Prevalence of Psychological Disorders among Health Workers During the COVID-19 Pandemic: A Systematic Review and Meta-Analysis

Abstract

Background: Repeated contact with patients with COVID-19 and working in quarantine conditions has made health workers vulnerable to psychological distress during the COVID-19 pandemic. The goal of the present systematic review and meta-analysis was to examine the prevalence of the various psychological distresses among health workers during the COVID-19 pandemic. **Methods:** PubMed, Scopus, Web of Science, EMBASE, and Cochrane databases were searched for access to papers examining psychological distress among healthcare workers during the COVID-19 pandemic. Risk of bias was assessed using the Newcastle–Ottawa Scale (NOS). Heterogeneity among the studies was examined using the Cochran's Q test; because heterogeneity was significant, the random effects model was used to examine the prevalence of psychological distress. **Results:** Overall, 12 studies with a total sample size of 5265 were eligible and included in the analysis. Prevalence rates of depression, anxiety, and PTSD were 20% (95% CI: 14–27), 23% (95% CI: 18–27), and 8% (95% CI: 6–9), respectively. The highest prevalence rates of depression and anxiety were related to the SDS and the GAD-7, respectively, and the lowest prevalence rates of the two aforementioned variables were related to the DASS-21. **Conclusions:** The high prevalence of psychological distress among healthcare workers during the COVID-19 epidemic can have negative effects on their health and the quality of services provided. Therefore, training coping strategies for psychological distress in this pandemic seems necessary.

Keywords: *COVID-19, health workers, pandemic, psychological distress*

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Introduction

On December 31, 2019, the office of world health organization (WHO) in China reported some viral pneumonia cases of unknown cause in Wuhan, Hubei. WHO called this coronavirus or COVID-19, and as a result of the fast spread of the virus throughout the world, it has been announced as a pandemic on March, 11, 2020.[1] According to the last WHO report, until May, 9, 2020, COVID-19 had infected about 3,855,788 people and had led to the death of 265,862 people globally.[2] These figures are rising day by day.

In this critical situation, health workers are at the frontline of diagnosis, treatment, and taking care of COVID-19 patients, and subsequently, they are at risk of mental disorders.[3] Challenges faced by health workers are not limited to increased workload, but also include fear about their own health and the health of their families, dealing with new treatment protocols that are constantly changing, shortage of personal protective equipment, looking after patients with severe symptoms and a declining health status, and looking after coworkers who have contracted the virus,[4] which collectively might increase the mental load of health workers, therefore making them vulnerable to mental problems.[3]

Previous studies on psychological reaction of health workers to the 2003 SARS outbreak showed that they were worried about the health of their families, friends, and coworkers as well as stigmatization,[5,6] and that they experienced high levels of stress, anxiety, and depression that could be accompanied by long-term psychological outcomes.[7] Many health workers work in quarantine conditions, while they have not received any training on the strategies to cope with psychological distress resulting from this crisis. Fear, anxiety, and helplessness among health workers can make them vulnerable to suicidal ideation.[8] A previous study on this topic showed that people working in quarantine conditions

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tend to experience psychological distress, including anxiety, stress, anger, confusion, and post-traumatic stress disorder (PTSD).[9] Previous studies on psychological distress among health workers during the current COVID-19 pandemic have reported mixed results.[1,3,10-13] The present systematic review and meta-analysis was aimed at examining the prevalence of psychological distress (depression, anxiety, and PTSD) among health workers during the COVID-19 pandemic, in order to report the status of psychological distress in this group.

Materials and Methods

The present systematic review and meta-analysis was reported based on the Meta-Analyses of Observational Studies in Epidemiology (MOOSE) and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for reviews of analytical observational studies.[14]

Search strategy

In the first step, databases of PubMed (Medline), Scopus, Web of Science, EMBASE, and Cochrane were searched for articles, with no time limit, using the "OR" and "AND" operators. The following keywords (selected using "MSH" and "Emtree") were used:

"Depression," "Depressive Symptom," "Depressive Disorder," "Emotional Depression," "Depressive Neuroses," "Depressive Neurosis," "Endogenous Depression," "Depressive Syndrome," "Neurotic Depression," "Unipolar Depression," "Traumatic Stress," "Acute Stress Disorder," "Traumatic Stress Disorder," "Post-Traumatic Neuroses," "Delayed Onset Post-Traumatic Stress Disorder," "Chronic Post-Traumatic Stress Disorder," "PTSD," "Anxiety," "Hypervigilance," "Nervousness," "Social Anxiety," "Anxiety Disorder," "Anxiety Neuroses," "Neurotic Anxiety State," "Health Personnel," "Healthcare Provider," "Healthcare Worker," "Health Care Provider," "COVID-19," "2019-nCoV," "Wuhan Coronavirus," "SARS-CoV-2," "2019 Novel Coronavirus," "COVID-19 Virus," "Coronavirus Disease 2019 Virus," "Wuhan Seafood Market Pneumonia Virus."

Reference lists of articles were examined to access more related articles. Databases related to PsycINFO and also Google Scholar were searched for gray literature. The search was conducted by two independent reviewers, and disagreements between them were resolved through discussion, and if needed, based on the opinion of a third reviewer.

Inclusion and exclusion criteria

Inclusion criteria were: observational studies, publication in English, reporting the prevalence of depressive disorders, anxiety and stress in health workers, access to the full text of the articles, conducting a study during the COVID-19 epidemic. Articles without available full texts or published in languages other than English were excluded.

Selection of studies and data extraction

Two authors independently reviewed titles and abstracts, and selected articles according to the inclusion criteria. Then, they extracted the following information from each article: first author, year of publication, sample size, place of study, and instrument used to assess psychological distress. Again, any disagreement between them was resolved through discussion or by asking the opinion of a third researcher.

Quality assessment and risk of bias

Risk of bias was examined using the Newcastle–Ottawa Quality Assessment Scale (NOS). This scale was completed by two independent researchers who divided the articles into three groups of high, moderate, and low in terms of risk of bias. The NOS assesses a study based on six items in three groups, including selection, comparability, and exposure. The maximum score on this scale is 9. The external discussion method is used when there are differences in the score given to the articles.

Statistical analysis

Point estimations and 95% confidence interval (CI) of the prevalence of depression, anxiety, and PTSD were calculated according to the binomial distribution formula. Heterogeneity among the studies was calculated using the I^2 index and the Cochran's Q test with a significance level of 0.1. According to the I^2 index, heterogeneity was classified into three categories of lower than 25% (low heterogeneity), 25% to 75% (average heterogeneity), and higher than 75% (high heterogeneity).[15] Because heterogeneity was high among the selected studies, pooled prevalence was estimated using the random effects model. In order to examine the potential factors of heterogeneity in the prevalence of depression, subgroup analysis and meta-regression analysis were used. Subgroup analysis was used based on different geographical regions and screening tools. Publication bias was assessed visually using funnel plots,[16] and analyzed using the Egger's method.[17] All analyses were performed using STATA, version 16.

Results

Study selection

A total of 198 articles were retrieved from international databases. After removal of duplicate articles, titles and abstracts of 150 non-duplicate articles were examined. In the screening stage, 120 unrelated articles were excluded, and full texts of 30 articles were examined in terms of eligibility. Finally, six articles were included in the analysis. The process of selecting and screening articles based on the PRISMA guidelines is presented in the flowchart below Figure 1.

Study characteristics

Overall, 12 articles with a total sample size of 29960 (on average 25320 participants in each study) were included in

the analysis. All selected studies were cross-sectional and were conducted in 2020. Ten studies had been conducted in China, one study in Singapore and India. Twelve studies reported the prevalence of anxiety, while 11 studies reported the prevalence of depression, and two reported the prevalence of PTSD. Further details are reported in Table 1.

The pooled prevalence of depression and anxiety among health workers was 20% (95% CI: 14–27) and 23% (95% CI: 18–27), respectively [Figures 2 and 3]. Two studies had reported the prevalence of PTSD (8%, 95% CI: 6–9). [Table 2]

Publication bias was assessed using the Egger's test, and no bias was found in the publication of the articles included in meta-analysis of the prevalence of depression (Coefficient: −2.64, SE: 5.26, P: 0.617). In addition, no publication bias was found in the meta-analysis of the prevalence of anxiety (Coefficient: 0.86, SE: 2.82, P: 0.761). Results by screening tools indicated that the highest and lowest prevalence rates of depression were related to the Self-rating Depression Scale (SDS) (33%, 95% CI: 30–36) and the depression, anxiety, stress scale (DASS) (10%, with 95% CI: 8–12),

respectively. In addition, the prevalence of depression in both India and Singapore (10%, 95% CI: 8–12) studies was lower than the prevalence of depression in studies conducted in China (23%, 95% CI: 15–30). Results of subgroup analysis by instrument showed that the highest and lowest prevalence rates of anxiety were related to the GAD-7 (30%, 95% CI: 21–40) and the DASS-21 (15%, 95% CI: 13–17), respectively. In addition, the prevalence rates of anxiety in the studies conducted in India and Singapore (15%, 95% CI: 13–17) were lower than those reported by the studies conducted in China (24%, 95% CI: 19–29) [Table 2].

Meta regression

To assess the effect of the study variables such as sample size on heterogeneity, we used meta-regression analysis. Results of meta-regression analysis in Table 3 did not show any significant association between this variable with the prevalence of outcomes [Table 3 and Figure 4].

Discussion

The present study was aimed at examining the prevalence of psychological distress among health workers during

First author	Place	Sample size	Target group	Study time	Setting	Scale	Outcome	Prevalence (%)
Chew[1]	Singapore-India	906	Doctors, nurses, and allied healthcare workers	February 19 to April 17, 2020	Healthcare institutions	DASS-21	Depression	10.6
							Anxiety	15.7
						IES-R	PTSD	7.4
Zhao[13]	China	2250	Health workers	February 3 to17, 2020	Community	GAD-7	Anxiety	35.6
						CES-D	Depression	19.8
Du[10]	China	134	Nurses and doctors	February 13 to 17, 2020	Hospital	BDI	Depression	12.7
						BAI	Anxiety	20.1
Guo[18]	China	11118	Physician, nurse, and medical students	February, 2020	Hospital	SAS	Depression	31.4
						SDS	Anxiety	17.4
Tan[11]	Singapore	296	Physician, nurse, and allied healthcare professional	February 19 to March 13, 2020	Healthcare institutions	DASS-21	Depression	8.9
						DASS-21	Anxiety	14.5
						IES-R	PTSD	7.7
Lai[3]	China	1257	Health worker	January 29 to February 3, 2020	Clinics and hospitals	PHQ-9	Depression	50.4
						GAD-7	Anxiety	44.6
						IES-R	Distress	71.5
Huang[12]	China	603	Health worker	February 3 to 10, 2020	Community	CES-D	Depression	18.1
						GAD-7	Anxiety	34
Liu[19]	China	512	Frontline medical staff	February 10 to 20, 2020	Hospital	SAS	Anxiety	12.5
Liu[20]	China	4679	Doctors and nurses	February 17 to 24, 2020	Hospital	SDS	Depression	34.6
						SAS	Anxiety	16.1
Lu[21]	China	2042	Medical staff	January, 2020	Hospital	HAMD	Depression	12.1
						HAMA	Anxiety	25.5
Zhang[22]	China	927	Medical health workers	February 19 to March 6, 2020	Community	PHQ-2	Depression	12.1
						GAD-2	Anxiety	13
Zhu[23]	China	5062	Health worker	February 8 to10, 2020	Hospital	PHQ-9	Depression	13.5
						GAD-7	Anxiety	24

IES-R: Impact of Events Scale—Revised; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; SDS: Self-rating Depression Scale; SAS: Self-rating Anxiety Scale; HAMD: Hamilton Depression Scale; HAMA: Hamilton Anxiety Scale; GAD: Generalized Anxiety Disorder; PHQ: Patient Health Questionnaire; CES-D: Center for Epidemiologic Studies Depression Scale
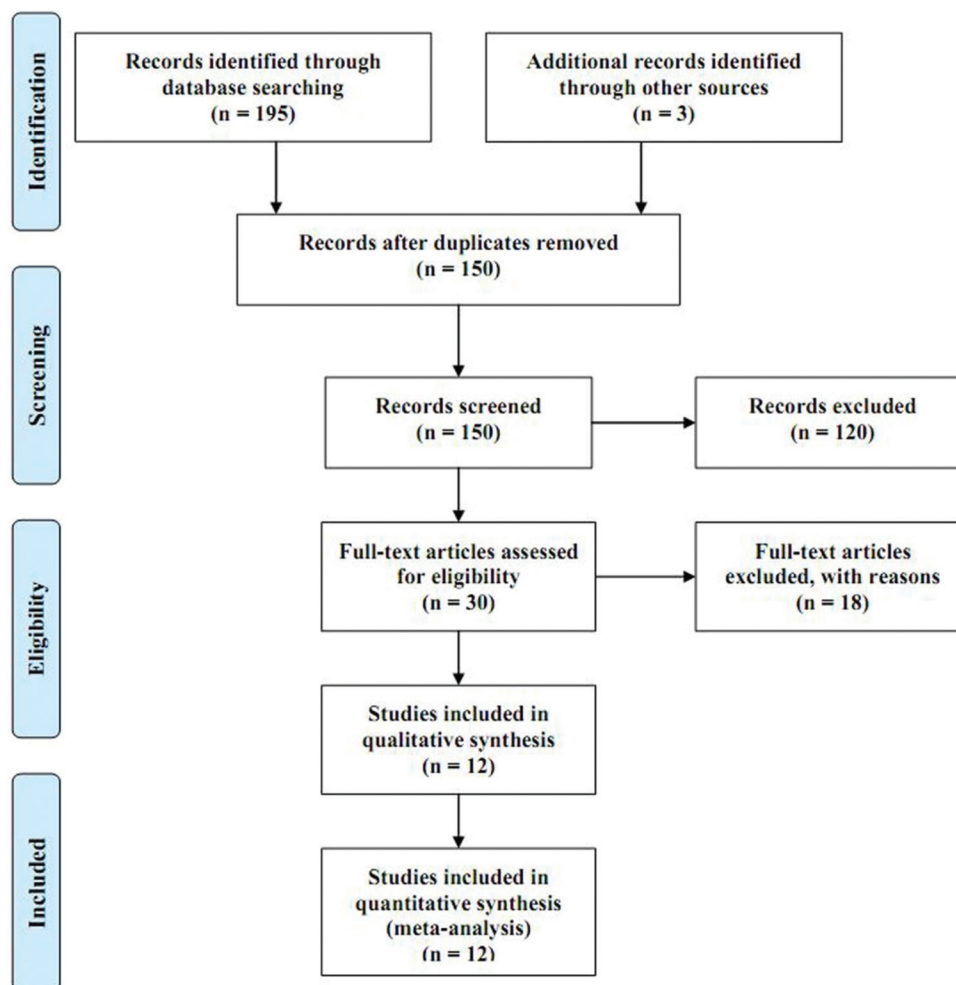
**Figure 1: Screening and selection process of articles based on PRISMA guideline**

the COVID-19 pandemic. In their seminal study, Pappa *et al.*[24] examined depression, anxiety, and sleep disorders in health workers; however, their study was influenced by methodological flaws several mistakes in terms of reporting the prevalence of the aforementioned disorders. The results of that study are often used in making health decisions, but they can be misleading. Lu *et al.*[21] examined the prevalence of depression and anxiety in two groups of medical staff ($n = 2042$) and administrative staff ($n = 257$); however, they reported total prevalence rates instead of separate prevalence rates for each group. Zhang *et al.*[22] explored the prevalence of depression and anxiety in two groups of medical health workers and non-medical health workers, but according to the title of their article, they should have examined the prevalence of the two disorders only in medical health workers, not in both groups. As a result, they reported a prevalence of 10.6% for anxiety and a prevalence of 10.4% for depression by mistake, while the valid prevalence rates should have been 13% and 12.1%, respectively. They also included Huang's study in their analysis, but this study was in Chinese and its methodological quality could not be examined.[25] They

also did not include the seminal work of Chew *et al.*[1] in their analysis. In addition, their work could have been more complete if they had examined PTSD along with depression and anxiety.

The study results showed that the prevalence of depression in health workers during the COVID-19 pandemic was 20%. In addition, anxiety and PTSD had prevalence rates of 23% and 8%, respectively. In a study by Tan *et al.*,[11] the prevalence of anxiety was lower in trained health workers than in untrained health workers. Given that symptoms of coronavirus are sometimes similar to those of other infectious diseases, health workers who experience these symptoms are often faced with the dilemma of either continuing to work or taking a medical leave of absence from work, while there is a greater demand for health workers; this can increase their anxiety.[11,26] The high prevalence of psychological distress in health workers during the COVID-19 pandemic can be attributed to hypochondriac concerns, including worry about being infected with the virus or worrying that the pandemic will not be controlled.[12,27] Results of a study by Su *et al.* (2007)[28] during the SARS epidemic showed

Table 2: The results of subgroup analysis

Subgroup	Number of studies	Pooled prevalence (95% CI)	Between studies			Between subgroups	
			I^2 (%)	P heterogeneity	Q	Q	P heterogeneity
Anxiety							
Scales							
GAD-7	5	30 (21-40)	90.03	0.001	414.25	19.05	0.001
DASS-21	2	15 (13-17)	0.00	0.550	0.33		
SAS	3	16 (14-18)	84.2	0.001	12.52		
Others	2	24 (19-29)	50.38	0.001	2.02		
Country							
China	9	24 (19-29)	98.91	0.001	823.73	11.03	0.001
Singapore & India	2	15 (13-17)	0.00	0.550	0.33		
Depression							
Scales							
SDS	2	33 (30-36)	0.00	0.001	14.69	213.75	0.001
CES-D	2	19 (8-21)	0.00	0.001	0.87		
DASS-21	2	10 (8-12)	0.00	0.001	0.97		
PHQ-9	3	25 (6-44)	99.68	0.001	617.33		
Others	2	12 (11-14)	0.00	0.001	0.04		
Country							
China	9	23 (15-30)	99.5	0.010	174.41	10.56	0.001
Singapore & India	2	10 (8-12)	0.00	0.001	0.97		
PTSD							
Total	2	8 (6-9)	0.00	0.840	0.04	10.56	0.001
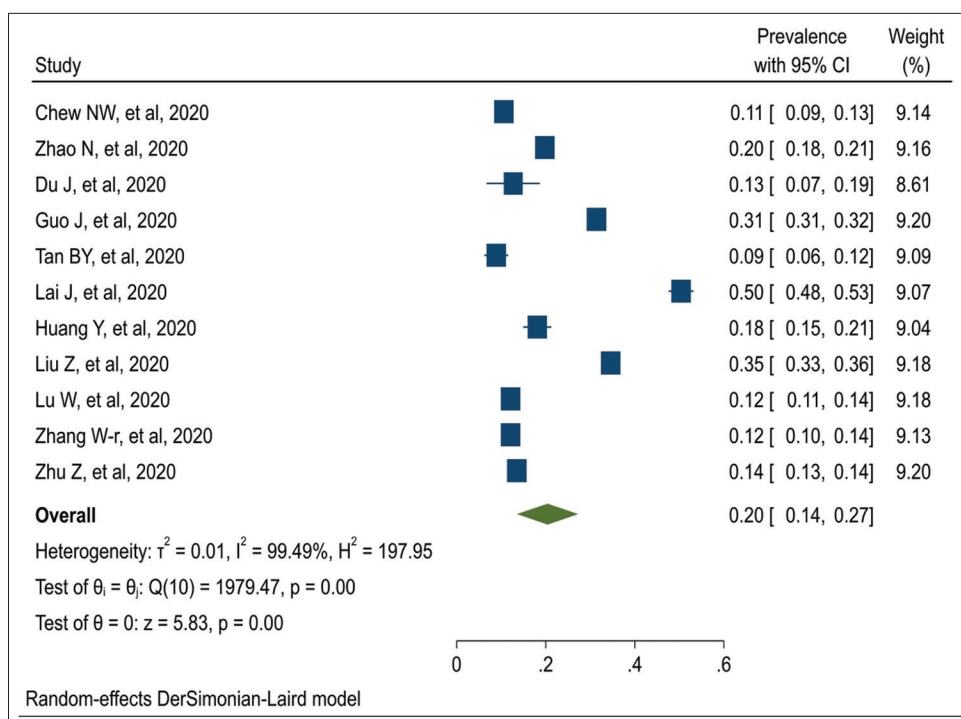
Figure 2: The pooled estimate of depression among health worker in exposed to COVID-19

that one-third of nurses looking after patients with SARS had psychological symptoms, such as depression, PTSD, and insomnia. Psychological distress during crises or pandemics is not limited to health workers. Results of a study in Toronto among 129 quarantined persons in the SARS pandemic showed that one-third of them suffered from PTSD or depression.[29] Health workers show complex reactions to epidemics of infectious
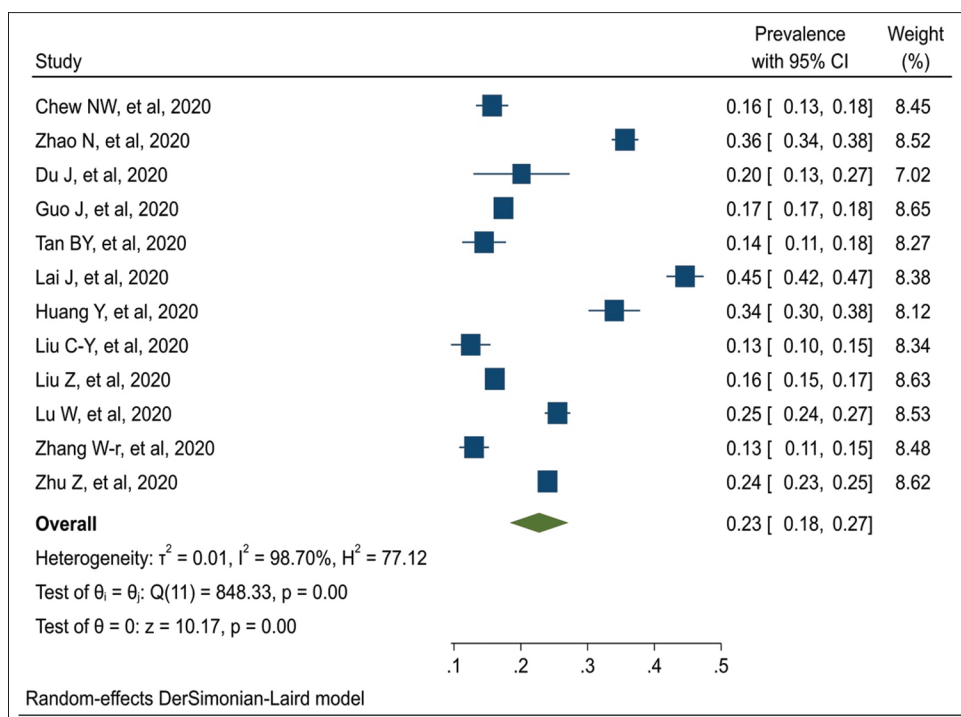
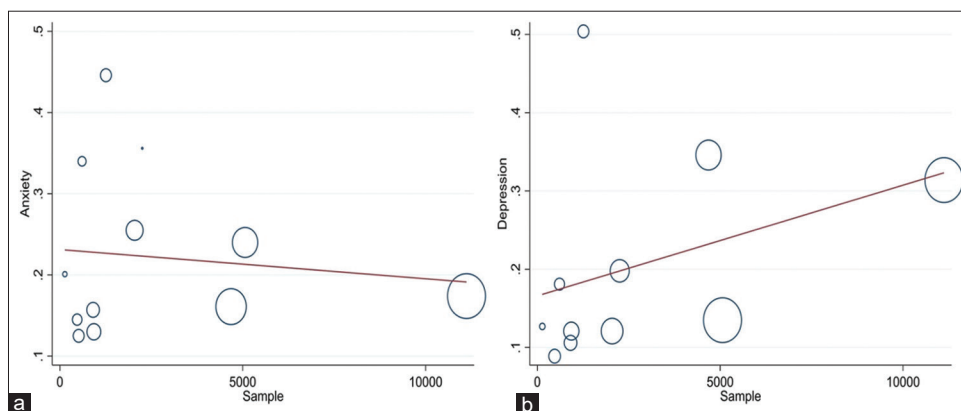**Figure 3: The pooled estimate of anxiety among health worker in exposed to COVID-19**

Figure 4: The meta-regression graph for the prevalence of depression (a) and anxiety (b) according to sample size

Table 3: Meta-regression analysis for assessing the effect of suspected variables on the pooled prevalence of outcomes in health workers

Prevalence	Variables	Univariable model		
		β	SE	*P* (95% CI)
Depression	Sample size	0.001	0.002	0.287 (−0.000, 0.004)
Anxiety	Sample size	0.099	0.012	0.725 (0.071, 0.132)

diseases, and feeling of vulnerability, fear about one's own health, isolation, and worry about the spread of the virus can be identified as sources of their psychological distress.[3,30] It appears that along with these factors, the fact that coronavirus can be transmitted from person to person may have increased the vulnerability of health workers to psychological distress. On the other hand, close and repeated contacts with COVID-19 patients

and working hours longer than usual may play a role in psychological problems of health workers.[31,32] According to the results of subgroup analysis, the prevalence of anxiety was higher in the studies conducted in China than those performed in other countries; this finding can be attributed to the fact that the outbreak of COVID-19 was started from China, and it was the first country experiencing damages caused by the spread of the virus. In addition, differences in the prevalence of psychological distress by different instruments can be attributed to their different psychometric properties.

Overall, the study results showed that psychological distress is prevalent in health workers during the COVID-19 pandemic, and that this can have adverse outcomes both for health workers and patients receiving service from them. Providing health workers with training on strategies

to cope with psychological distress can help reduce this problem.

Conflicts of interest

There are no conflicts of interest.

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