor.[8]

Infection control measures: Most studies regarded inadequate PPEs and inadequate infection control measures as a major factor for anxiety and depression in HCWs.[15,16,21,23,27] They also discussed training on management of PPEs and infection control as most important protective factor in prevention of psychological distress.[15,16] Regular update on information about pandemic and its management could be a major protective factor.[16]

Workload: A study yielded a result that 40.7% of total HCWs worked overtime.[8] Physicians working overtime were linked with disturbed sleep, anxiety and depression.[27] This review shows excessive workload during pandemic as a risk factor for anxiety and depression.[21]

Quarantine: HCWs are kept in isolation away from their homes to contain the virus and prevent its transmission to family members. They don't have a supportive family beside them nor can they communicate their emotions effectively. Most of the studies

showed quarantine or self-isolation as a risk factor for depression and insomnia.[16,21]

Incentives: One study revealed that HCWs with inadequate governmental incentives during the pandemic had higher anxiety levels.[27]

Psychological determinants

Psychological determinants include factors such as support system, information of COVID-19, history of mental illness, recreation, stigma and other mediators responsible for predisposition to mental distress.

Support system: Anxiety was aggravated by lack of family support in the phase of pandemic.[16,17] HCWs were concerned about infecting their family members especially children and elderly parents which further subjected them to stress and anxiety.[14,16]

Information of COVID-19: Negative information surfing on internet regarding the pandemic was a major stressor for health workforce.[18] Regular update on information regarding COVID-19 and its management could help to reduce stress and anxiety in frontline workers.[16]

History of mental illness: HCWs with history of anxiety or depression were more vulnerable to psychological deterioration and HCWs with previous psychologist visit were more associated with mental health issues.[13,21] Medical personals with history of medication for psychological disorders were at risk for anxiety, depression and insomnia.[27]

Recreation: No leisure activity had aggravated anxiety and depression in HCWs.[21] Disturbed social life also mediated mental health issues in clinical health workers.[17]

Stigma: A study pointed out that about 41% of total participants had been a victim of social stigmatization especially those working in isolation centers.[17] Social stigmatization towards frontline workers working with infected individuals was a major determinant for stress and anxiety.[17,27]

Interrelation between various mental issues: A study conducted in Italy revealed that 65.5% of HCWs suffered from PTSD.[22] Physicians with PTSD were more associated with anxiety and depression.[22] Also, HCWs with depression were more prone to develop anxiety and insomnia and HCWs with anxiety were more likely to suffer from insomnia.[9,16,23] Our study also showed that physicians with insomnia had higher scores of anxiety and depression showing interrelation between these mental issues.[9]

Coping skills: Psychological preparedness was a major protective factor for anxiety and depression in our study.[17] Coping abilities were more commendable in physicians and HCWs working in COVID-19 wards who were later shifted to other wards.[22] This was a protective factor for physicians against anxiety.

Table 2: Determining factors

First author, year of publication	Socio-demographic factors	Psychological factors	Occupational factors	Mean value
Aly HM, 2021	Female, HCWs over 30 years Married HCWs had high stress level while single HCWs had higher anxiety score.	87% of HCWs suffered from all three stress, anxiety and depression while 3.5% of HCWs had at least one of them.	N/A	PSS-10: 22.1±3.9 GAD-7: 10.3±4.7 PHQ-9: 12.6±5.8
Abu-Elenin MM., 2021	Physicians with offspring	Family support as protective factor. Sleep quality and psychological preparedness as protective factor. Lack of professional degree, affected social life and stigma towards physicians	About 41% of physicians faced social stigmatization. Material preparedness as protective factor. Physicians working at teaching hospitals	GAD-7 scale Total: 9.8 ± 4.7 Tertiary hospitals : 10.25 ± 5.4 Isolation centers: 9.4 ± 5.2 PHQ-9 scale Total: 10.4 ± 3.6 Tertiary hospitals: 10.4 ± 3.5 Isolation centers: 10.5 ± 3.9
Alenko A.,2021	HCWs of age 30–36 year and married HCWs. HCWs with higher education.	HCWs with depression were 7 times more likely to develop anxiety related to COVID-19.	N/A	N/A
Ranieri J., 2021	Younger nurses Unmarried nurses	52.6% of total nurses showed PTSD.	N/A	N/A
Chew N W.S., 2020	HCWs older in age and with pre-existing comorbidities	7.4% HCWs had PTSD symptoms. Anxiety as risk factor for depression.	N/A	DASS-21 Depression: 3.08 ± 4.86 Anxiety: 3.21± 4.29 Stress: 4.62 ±5.54
Collantoni E., 2021	Female HCWs. Nurses Living with school-aged children and elderly people	65.5% of HCWs had PTSD. Coping abilities were more commendable in physicians and HCWs working in COVID-19 wards.	HCWs working in a COVID-19 unit Nurses were less satisfied with work environment and support from colleagues. HCWs with COVID-19 infection or a colleague with infection.	GAD-7 Physicians: 5.35 ± 4.50 Nurses: 7.27 ± 5.50 PHQ-9 Physicians: 4.00 ± 3.94 Nurses: 5.43 ± 4.81 ISI Physicians: 6.49 ± 5.37 Nurses: 8.29 ± 6.54

Parthasarathy R., 2021	Frontline HCWs Older age, sedentary lifestyle, females, unmarried HCWs	Fear of infection or infecting their family members HCWs with depression and history of previous psychologist visit No leisure period	Excessive workload, inadequate PPE, inadequate training and quarantine	N/A
Khanal P., 2020	Nurses HCWs of older age and those not familiar with governmental incentives Work experience of more than 5 years	Stigma faced by health workers History of medication for psychological disorders	Inadequate PPE or infection control measures HCWS working overtime Inadequate incentive	N/A
Sharma V., 2020	Non-medical HCWs	7.7% of HCWs had PTSD.	Inadequate training on infection control measures Inadequate PPEs	DASS-21 Depression Non-medical HCWs: 3.24 ± 5.07 Medical HCWs: 2.54 ± 5.23 Stress Non-medical HCWs: 6.10 ± 5.95 Medical HCWs: 3.82 ± 5.74 Anxiety Non-medical HCWs: 3.57 ± 3.91 Medical HCWs: 2.45 ± 4.28
Weilenmann S., 2021	Female, nurses and frontline workers	N/A	40.7% of HCWs work overtime. Good support from employer and availability of required infection control equipment as protective factor. HCWs exposed to infected patients and working in isolation units	GAD-7 :6 PHQ-9 :5
Xiao X., 2020	Female, married HCWs, pregnancy and nurse	N/A	60.8% of HCWs were unsatisfied with PPE Contact with infected	PSS score: 28 HAD scale- Anxiety: 8 Depression:9

Amerio A., 2020	N/A	HCWs with depressive symptoms	Inadequate PPE	ISI: 6.39 ± 5.11 GAD-7: 6.84 ± 5.30 PHQ-9: 6.16 ± 5.22
Que J., 2020	Frontline workers, nurses Lack of exercise	Lack of support from friends and family Negative information about pandemic	N/A	N/A
Zhu J., 2020	Being female , Nurses	History of anxiety or depression	N/A	N/A
Zhang C., 2020	Female, 18-25 age group, Low educational level than high school Nurses	Insomnia	Previously infected or been in contact with infected people HCWs working in isolation unit or living with colleagues Lack of infection control training and inadequate PPEs	N/A
Mira JJ., 2020	Nurses	Fear of infecting family member	HCWs working in high risk areas	EASE scale: 11.1 ± 6.7
Sharif S., 2020	N/A	Concerns about infecting their family members Insomnia and lack of support from families HCWs with depression had reduced decision making ability with suicidal ideation in 5%.	Quarantine or self-isolation, inadequate PPE and exposure to infection Increased workload Training courses and information about pandemic were protective factors.	N/A
Abdulah DM., 2020	Female physicians or younger physicians	Stressed physicians were sufferers of insomnia.	Physicians dealing with infected cases	Sleep score: 8.43 ± 4.82 Stress score: 4.20 ± 2.46

HCWs: Health care workers, PTSD: Post-traumatic stress disorder, N/A: Not available

PPE: Personal protective equipment

DISCUSSION

We reviewed 18 studies from different regions of the world affected by COVID-19 pandemic to identify the mediators exacerbating the mental burden in HCWs serving at health care centers. We found out that HCWs have become vulnerable with mental stress building within themselves due to unknown disease characteristics, rapid surge in cases and infection among colleagues.[4,5] Mental health outcome is even more influenced by physical burden, ineffective preventive

measures, separation from family and isolation. The health care workers employed at severely impacted areas exhibited elevated forms of psychological distress, including elevated anxiety or depressive symptoms.[14]

Majority of the studies supported the finding that frontline workers working in high risk areas treating individuals infected with COVID-19 are at major risk for anxiety and depression. Physicians employed at isolation centers have poor mental health outcomes than those working in general wards.[8,15,22] A systematic review and meta-analysis showed prevalence of depression in frontline workers about 53% and in non-frontline workers about 38% whereas one study included in our review showed non-medical health workers had severe anxiety symptoms than clinical health workers.[26,30] This is probably due to lack of attention and special training on prevention measures for non-frontline workers. Ineffective infection control measures, inadequate PPE, neglected work environment and lack of appreciation from employer are some of major mediators for poor mental health and disturbed quality of life. This finding is consistent with previous research where HCWs demonstrated higher anxiety levels with poor disinfection practices and unmet needs for PPEs such as masks and eye protection.[10] Adequate availability of PPEs are necessary for protection against infection as clinical workers are exposed to infected individuals repeatedly. This also ensures a sense of confidence and dedication in HCWs for providing quality of care to patients.

Individuals with comorbidities have shown severe form of infection and more often, this infection has resulted in death of the patients.[4] Thus, these individuals are at verge of nervous breakdown during this pandemic. Our study has also demonstrated comorbidity as major contributing factor for psychological burden. This finding is comparable to an article where individuals with pre-existing medical condition such as cardiovascular diseases are at major risk for depression and anxiety.[31] A wide range of studies regarded young adult age group as most vulnerable age group while some of the studies revealed that anxiety attacks HCWs of older age predominantly.[19,20,27,29] Coping abilities were much stronger in physicians which may explain the finding that nursing is the most commonly affected profession in our study. The magnitude of anxiety in doctors (28%) was lower than in nurses (34%) as shown in a previously conducted meta-analysis.[30]

Anxiety and depression is more pronounced in low income countries like Pakistan (85.7% and 72.3%) than in United States of America (38%).[32,33] High income countries had taken adequate steps in response to the pandemic such as distribution of PPEs, maintenance of intensive care units and special trainings for infection control. This has significantly reduced mental burden in HCWs.[32] In addition to this, psychological distress was further aggravated by compulsion of quarantine for frontline workers and boycott of HCWs working in isolation units by society.[17,27] Similar findings was seen in a review which reported quarantine as a predisposing factor for depression.[34] Being away from your loved ones induced loneliness in HCWs. They have lost their sense of security and social support putting them at risk of psychological instability. HCWs with depression had reduced decision making ability with suicidal ideation in about 5% of HCWs.[16] This study also shows that mental health issues are often associated with one another. HCWs with depression were more likely to be sleepless whereas a person with anxiety is nine times more likely to be affected by depression.[31]

Recommendations: Based on our review, we have come up with few recommendations such as specialized trainings, discussion forums and psychological preparedness that

may be helpful to protect and promote psychological health of HCWs in present or future outbreaks. These recommendations may be quite useful to modify the existing policies of governmental and private hospitals.

a. Provision of adequate infection control measures such as PPEs, correct disinfection practices and isolation centers for suspected or infected individuals.
b. Proper training on infection control, management of PPE and its disposal and response to emergency conditions.
c. Fully equipped quarantine facilities nearby hospitals with lockers and personal bathroom.
d. Support groups or discussion forums may be formed where one can express their fears and anxiety with no prejudice whatsoever, reducing feeling of loneliness.
e. Special care to risk groups such as females, nurses, ones with less experience or low educational level, previous history of mental illness, comorbidity.
f. Seniors should be motivating, approachable and supportive. Coordination and mutual respect between various professions and spirit of teamwork is also important.
g. Appreciation from employer, motivating work environment, incentives from employer or government.
h. Regular update on protocol for diagnosis and treatment of infected individuals, COVID-19 pandemic and discussion among colleagues regarding false information on internet.
i. Seminars and workshops for promotion of mental health in HCWs such as art of life, yoga and meditation.

j. Material preparedness for pandemic or disaster relief in hospitals and psychological preparedness through regular trainings or seminar for staffs to handle challenging situations.

Limitations: Despite well thought search strategy and review of quality literatures, this study has few limitations. We have not registered our study at PROSPERO which is a major limitation of this study. Majority of the studies included in the review were cross-sectional studies conducted at various regions. Thus, result was chiefly based on association of the studies rather than causality. Longitudinal studies are needed to compare the severity and duality of risk factors. Moreover, there was large variation in between the studies like measurement tool and study population. Some studies were conducted in the initial phase of pandemic and some in the high alert phase at different time frame, thus disparity in the risk factors was clearly evident in our findings. Meta-analysis was not performed due to variation in reporting of data across the studies although the good quality of studies was included. Therefore, the evidence remains inconclusive.

CONCLUSION

The review highlights the need of measures directed to benefit mental wellbeing of health care workers who have dedicated themselves for patient's treatment and care in the phase of pandemic. The magnitude of psychological burden on health workforce can be well understood through this study. The determinants chiefly responsible for mental exhaustion such as socio-demographical, psychological or occupational factors provide a better insight for strengthening mental health of medical taskforce during public health emergency such as COVID-19. Special care towards frontline line workers and physicians who are in isolation must be provided. Proper training on infection control

and management of pandemic, adequate personal protective devices and positive work environment are to be considered to promote mental wellbeing of HCWs.

Author's Contribution: NB and SS did the article selection. NB extracted the data. SS, SKS and BSP checked the extracted data. NB wrote the original manuscript, reviewed and edited the manuscript. SS, BSP and SKS reviewed and edited the manuscript.

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