Prevalence of Anxiety, Depression, Stress, and Insomnia among Healthcare Workers during Covid-19: A Systematic Review and Meta-Analysis

Kurvatteeppa Halemani[1], Alwin Issac[2], Prabhaker Mishra[3], Sanjay Dhiraaj[4], Suma Mavinatop[5]

Abstract

Covid-19 pandemic had a deleterious impact on the healthcare system and interrupted the healthcare services for individuals, families, and communities. This review aimed to ascertain the prevalence of anxiety, depression, insomnia, and stress among nurses and doctors during Covid-19 pandemic based on Cochrane collaboration guidelines and reported using Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) statement. The online literature search was conducted from 1 January 2021 to 31 April 2021; two authors independently searched and appraised the quality of studies. The quality of studies was assessed using modified Newcastle-Ottawa scale. Pooled data was analysed using random-effect model and heterogeneity was assessed by I2 test. A total of 13 studies comprising 9060 participants were selected for meta-analysis. The prevalence of anxiety and depression among nurses was ES (95% CI) [0.42(0.33,0.50), I^2=97.42, p<0.001], and 0.42 (0.32, 0.52), I^2=97.60, p<0.001] respectively. Anxiety and depression among doctors was ES (95%CI) [0.34(0.26,0.42)], I^2=95.26, p<0.001 and 0.34 (0.23,0.45), I^2=97.61, p<0.001 respectively. The overall pooled prevalence of insomnia among nurses was 0.44 (0.35, 0.53), I^2=90.97, p<0.001 and doctors was 0.35 (0.26, 0.43), I^2=90.79, p<0.001. The total pooled prevalence rate of stress among nurses was 0.37 (0.08, 0.66), I^2=99.56, p<0.001 and doctors was 0.37 (0.06, 0.68), I^2=99.07, p<0.001. The overall subgroup pooled prevalence rate of anxiety, depression, insomnia, and stress due to Covid-19 pandemic among nurses and doctors was 0.42 (0.33, 0.50) I2= 99.96, p<0.001, 0.34 (0.29, 0.40), I^2=96.93, p<0.001, respectively. Anxiety and depression were the most common problems exhibited by the doctors and nurses during Covid-19 pandemic. These findings emphasise the urgency for an early identification and interventional strategies to mitigate the mental health crisis among frontline healthcare providers.

Key words: Covid-19, Anxiety, Depression, Insomnia, Nurses, Doctors

On 31 December 2019 an abrupt increase in cases of pneumonia of mysterious origin was reported by the Chinese health officials to the World Health Organization (WHO). Subsequently the novel coronavirus (nCoV) as the aetiological agent was named "2019-nCoV", and later as coronavirus disease-2019 (Covid-19). On March 11, 2020 WHO announced Covid-19 as a pandemic. As of 2 June 2021, 1.71 billion people were infected worldwide with coronavirus and 3 million people succumbed to this deadly infection (Worldometer, 2021). Governmental and individual responses to Covid-19 dramatically changed the way millions of peoples now socialise, work, study and live (Stephen et al, 2021). Mental health issues namely stress, anxiety, depression, and sleep disturbances could be attributed to the fear of being infected, mortality rate, changed lifestyles, escalated work pressure, and deteriorating living conditions.

The kind and gravity of mental health problems vary as per individual's health status and the roles they perform in the society (Bao et al, 2020; Lu et al, 2020). Neglect and underinvestment in individuals' mental health needs became evident during this pandemic and the UN has stressed on the importance of investments in the way countries treat psychological illness. The rapid surge in coronavirus cases multiplied by the enforced quarantine, and travel restrictions could dismay the public (Bao et al, 2020). Combating a pandemic would require intersectoral co-ordination of healthcare system; a healthy mental state among the Health Care Workers (HCWs) is of utmost importance. Regretably, the

The authors are: 1. Teaching Staff; 3 Associate Professor, 4. Professor, Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), Lucknow (UP); 2. Tutor, College of Nursing, AIIMs, Bhubaneswar (Odisha); 5. Teaching Staff, Oxford Public School, Anavatti, Shivamogga (Karnataka).

unvarying tenseness of piloting our interrupted routine and social lives during the Covid-19 pandemic was a setback for maintaining healthy behaviours. The stress of dealing with coronavirus cases amplified by the scarcity of medical supplies, re-socialisation. New routines could drastically affect the HCWs mental health and working potential (Jacob et al, 2021; Lu et al, 2020). The repercussion of this could be worse than the direct consequences of pandemic itself.

Attributed to the increased intersection between animal-human, global connectivity, and constrained healthcare system, Covid-19 pandemic won't be the final time a pandemic would threaten human existence (Walsh et al, 2020). A comprehensive understanding of the prevalence of psychological problems among the HCWs could assist the stakeholders and policy decision makers in formulating strategies aimed at ameliorating the mental health of HCWs (Halemani et al, 2021). A better mental health would enable the HCWs in escalating their working capacity, and enable them to provide a better care for the needy. Psychological distress is more common in nurses during uncertain health emergency, especially pandemic situation. Persistence stress may induce long-lasting health problems. Moderate to severe psychological problems among frontline healthcare workers may induce a negative impact on their overall quality of life during Covid pandemic. The policymakers need to give immediate attention and take appropriate risk-reduction strategies. In addition, regular counselling, adequate rest between working hours and adequate supply of resources need to be considered during Covid pandemic.

Objectives

The objective of this study was to (a) Assess the prevalence of anxiety, depression, stress, and insomnia among nurses and doctors working in Covid-19 pandemic health care centres and (b) Find association between anxiety, depression, stress, and insomnia among nurses, and doctors.

Review of Literature

The Covid-19 pandemic poses an uncertain risk to psychological well-being. More affected are the healthcare workers. Women experience mental health problem more frequently. Disease outbreak increased the anxiety provoking situations. Anxiety is the most common psychological issue. Majority of nurses (n=123, 37.8%) showed frequent complaints of anxiety. However, nurses with organisational support had lower psychological distress related to Covid-19 (Labrague et al, 2021). Psychological factors help to improve mental health and work performance. Therefore, proper training, appropriate counselling improve knowledge on Covid-19 pandemic (57.5%) (Halemani, et al, 2020).

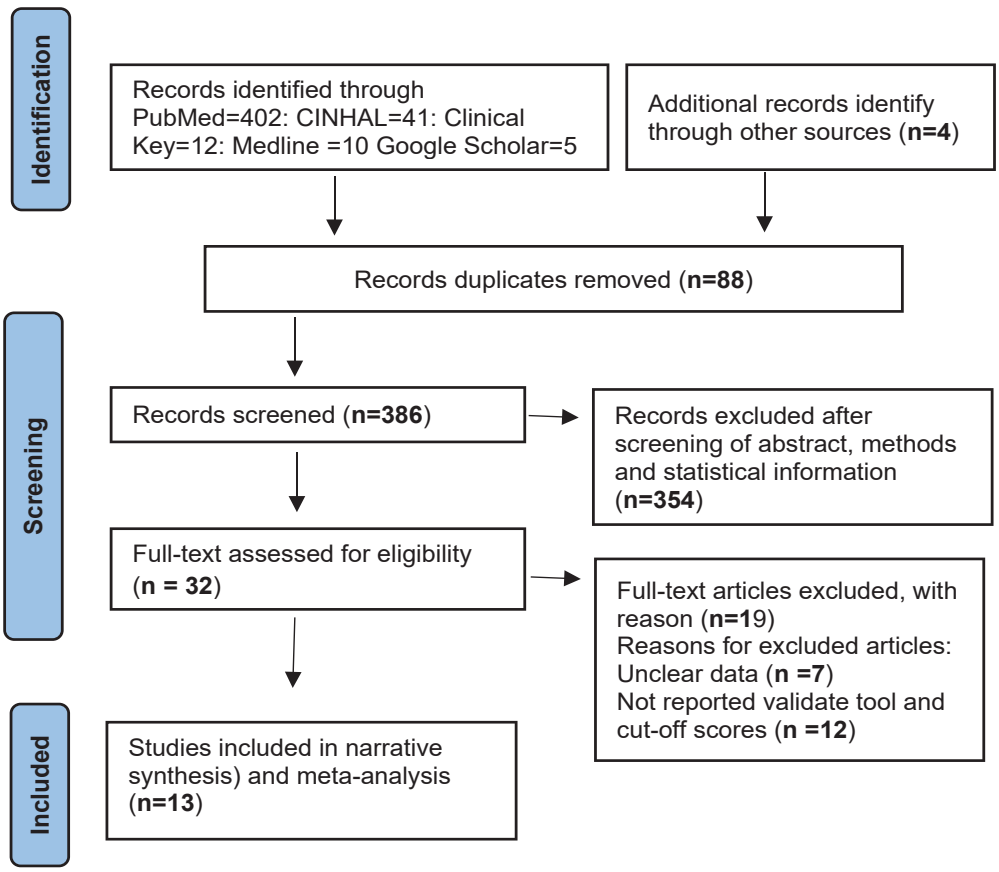

Figure 1: PRISMA flow diagram of study selection.

Women and nurses from low economic class experienced higher psychological distress due to Covid -19 as compared to the male and other health care workers (HCWs). Few studies reported that 23.2 percent of health care workers experience anxiety and 22.8 percent workers experience depression. Similar study conducted in Bangladesh found that 36.5 percent of doctors had anxiety, 38.4 percent had depression, 18.6 percent experienced insomnia, and 31.9 percent had fear about Covid-19.

A similar study showed that many HCWs perceived symptoms of depression (92, 47%), anxiety 98, 50%) and low Quality of Life (QoL) (89, 45%), respectively. Developed or develop-

Table 1: Quality appraisal of the included studies (all low risk) using modified Newcastle-Ottawa scale

Name of studies, years	Representativeness of samples >70 % response	Sample size >300 HCWs	Response rate >80%	Validated tool with cut-off	Statistical information, not required further calcul[n]	Total Scores
(22)	*	*	-	*	*	4/5
(23)	*	*	*	*	*	5/5
(24)	*	-	*	*	*	4/5
(25)	*	*	*	*	*	5/5
(26)	*	-	*	*	*	4/5
(27)	*	*	*	*	*	5/5
(28)	*	*	*	*	*	5/5
(29)	*	*	*	*	*	5/5
(30)	*	*	*	*	*	4/5
(10)	-	*	*	*	-	4/5
(31)	*	*	*	*	-	4/5
(32)	*	*	*	*	*	5/5
(18)	*	-	*	*	*	4/5

Note=Considered low-risk of bias when studies secured more than 3 stars.

ing countries are reported to have similar psychological problems among HCWs. The symptoms of depression, anxiety and insomnia were reported in lower proportion may represent good management of health care organisation during Covid pandemic. Therefore, there is an urgent need for intervention by HCWs to alleviate the psychological problems.

Abundant studies reported the importance of the mental health, social support and administration support in helping the healthcare workers maintain health working environment during stressful events. Previous studies on pandemic have found that anxiety most likely affected the nurses during emergency health situation.

Methodology

Protocol and registration: The protocol of this systematic review and meta-analysis was registered on PROSPERO (CRD42021245929) and available online. Cochrane collaboration guidelines were chosen to conduct the review and reported using Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) statement (Page et al, 2021)

Search strategy and selection: The search strategies were designed on the basis of MeSH terms ('physician 'OR 'doctors' OR 'healthcare workers' OR 'nurse' OR 'frontline worker' OR 'health worker') AND ('anxiety' OR 'fear' OR 'nervousness' OR 'sleep disturbance' OR 'sleep hygiene' OR 'depression', OR 'hopelessness' OR 'sleep problem' OR 'sleepwalking' OR 'insomnia') AND ('coronavirus' OR 'SARS-COV-2'). Identification of records was carried out by two authors independently and databases namely PubMed, CINAHL, Google Scholar, and Clinical key were searched for studies published between 15 January 2020 to 31 April 2021. Two authors independently screened the titles, abstracts, and full text of the articles for meeting the inclusion criteria. The criteria were (i) study population comprising of HCWs working in Covid-19 centres (ii) use of standardised tools for estimating the prevalence of anxiety, depression, insomnia, and stress of HCWs (iii) cross-sectional studies published in the English language. The reference list and citation tracking of each of the retrieved articles were also carried out by the authors. Any difference of opinion between the first two authors on primary data extraction was referred to the third author and a mutual agreement was sorted. The data, extracted by two authors independently consisted of: author name, year of study, country in which study was conducted, sample size, age of participants, gender, category of HCWs, instruments used, and the study outcomes.

Search outcome: The search strategy identified 470 studies from various databases and an additional 4 studies were identified from printed sources. A total of 88 duplicate records were rejected. Another 354 records were omitted after screening titles and abstracts, as they couldn't meet the PICO criteria of the review. The remaining 32 full-text articles were screened and another 19 articles were excluded as they didn't match the inclusion criteria of the review. The reasons for exclusion of the articles were: (i) the job title of the HCWs weren't specified, (ii) prevalence of psychological symptoms weren't measured (iii) tools used in the study, its cutoff

Table 2: Summary of included studies

Author, year	Country	Sample size	Age in years	Gender f (%)		Category of Health care workers			Instruments used			Study outcome		
				M	F	Doctor	Nurse	Others	Psychol factors	Name	Cut off	Anxiety (N* & D*)	Depression	Insomnia
(22)	China	309	33.5 ±9.5	301 (97.4)	8 (2.6)	35 (11.3)	274 (88.7)	-	Anxiety Depression	SAS SDS	>50 >53	N-81(29.6) D-7(20)	N-161(58) D-12(34.2)	-
(23)	China	617	≤40->40	03 (0.5)	614 (99.5)	-	617	-	Anxiety Depression stress	DASS-21 DASS-21 DASS-21	>8 >10 >14	N-201 [32.6%]	N-95 [15.4%]	**Stress** N-111 (17.9)
(24)	Singapore	270	>25	79 (28.3)	191 (71.7)	115	155	-	Anxiety Depression	HADS-A HADS-D	>11 >11	N-52 (33.5) D-30 (26)	N-49 (31.6) D-32(11.9)	-
(25)	India	1124	>20	406 (36.1)	718 (63.9)	749	207	168	Anxiety Depression	HADS HADS	>8 >8	N-103(49) D-264(35)	N-80(38.6) D-211(28)	--
(26)	Nepal	475	>20	225 (47.4)	250 (52.6)	161	167	147	Anxiety Depression Insomnia	HADS HADS ISI	>8 >8 >8	N-94(56) D-56(34)	N-78(46.7) D-50(24.7)	N-69 (41.3) D-52(29)
(27)	Turkey	939	>18	319 (34)	620 (66)	580	254	105	Anxiety Depression Insomnia	GAD-7 PHQ-9 ISI	≥ 5 ≥ 5 ≥ 8	N-169(66) D-335(58)	N-201(79) D-443(76)	N-154 (61.4) D-256 (54.1)
(28)	China	1257	>18	293	964	493	764	-	Anxiety Depression Insomnia	GAD-7 PHQ-9, ISI,	>4 >4 >8	N-360(47) D-200(41)	N-409(54) D-225(46)	N-292(38) D-135(27) **Stress** N-569(74) D-330(74)
(29)	China	908	33.8 ±6.9	222	686	369	394	145	Anxiety Depression	SAS SDS	>50 >53	N-60 (60) D-52(54.7)	N-65(50.3) D-63(46.6)	-
(30)	Japan	848	37 (28-47)	213	635	104	461	283	Anxiety Depression	GAD-7 CES-D	>9 >16	N-51 (11.1) D-11 (10.6)	N-161 (35) D-12 (11.5)	-
(10)	UK	635	-	-	-	291	344	74	Anxiety Depression	GAD-7 CES-D PTSD	>9 >9 >13	N-167 (48.5) D-197 (57)	N-30 (9) D-13(5)	**Stress** N-168(49) D-92 (31.6)
(31)	China	686	36.9 ±9.8	190	496	158	221	308	Anxiety Depression Stress	DASS-21 DASS-21 DASS-21	>8 >9 >14	N-69 (31) D-52 (33)	N-38 (17.2) D-24 (15.2)	**Stress** N-24 (10.9) D-20 (12.5)
(32)	Saudi Arabia	720	>18	258	462	194	262	264	Anxiety Depression Insomnia	GAD-7 PHQ-9, ISI,	>4 >4 >8	N-111(42) D-94(48))	N-106 (40.4) D102 (52.6)	N-110 (41) D-79 (40.8)
(18)	Indi	197	≤30 >40	96	101	66	47	84	Anxiety Depression	GAD-7 PHQ-9	>8 ≥10	N- 14 (29) D- 17 (25)	N- 13 (28) D-12(18)	-

SAS: Self-rating Anxiety Scale, GAD: Generalised Anxiety Disorder, CES-D: Center for Epidemiologic Studies Depression Scale, PHQ-9: Patient Health Questionnaire, PTSD: Post-Traumatic Stress Disorder checklist, HADS: Hospital Anxiety and Depression Scale, DASS-21: Depression Anxiety and Stress Scale, SDS: Severity of Dependence Scale, ISI: Insomnia Severity Index, *N: Nurse, *D: Doctor.

score, and validation scores weren't mentioned. Finally, 13 trials were involved for quantitative and narrative synthesis. The study selection process is depicted in Figure 1.

Quality evaluation: Quality assessment of the studies were ascertained using modified Newcastle-Ottawa scale. The assessment scale consisted of three subscales: (i) selection, (ii) comparability,

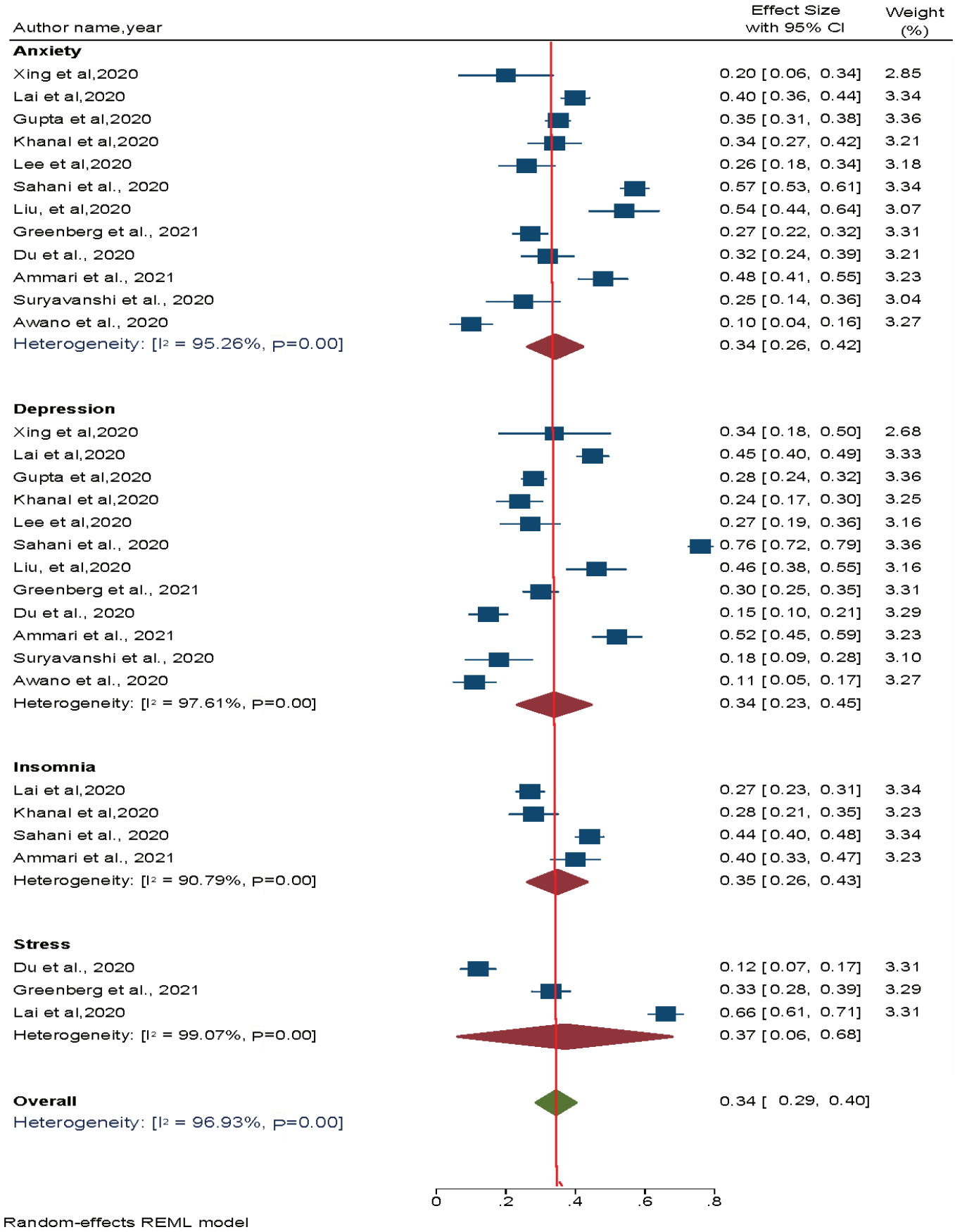

Figure 3: Prevalence of anxiety, depression, insomnia and stress of COVID-19 pandemic among doctor.

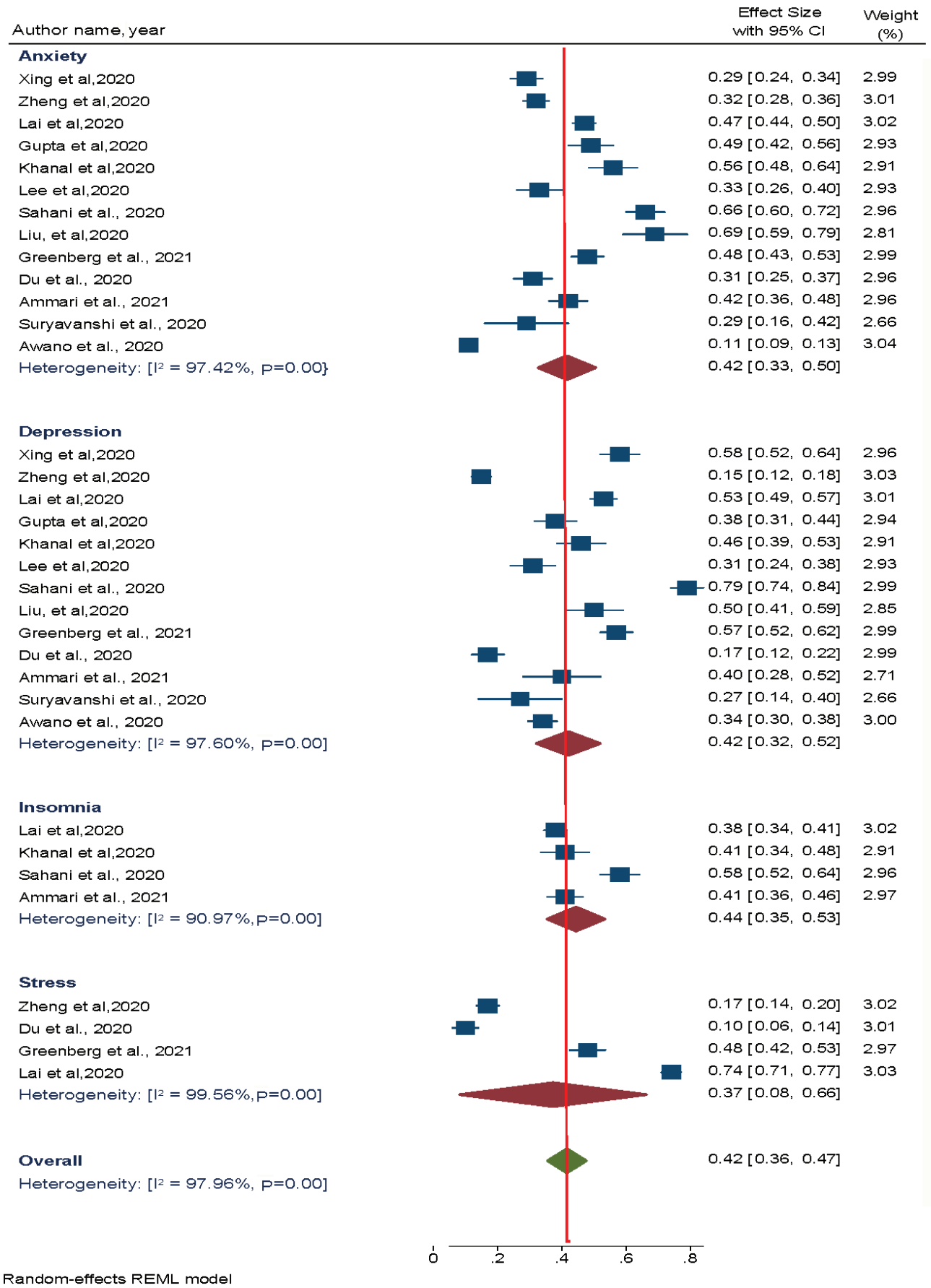

Figure 2: Prevalence of anxiety, depression, insomnia and stress of COVID-19 pandemic among nurses.

(iii) and (iv) outcome. The maximum possible quality score ranged from 0 to 5. Each of the study was screened and the total score obtained by each study was ascertained. The studies that secured ≥3 stars were considered having low-risk of bias or as high-quality articles, while those studies securing <3 stars were considered having high risk of bias. The studies included in our systematic review were in accordance to our inclusion criteria and studies that had high quality in accordance to Newcastle-Ottawa Quality Assessment Scale were only included (Table 2).

Statistical analysis: Data analysis was carried out using Stata software version 16 (Stata Corp LP, College station USA). The pooled prevalence of anxiety, depression, insomnia, and stress with 95% confidence interval was calculated by using Poisson distribution under Metaprop module in Stata. The heterogeneity of studies was calculated using I^2 test, and the random effect model deemed appropriate for the depreciation of selection bias.

Results

Participants characteristics: Among the selected 13 studies for the systematic review and meta-analysis, a total of 9060 participants 2606 male, 5745 females were involved. Among these, 3315 were doctors, 4167 nurses, and 1578 were paramedical staff. The sample size ranged from 197 to 1257 participants. Majority of the studies (5 in number) were conducted in China, two studies from India, and one study each from Saudi Arabia, United Kingdom, Japan, Turkey, Nepal, and Singapore. The included studies were summarised based on the author name, year of study, country in which study was conducted, sample size, age of participants, gender, category of HCWs, instruments used, and the study outcomes. The data extracted is depicted in Table 2.

These studies used diverse assessment tools for assessing anxiety, depression, insomnia, and stress among the HCWs. All the 13 studies reported prevalence of anxiety among HCWs, of which six studies used the Generalised Anxiety Disorder-7 scale, three studies used Hospital Anxiety and Depression Scale two studies used Depression Anxiety Stress Scale -21 and remaining two studies used Self-Rating Anxiety Scale.

Similarly, prevalence of depression was estimated using different scales of which four studies used Patient Health Questionnaire-9 scale, three used Hospital Anxiety and Depression scale, two studies used Depression Anxiety and Stress Scale-21, two studies used Severity of Dependence Scale, and remaining two studies used Center for Epidemiologic Studies-Depression scale. Insomnia was estimated using Insomnia Severity Index scale, stress was assessed using Depression Anxiety and Stress Scale-21, and Post-Traumatic Stress Disorder Scale.

The prevalence of anxiety, depression, stress, and insomnia during Covid-19 pandemic among nurses is summarised using forest plot. We pooled data from 13 studies for meta-analysis and all studies have reported the prevalence of anxiety [ES (95% CI)] 0.42 (0.33,0.50), I^2=97.42, p<0.001, and depression 0.42 (0.32,0.52), I^2=97.60, p<0.001, among nurses respectively (10,18,23–27,32–37) [Figure 2 & 3].

Similarly, the prevalence of anxiety and depression among doctors was [ES(95%CI)] 0.34 (0.26, 0.42), I^2=95.26, p<0.001 and 0.34 (0.23, 0.45), I^2=97.61, p<0.001 respectively (10, 18, 24–27, 32–37) (Figure 2 & 3).

Insomnia prevalence: Prevalence of insomnia among 1447 nurses was estimated from 4 studies. The overall pooled prevalence of insomnia among nurses was 0.44 (0.35, 0.53), I^2=90.97, p<0.001. Similarly, the prevalence of insomnia among 1428 doctors was estimated from 4 studies. The overall pooled prevalence of insomnia among doctors was 0.35 (0.26, 0.43), I^2=90.79, p<0.001 (Figure 2 & 3).

Stress prevalence: Stress among 1946 nurses was estimated from 4 studies. The total pooled prevalence rate of stress was 0.37 (0.08, 0.66), I^2=99.56, p<0.001. Similarly, stress among 928 doctors was estimated from 3 studies. The pooled prevalence rate of stress among doctors was 0.37 (0.06, 0.68), I^2=99.07, p<0.001 (Figure 2 & 3).

Subgroup analysis: The overall subgroup pooled prevalence rate of anxiety, depression, insomnia, and stress due to Covid-19 pandemic among nurses and doctors were 0.42 (0.33,0.50) I^2=99.96, p<0.001, 0.34 (0.29, 0.40), I^2=96.93, p<0.001 respectively (summary in Figures 2 & 3).

The average prevalence of the anxiety in nurses and doctors was 41.18 percent and 36.8 percent respectively. On the other hand, nurses being in close contact with Covid patients had a greater chance to experience anxiety. Prevalence of average depression in nurses was 38.7 percent and for doctors 30.8 percent. Similarly, 39.9 percent of nurses complained of insomnia and 37.7 percent stress. About 29.6 percent of doctors reported insomnia and 39.3 percent stress during Covid pandemic (Table 1).

The heterogeneity of included studies evaluated using I^2 values, when values more than 80 percentage low heterogeneity, 50-80 percent average risk and less than 50 percent indicates high risk. Subgroup analysis of overall studies evaluated using chi square and p value should be less than 0.05. This systematic review and meta-analysis revealed that involved studies had low risk and acceptable heterogeneity between studies.

Discussion

As of date, this is presumably the first study to separately estimate the effect of Covid-19 pandemic on the prevalence of stress, anxiety, depression, and insomnia among nurses and doctors. Most of the studies have reported anxiety and depression as the most common psychological problems reported among HCWs during management of epidemic (Maunder et al, 2003). Among the included studies Sahin et al (2020) reported highest levels of anxiety 0.69 (0.59, 0.79)]; 0.79 (0.74, 0.84)] and depression among nurses and doctors 0.57 (0.53, 0.61), 0.76 (0.72, 0.79) respectively. Our review found that doctors scored low on anxiety and depression scales than nurses (Figure 2 & 3).

Many factors contribute to the psychological burden among nurses: scarcity of personal protective equipment, fear of contracting infection to the family members, work pressure, desocialisation, working in close contact with the patient, and lack of experience in managing epidemics. A higher prevalence of psychological difficulties were reported among the HCWs during the previous epidemics Ebola, swine flu, and severe acute respiratory syndrome. Our findings conform to earlier studies which assessed the prevalence of anxiety and depression among HCWs, and reported anxiety and depression as most common problems exhibited by the HCWs.

Persistent psychological symptoms could further attributed to chronic mental health problems. Numerous reports of suicidal tendency and thoughts about quitting job were reported by various HCWs (Halemani et al, 2020). With long-term psychological problems, there may be chance of them turning into chronic psychiatry illness, therefore psychologic support and guidance of the healthcare workers are the crucial aspects of management. In making clinical decision, healthcare authority and policymakers rely on existing evidences developed during previous pandemic. The current review found that female and nurses had reported higher anxiety and depression than the male and doctors. Previous studies also revealed women to be more prone to psychological distress during Covid pandemic. Besides, findings indicated social isolation from family or community, financial insecurity and fear of infection of Covid-19 are increased psychological distress (Luo et al, 2020).

Our study emphasises the urge of maximising the mental well-being of HCWs, as improving the psychological well-being of HCWs is a crucial aspect in combating the pandemic. Coordinated effort by the stakeholders and HCWs holds the key in managing any crisis.

Limitations

Our systematic review and meta-analysis summarised the study findings based on 13 studies comprising 9060 participants. A relatively larger sample size is required for generalisation. It included studies published in English language only. Diverse assessment scales were used to assess stress, depression, anxiety, and insomnia characteristics from the participants. Additionally, there is only a low quality of evidence owing to the high dissimilarity, large heterogeneity, and diverse study settings.

Publication bias: Begg's & Egger's test was used to find any publication bias. We haven't found any publication bias ($p>0.54$) i.e. when p value is more than 0.05 implicates low publication bias.

Conclusion

Frontline healthcare workers namely doctors and nurses are vulnerable group and at high risk for developing mental health problems, attributed to the fear of contracting coronavirus disease during their care of Covid-19 patients. Early identification and individually tailored strategies may alleviate the symptoms and improve their overall quality of life. Hence, swift implementation of safe working environment, adequate personal protective devices, adequate rest and sleep, ongoing infection control training programs and recreational activities may help to improve the overall well-being of HCWs who are in the frontline of Covid-19 pandemic.

References

1. WHO Director-General's opening remarks at the media briefing on Covid-19, 11, March 2020
2. Worldometer Covid Live Update: 171,944,354 Cases and 3,576,061 Deaths from the Coronavirus - Worldometer
3. Stephen S, Issac A, Jacob J, Vijay VR, Radhakrishnan RV, Krishnan N. COVID-19: Weighing the endeavors of nations, with time to event analysis. Vol. 11, Osong Public Health and Research Perspectives. Korean Disease Control and Prevention Agency; 2020. p 149–57
4. Zhang J, Lu H, Zeng H, Zhang S, Du Q, Jiang T, et al. The differential psychological distress of populations affected by the COVID-19 pandemic. Vol. 87, Brain, Behavior, and Immunity. Academic Press Inc.; 2020, pp 49–50
5. Jacob J, VR V, Issac A, Stephen S, Dhandapani M, et al. Factors associated with psychological outcomes among frontline healthcare providers of India during Covid-19 pandemic. *Asian Journal of Psychiatry* 2021; 55: 102531. Elsevier BV
6. Alshekaili M, Hassan W, Al Said N, Al Sulaimani 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): 42030
7. Tan BYQ, Chew NWS, Lee GKH, Jing M, Goh Y, Yeo LLL, et al. Psychological impact of the COVID-19 Pandemic on Health Care Workers in Singapore. *Annals of internal Medicine NLM (Medline)* 2020; 317–20

8. Bao Y, Sun Y, Meng S, Shi J, Lu L. 2019-nCoV epidemic: Address mental health care to empower society. *The Lancet* 2020; 395: e37–38

9. Lu W, Wang H, Lin Y, Li L. Psychological status of medical workforce during the COVID-19 pandemic: A cross-sectional study. *Psychiatry Res* 2020; 288: 112936

10. Walsh MG, Sawleshwarkar S, Hossain S, Mor SM. Whence the next pandemic? The intersecting global geography of the animal-human interface, poor health systems and air transit centrality reveals conduits for high-impact spillover. *One Heal* 2020;11: 100177

11. Halemani K, Shashidhara YN, D'Souza SRB. An evaluative study to assess the effectiveness of a video-assisted teaching module on knowledge and practice regarding home-based colostomy care of children among primary caregivers in selected hospital Lucknow, Uttar Pradesh. *Indian J Surg Oncol* 2021;12 (1): 146–51

12. Labrague LJ, de los Santos JAA. Fear of COVID-19, psychological distress, work satisfaction and turnover intention among frontline nurses. *J Nurs Manag* 2021; 29(3): 395-403

13. Halemani K, Cheema M, Khatun S, Singh B. An effectiveness of training program on COVID-19 among healthcare students: A cross section study. *Intern Journal of Res in Pharmaceutical Sci* 2020;11(1):1250–54

14. Luo M, Guo L, Yu M, 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. Vol. 291, Psychiatry Research. Elsevier Ireland Ltd; 2020, p 113190

15. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. Vol. 372, *The BMJ*. BMJ Publishing Group; 2021

16. Zheng R, Zhou Y, Qiu M, Yan Y, Yue J, Yu L, et al. Prevalence and associated factors of depression, anxiety, and stress among Hubei pediatric nurses during COVID-19 pandemic. *Compr Psychiatry* [Internet] 2021; 104:152217. Available from: https://doi.org/10.1016/j.comppsych.2020.152217

17. Lee MCC, Thampi S, Chan HP, Khoo D, Chin BZB, Foo DPX, et al. Psychological distress during the COVID-19 pandemic amongst anaesthesiologists and nurses. *Br J Anaesth* [Internet], 2020; 125(4): e384–6. Available from: https://doi.org/10.1016/j.bja.2020.07.005

18. Gupta S, Prasad AS, Dixit PK, Padmakumari P, Gupta S, Abhisheka K. Survey of prevalence of anxiety and depressive symptoms among 1124 healthcare workers during the coronavirus disease 2019 pandemic across India. *Med J Armed Forces India* [Internet] 2020; Available from: https://doi.org/10.1016/j.mjafi.2020.07.006

19. Khanal P, Devkota N, Dahal M, Paudel K, Joshi D. Mental health impacts among health workers during COVID-19 in a low resource setting: A cross-sectional survey from Nepal. *Global Health* 2020; 16(1): 1–12

20. Sahin MK, Aker S, Sahin G, et al. Prevalence of depression, anxiety, distress and insomnia and related factors in healthcare workers during COVID-19 pandemic in Turkey. *J Community Health* [Internet] 2020; 45(6): 1168–77

21. Lai J. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw open* [Internet] 2020; 3(3): 1–22.

22. Du J, Mayer G, Hummel S, Oetjen N, Gronewold N, Zafar A, et al. Mental health burden in different professions during the final stage of the COVID-19 lockdown in China: Cross-sectional survey study. *J Med Internet Res* 2020; 22(12): e24240

23. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw Open* 2020; 3(3): e203976

24. Li Q, Chen J, Xu G, Zhao J, Yu X, Wang S, et al. The psychological health status of healthcare workers during the COVID-19 outbreak: A cross-sectional survey study in Guangdong, China. *Front Public Heal* 2020; 8: 56288

25. Awano N, Oyama N, Akiyama K, Inomata M, Kuse N, Tone M, et al. Anxiety, depression, and resilience of healthcare workers in japan during the coronavirus disease 2019 outbreak. *Intern Med* 2020; 59(21): 2693–99

26. Maunder R, Hunter J, Vincent L, Bennett J, Peladeau N, Leszcz M, et al. The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *Cmaj* 2003; 168 (10): 1245–51

27. Grover S, Sahoo S, Mehra A, et al. Psychological impact of COVID-19 lockdown: An online survey from India. *Indian J Psychiatry* 2020; 62(4): 354–62

28. Shaukat N, Ali DM, Razzak J. Physical and mental health impacts of COVID-19 on healthcare workers: A scoping review. *Int J Emerg Med* 2020; 13(1): 1–8

29. Zhang W, Wang K, Yin L, Zhao W, Xue Q, Peng M, et al. Mental health and psychosocial problems of medical health workers during the COVID-19 epidemic in China. *Psychother Psychosom* 2020; 89(4): 242–50

30. Halemani K, Nursing MP, Kumar B. Effect of preradiotherapy education on anxiety in parents of under-five children undergoing radiation therapy for the first time. *Journal of Pediatric Surgical Nursing* 2021;10 (2): 83-89

31. Giusti EM, Pedroli E, D'Aniello GE, Stramba Badiale C, Pietrabissa G, Manna C, et al. The psychological impact of the COVID-19 outbreak on health professionals: A cross-sectional study. *Front Psychol* 2020;11(July): 1-9

32. Temsah MH, Al-Sohime F, Alamro N, et al. The psychological impact of COVID-19 pandemic on health care workers in a MERS-CoV endemic country. *J Infect Public Health* [Internet] 2020; 13(6): 877-82.

33. Zhang SX, Chen J, Afshar Jahanshahi A, Alvarez-Risco A, Dai H, Li J, et al. Succumbing to the COVID-19 pandemic: Healthcare workers not satisfied and intend to leave their jobs. *Int J Ment Health Addict* 2021; 1-10

34. Issac A, Vijay V, Krishnan N, Jacob J, Stephen S, Radhakrishnan RV, et al. How the nations should gear up for future pandemics? *J Glob Health 2021,* 11: 03075

35. Alvarez-Risco A, Mejia CR, Delgado-Zegarra J, et al. The Peru approach against the COVID-19 infodemic: Insights and strategies. *American Journal of Tropical Medicine and Hygiene* 2020; 103: 583-86

36. Kinman G, Teoh K, Harriss A. Supporting the well-being of healthcare workers during and after COVID-19. *Occupational Medicine* 2020; 70: 294-96

■