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The pooled prevalence of the mental problems of Chinese medical staff during the COVID-19 outbreak: A meta-analysis

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ABSTRACT

Background: The COVID-19 pandemic has had a great impact on the mental health of the medical staff in China, especially those on the first-line (frontline) of the pandemic. But the profile of the mental problem of nationwide Chinese medical staff is still unclear, especially about the sleep problems.

Methods: There are five databases (PubMed, Embase, CNKI, Wanfang Database and Web of Science) searched to identify the published studies on the mental health of the medical staff in China during the COVID-19 outbreak. The pooled prevalence of mental problems of Chinese medical staff during the pandemic were calculated, especially for the first-line medical staff. Subgroup analysis and meta-regression analysis were performed to identify the potential impact factors.

Results: A total of 71 articles including 98,533 participants are included in this meta-analysis. The results showed that the pooled prevalence of the mental problems was as follows: anxiety problem 27%, depression problem 29%, sleep problem 40%. Subgroup analysis showed that there were significant differences in the prevalence of anxiety and depression problems between first-line and non-first-line medical staff ($p < 0.01$). Sex had a significant impact on the sleep of first-line medical staff ($p < 0.01$).

Limitations: There may be heterogeneity among the included studies. The analysis of potential influencing factors remains limited.

Conclusions: The prevalence of adverse mental problems among medical staff is high during the COVID-19 outbreak. We need to pay special attention to the mental health of first-line medical staff, especially the sleep problems of female first-line workers.

1. Introduction

The COVID-19 pandemic, which has led to worldwide lifestyle changes, not only damages people's physical health but also causes a range of mental problems (Wu et al., 2021), with medical staff at higher risk of facing mentally challenging circumstances than the general population (Zhou et al., 2018). Previous studies have shown that medical staff may suffer from severe mental difficulties during the outbreak of COVID-19 (Wu et al., 2021; Xiang et al., 2020; Yan et al., 2021). In close contact with infected patients, medical staff working on the first-line (frontline) were reported to have experienced stress and fear of emerging infectious diseases, therefore contributing to a higher risk of

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developing mental conditions (Giorgi et al., 2020; Greenberg et al., 2020). Emerging mental problems have hindered medical workers' ability to function efficiently (Kang et al., 2020), while an increasing number of medical staff might be needed at the first-line. The healthcare of frontline medical workers is thus of utmost significance during the continuing outbreak of COVID-19.

Several issues have yet to be addressed concerning the mental problems of medical staff during the COVID-19 outbreak. Despite several studies reporting decreased mental health of Chinese medical staff in the last two years (Liu et al., 2021; Liu et al., 2020c; Mei et al., 2020; Qi et al., 2020; Wang et al., 2020a), few have comprehensively evaluated the mental conditions of medical staff using a multidimensional approach. A survey that included 14,826 first-line medical staff in China found that 25.2% of participants manifested depressive symptoms (Song et al., 2020). Another study reported a prevalence of anxiety for medical staff as high as 43.61% (An et al., 2020). However, most of the above studies focused on restricted dimensions of mental problems, typically including anxiety and depression. Existing evidence suggests that pandemics give rise to both emotional and stress-related problems, along with sleep deprivation, which seems to have been undeservedly neglected (Gu et al., 2020; Guo et al., 2021; Lai et al., 2020; Liu et al., 2020b; Zhou et al., 2020a).

Numerous studies have reported the prevalence of mental problems for medical staff with relatively small sample sizes due to a lack of national-level effort. Moreover, although there have been some surveys on the mental health status of medical staff during COVID-19 in China across several regions, the results reported are inconsistent (Li et al., 2020; Wang et al., 2020b; Zhang et al., 2020b). In addition, some studies have found that female medical staff experienced more severer psychological problems than males during the COVID-19 pandemic (Hu et al., 2020; Jiang et al., 2020; Ning et al., 2020; Wang et al., 2020b; Zhou et al., 2020b; Zhu et al., 2020). However, other studies found such gender differences to be non-significant (Liu et al., 2020a; Xu et al., 2021). Further investigation is needed to determine whether working location and gender have an impact on the mental health of medical staff during the pandemic.

Compared to medical staff in the general domain, first-line workers are under greater physical and mental stress (Chen et al., 2020). This was especially true in the early stages of the COVID-19 outbreak, during which time the whole world knew very little about coronavirus. Medical staff had been working under the condition of insufficient psychological preparation and poor knowledge reserve (Huang et al., 2020). They worked intensively, with a high risk of occupational exposure and high levels of mental stress. They were forcibly isolated and had difficulty obtaining adequate social support (Huang et al., 2020). According to (Chen et al., 2020), a main source of anxiety for medical staff was that they did not know how to deal with patients' unwillingness to cooperate in treatment, resulting in a feeling of helplessness when faced with critically ill patients. Moreover, sleep problems were reported to be particularly prominent among first-line medical staff (Guo et al., 2021; Tu et al., 2020; Wu et al., 2020). Overall, these detrimental factors aggravated the latent psychological problems of first-line medical workers.

From a multidimensional perspective, a meta-analysis was performed to identify the mental problems of Chinese medical staff during the COVID-19 outbreak. A relatively large sample of medical workers across China was collected. Meanwhile, subgroup analysis and meta-regression analysis were used to explore the potential influencing factors. Additional analyses were carried out specifically for the first-line medical staff. The results of this study will provide evidence to policymakers to make more detailed and comprehensive suggestions for psychological care policymaking for medical staff.

2. Methods

2.1. Identification of included studies

In line with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009), a systematic review was carried out on the mental problems of Chinese medical staff during the COVID-19 outbreak. A systematic review and literature search were performed in October 2020. An extensive literature search was conducted in the following databases: PubMed, Web of Science, Embase, China National Knowledge Infrastructure (CNKI), and Wanfang Database E-Resources. We only considered studies published before March 31, 2021. This study is registered with INPLASY, the number is INPLASY202130112.

The search terms used to identify studies were as follows: "COVID-19" or "2019 novel coronavirus infection" or "SARS-CoV-2 infection" & "mental health" or "depression" or "anxiety" or "stress" or "post-traumatic stress disorder (PTSD)" or "sleep" or "insomnia" & "medical staff" or "medical personnel" or "health care workers" & "China". References of related articles were also read through for relevant studies.

All studies were screened to exclude citations that were irrelevant. Two authors coevaluated the potentially relevant studies to be included. Exclusion criteria were applied for each candidate. If two authors who checked the relevance could not reach an agreement, the remaining authors could act as the arbiter.

The inclusion criteria were as follows: (1) the study involved Chinese medical staff working in hospitals during COVID-19. (2) Participants' symptoms were measured by validated scales. (3) The study reported anxiety, depression, sleep disorders or stress-related disorders. (4) The study was published in either Chinese or English.

The exclusion criteria were as follows: (1) The prevalence of each symptom (anxiety, depression, sleep disorders or stress-related disorders) was not available. (2) Duplicated records. (3) Sample size less than 100. (4) The study was not empirical research (conference abstracts, news reports, reviews, expert comments, case reports, dissertations).

2.2. Quality assessment for included studies

The quality of each included study was assessed by the Joanna Briggs Institute (JBI) scale (Munn et al., 2015) in April 2021. The JBI scale was developed by the Joanna Briggs Institute. We used a modified JBI scale to assess the methodological quality of a study. Specifically, the extent to which a study has addressed the possibility of bias in its design, conduct and analysis could be determined by this critical appraisal tool. Each study was evaluated using the following criteria: was the sample frame appropriate to address the target population? Were the study subjects and the setting described in detail?

2.3. Data Extraction

In April 2021, the following characteristics of each included study were extracted: authors, publication years, location of investigation, sample sizes, mean ages, female percentage, response conditions, working types, assessment scale, and rate of depression/anxiety/stress/sleep problems. "Female Percentage" was calculated as the ratio of female number to total number of males and females. "Working Type" includes first-line, nonfirst-line and mixed (whether they are first-line medical staff is not reported). First-Line, Non-First-Line and Mixed types were encoded as digital numbers 1, 2 and 3, respectively. As Hubei Province was the first area to be hit by COVID-19 in China, we defined the "Location" as Hubei Province, Non-Hubei Areas and National Areas (sample from national wide), which were encoded as digital numbers 1, 2 and 3, respectively.

2.4. Statistical analysis

Statistical analyses were conducted in R (version 3.5.3,) with the packages "meta" and "metafor"(Balduzzi et al., 2019). The I^2 and forest plots were used to identify the between-study heterogeneity of anxiety, depression, stress, and sleep problems in Chinese medical staff during the COVID-19 outbreak across the included studies. If I^2 was greater than 50%, a random-effects model was applied (Borenstein et al., 2010) to assess the proportion and accompanying 95% confidence intervals (CIs) of the four dimensions of mental problems. We then performed subgroup analysis, sensitivity analysis and meta-regression analyses to explore heterogeneities in effect sizes. We considered a p value < 0.05 to be statistically significant. The calculation of logit-transformed proportions and their standard errors can be done using these formulas. The meta-analysis function we can use in R performs this logit-transformation automatically. To calculate a proportion p, we have to divide the number of individuals

K falling into a specific subgroup by the total sample size n (SE, standard error).

$$p = \frac{k}{n} \quad \text{plogit} = \left(\frac{p}{1-p}\right) \quad SE_{\text{plogit}} = \sqrt{\frac{1}{np} + \frac{1}{n(1-p)}}$$

The pooled prevalence of medical staff was calculated with a 95% CI, and Egger's test was also applied to measure publication bias. Subgroup analysis and meta-regression analysis were used to explore the influential factors for the pooled prevalence of mental problems. Sensitivity analysis was performed to test the stability of these results. First-line workers might suffer from more serious mental health problems, such as anxiety, depression, and sleep problems. To further obtain the pooled prevalence of mental problems in first-line medical staff, we analyzed the data of first-line medical staff.

3. Results

3.1. Description of the included studies and publication bias analysis

We identified 476 studies concerning mental problems for Chinese medical staff during the COVID-19 outbreak (for more details, see Fig. 1). After removal of duplications and application of the inclusion/exclusion criteria, a total of 71 studies were identified, including 98,533 participants (see sTable 1 in the Supplementary materials). All studies met the quality criteria of the included studies in the quality assessment process (at least 7 "Yes" items). For more details, please refer to sTable 2 in the Supplementary materials.

INSERT Fig. 1

Among the included studies, 17 were conducted in Hubei Province, and the other 22 were conducted nationwide. The mean age of participants within all studies was 33.29 years (SD=2.31, ranging from 27.2 to 36 years). Within 60 studies that reported gender ratios, 89% were females (SD=19.05, ranging from 67% to 100%). Approximately 73% of the 71 studies included first-line medical staff. According to the results of Egger's funnel plot, publication bias for stress-related problems ($p < 0.05$) was indicated, which suggested that the pooled prevalence of stress must be interpreted with caution. (For more details see Supplemental sFig. 1 and sTable 3). No publication bias was observed for any other factors.

3.2. The pooled prevalence of mental problems for Chinese medical staff during the COVID-19 outbreak

Based on the random-effects model, the pooled prevalence was 0.27 (95% CI: 0.20 to 0.35) for anxiety, 0.29 (95% CI: 0.23 to 0.35) for depression, and 0.40 (95% CI: 0.34 to 0.47) for sleep problems (for more details, see ***Fig. 2***).

INSERT Fig. 2

The I^2 of the pooled prevalence of anxiety, depression and sleep

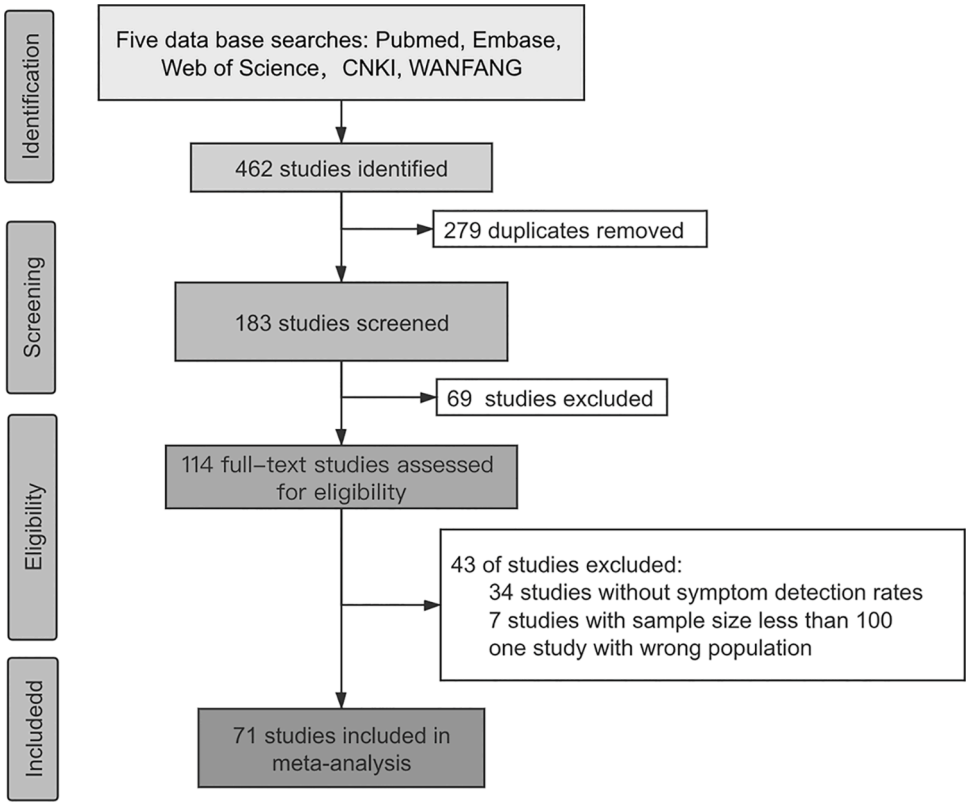


Fig 1. AAA

Table 1
The subgroup analysis of the pooled prevalence of mental problems for Chinese medical staff

Mental Problem Subgroup Analysis By Location and Sample	Pooled Prevalence(%) and 95% CI Mental Problem Subgroup Analysis By Working and Sample	Number of Included Studies			
	Pooled Prevalence(%) and 95% CI	Number of Included Studies			
Anxiety	26.77 [19.58, 34.63]	63 (N=76998)	Anxiety	26.77 [19.58, 34.63]	63 (N=76998)
Hubei Province (1)	28.68 [22.79, 34.95]	14 (N=13882)	First Line (1)	35.21 [30.30, 40.28]	29 (N=21112)
Non-Hubei Areas (2)	25.91 [19.20, 33.23]	29 (N=34756)	Non-First Line (2)	21.15 [7.03, 40.23]	15 (N=42124)
National Areas (3)	26.66 [11.26, 45.74]	20 (N=28360)	Mix (3)	19.07 [14.63, 23.94]	19 (N=13762)
Between Group Test	Q = 0.35	P = 0.84	Between Group Test	Q = 21.23	P = 0.00**
Depression	28.68 [19.58, 34.63]	56 (N=89390)	Depression	28.68 [22.88, 34.85]	56 (N=89390)
Hubei Province (1)	32.81 [20.75, 46.14]	13 (N=15055)	First Line (1)	37.36 [30.30, 44.71]	28 (N=38602)
Non-Hubei Areas (2)	26.01 [19.83, 32.71]	19 (N=31728)	Non-First Line (2)	22.72 [11.04, 37.08]	17 (N=39768)
National Areas (3)	29.30 [18.31, 41.67]	24 (N=42607)	Mix (3)	17.95 [12.70, 23.88]	11 (N=11020)
Between Group Test	Q = 0.96	P = 0.62	Between Group Test	Q = 17.39	P = 0.00**
Sleep	40.40 [33.79, 47.19]	25 (N=26937)	Sleep	40.40 [33.79, 47.19]	25 (N=26937)
Hubei Province (1)	50.86 [38.03, 63.63]	8 (N=7237)	First Line (1)	45.19 [36.86, 53.66]	14 (N=14197)
Non-Hubei Areas (2)	38.49 [26.83, 50.86]	6 (N=7255)	Non-First Line (2)	28.55 [19.08, 39.08]	5 (N=6845)
National Areas (3)	34.08 [29.20, 39.12]	11(N=12445)	Mix (3)	39.47 [25.30, 54.60]	6 (N=5894)
Between Group Test	Q = 5.86	P = 0.05	Between Group Test	Q = 5.9	P = 0.05

Note: *, $p < 0.05$; **, $p < 0.01$; CI, confidence interval.

Table 2
Results of meta-regression analysis of the sleep problem for first-line medical Staff

Predictors	Number of Included Studies	tau^2	I^2	H^2	R^2	Test of Predictors (P)
Female Percentage to Sleep	11	0.012	97.37%	38.04	37.15%	0.010**
Prevalence of Anxiety to Sleep	12	0.024	98.77%	81.27	16.27%	0.088
Prevalence of Depression to Sleep	13	0.027	99.12%	113.48	0.00%	0.703

Note: tau2: The estimated amount of residual heterogeneity; I2: The residual heterogeneity; H2: The unaccounted variability; R2: The amount of heterogeneity accounted for. (Due to the limited included studies of the Age information for Sleep studies, meta-regression analysis for the Mean Age to Sleep was not performed.)

problems were 100%, 100% and 99%, respectively. Then, we omitted one study at a time and tracked the change in I^2 to identify the contribution of each study to overall heterogeneity (Copas and Shi, 2000). The results showed that no studies contributed to more than 5% variability of I^2 (Supplemental Material sFig. 2).

3.3. Subgroup analysis

A random effects model applied to subgroup analysis of 'location' yielded a pooled prevalence for anxiety of 28.68%, 25.91% and 26.66% (random-effects model) for Hubei Province, non-Hubei Areas, and national areas, respectively. Similarly, the pooled prevalence of depression was 32.81% for Hubei Province, 26.01% for non-Hubei areas and 29.30% for national areas (random-effects model). The heterogeneity of both anxiety and depression was not statistically significant. For sleep problems, we found marginally significant heterogeneity between the location subgroups ($p = 0.05$). The pooled prevalence of sleep problems was 50.86%, 38.49% and 34.08% for Hubei, non-Hubei, and national areas, respectively. This result indicated that 'location' might be one of the influential factors only for the sleep problem. (see ***Table 1*** and Supplemental Material ***sFig. 3***).

Additionally, applying a random effects model, subgroup analysis of 'Working Type' showed a pooled prevalence of anxiety of 35.21% for first-line medical staff, 21.15% for nonfirst-line medical staff and 19.97% for combined data. The heterogeneity of anxiety between subgroups of 'Working Type' (first line/nonfirst line/mix) was significant ($p < 0.001$). The pooled prevalence of depression was 37.36%, 22.72% and 17.95% for the first-line, nonfirst-line and mixed subgroups, respectively. The heterogeneity of depression was also significant ($p < 0.001$). For sleep problems, there was marginally significant heterogeneity ($p = 0.05$). These results might imply that the working type is an important factor in the mental problems of medical staff during the COVID-19 pandemic. (see ***Table 1*** and Supplemental Material ***sFig. 4***).

3.4. Meta-regression analysis by 'Age' and 'Sex'

The impact of sex and age on mental problems was assessed by meta-regression analysis. As predictors, mean age and sex had no significant effect on anxiety, depression or sleep. (***sTable 4*** in Supplemental Material).

3.5. The sleep problem of first-line medical staff and its potential impact factors

In addressing the significant difference between first-line and nonfirst-line medical staff, the pooled prevalence of anxiety, depression, and sleep problems was 0.35 for anxiety (95% CI: 0.30 to 0.40), 0.38 for depression (95% CI: 0.31 to 0.45), and 0.45 for sleep problems (95% CI: 0.37 to 0.54) (***Fig. 3***).

INSERT Fig. 3

Sex was found to be a significant moderator ($p = 0.01$), which accounted for 37.15% of the total heterogeneity. The prevalence of anxiety accounted for 16.27% of the total heterogeneity, while no effect of the prevalence of depression was identified. This result suggested that sex and anxiety symptoms might be two influential factors for the sleep problems of first-line female medical staff. (For more details see Table 2).

4. Discussion

4.1. The main finding for this meta-analysis

The current meta-analysis on the mental health of medical staff during the COVID-19 outbreak found that the prevalence of depression,

Figure 2.1

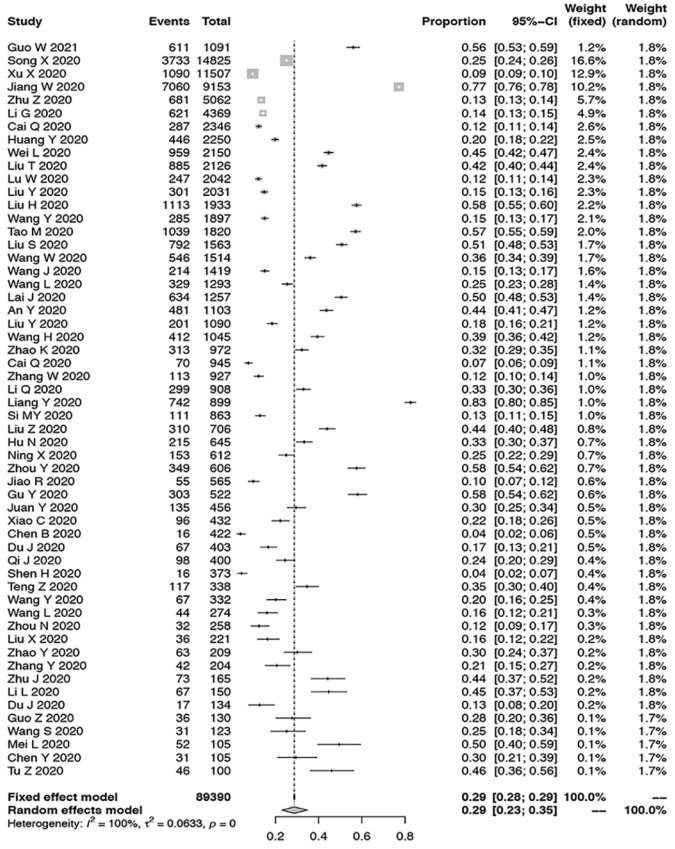
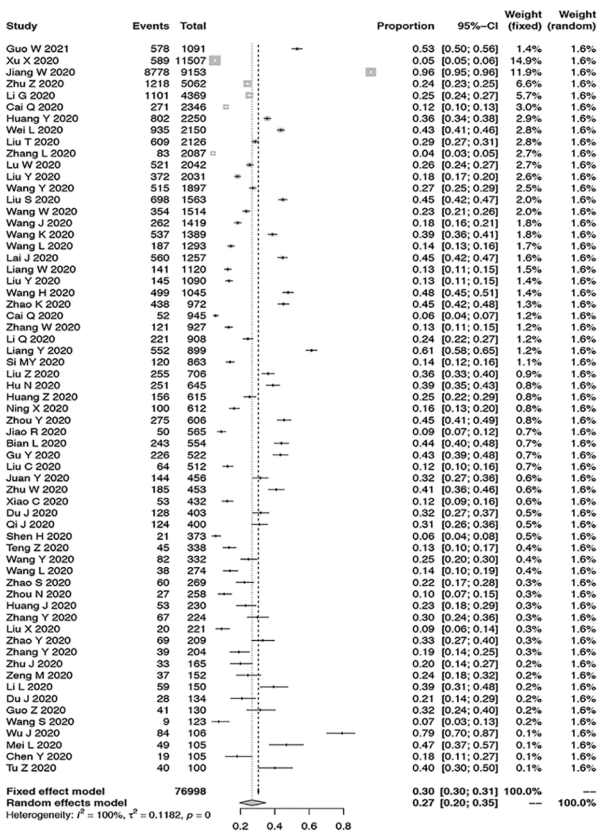


Figure 2.2



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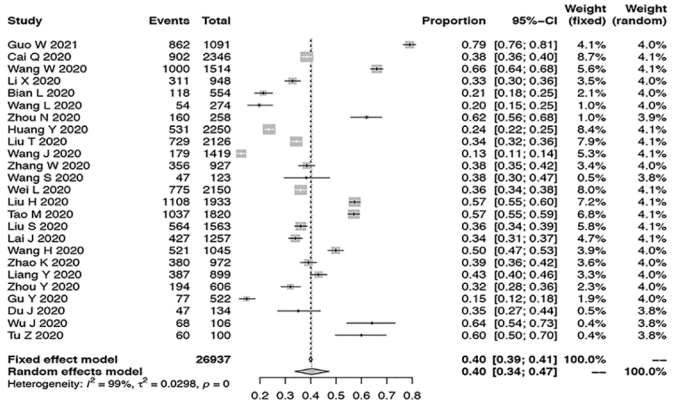


Fig. 2.1 The forest plot of the pooled prevalence of depression problems for Chinese medical staff

Fig. 2.2 The forest plot of the pooled prevalence of anxiety problems for Chinese medical staff

Fig. 2.3 The forest plot of the pooled prevalence of sleep problems for Chinese medical staff

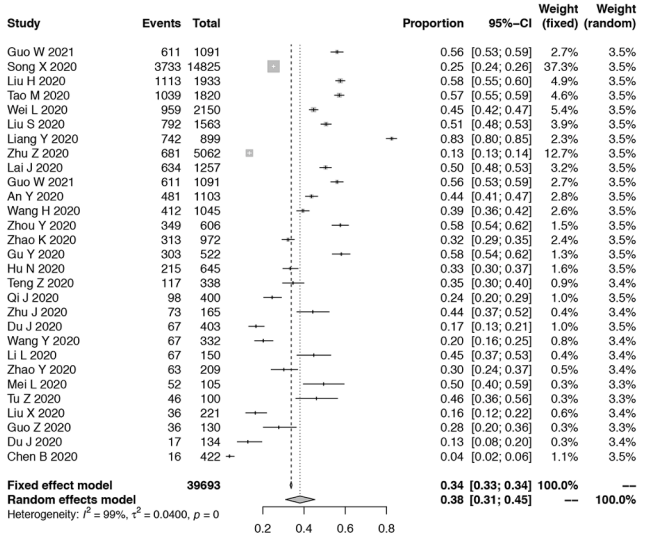
Fig 2. BBB

anxiety, and sleep problems accounted for 29%, 27%, and 40% of all problems among Chinese medical staff during the COVID-19 pandemic, respectively. A higher rate of anxiety, depression, and sleep difficulties for those working on the first line was revealed. Subgroup analyses suggested working type as an important factor influencing the mental state of medical staff. Significantly higher ratings of depression and anxiety between first-line and nonfirst-line workers were discovered. between sleep deficiency was among the most prominent factors hindering the health of medical staff in China. Sex was found to be a significant moderator of sleep problems in first-line medical staff, which accounted for 37.15% of the total heterogeneity.

Previous studies have shown that the mental problems of Chinese medical staff are worse than those of the general population (Zhou et al., 2018). The results in the present study provided evidence in support of this phenomenon. A recent meta-analysis demonstrated that the combined prevalence of mental problems in medical staff during the COVID-19 outbreak ranged from 22.6% to 36.3% for anxiety and 16.5 to 48.3% for depression (Pappa et al., 2020).

It is hardly surprising that COVID-19 poses a threat to the mental health of medical staff worldwide. The prevalence of mental health conditions varied greatly among countries. As one study in Switzerland found a 15% prevalence of depressive symptoms among medical staff during the COVID-19 outbreak (Krammer et al., 2020), another survey in Italy reported 19.80%, and 24.73% of medical staff showed depressive and anxiety symptoms (Rossi et al., 2020). Moreover, a study conducted in the United States reported that approximately 40% of medical staff suffered from mood disorders during the pandemic(Young et al., 2021). In Canada, the prevalence of anxiety and depression among medical staff was 38.1% and 32.1%, respectively (Mrklas et al., 2020).

Figure 3.1



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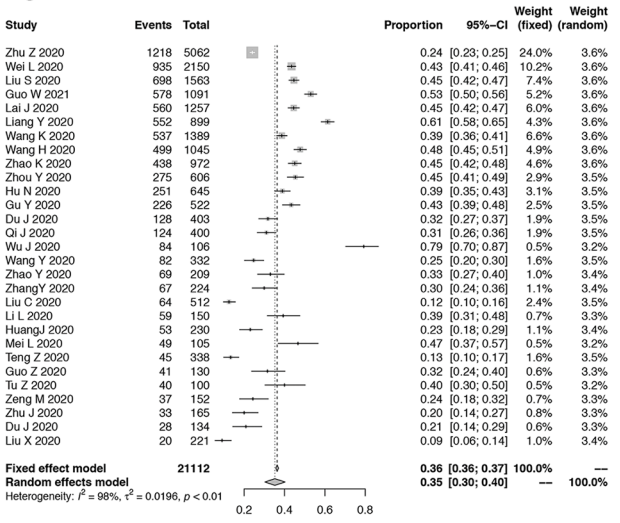

Figure 3.3

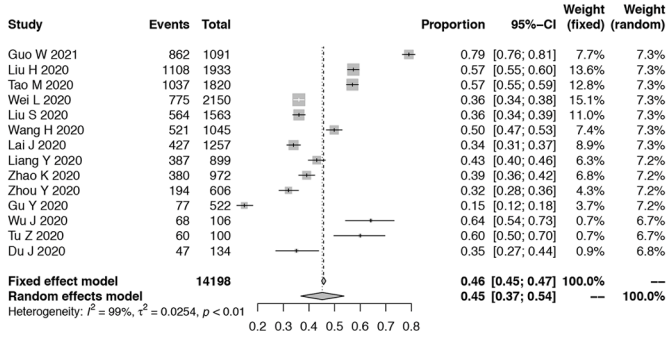

Fig. 3.1 The forest plot of the pooled prevalence of depression problems for the first-line medical staff

Fig. 3.2 The forest plot of the pooled prevalence of anxiety problems for the first-line medical staff

Fig. 3.3 The forest plot of the pooled prevalence of sleep problems for the first-line medical staff

Fig 3. CCC

4.2. High-risk groups and prominent symptoms

In this study, subgroup analysis showed that 'working type' (first-line/nonfirst line/mix) may be one of the influential factors for the mental health of medical staff. We found that mental problems were more prominent among first-line medical staff, who had a higher prevalence of depression and anxiety (37% and 35%, respectively), while 42% had sleep problems. First-line medical staff face mental stress, physical exhaustion, separation from their families, stigma, and other mental health-related stressors (Chersich et al., 2020). Therefore, we need to pay more attention to first-line medical staff.

The most prominent mental health problem among Chinese medical staff during the pandemic seems to be sleep problems. Indeed, it has been found that the overall sleep quality of first-line clinical nurses in COVID-19 was extremely poor, with the proportion of sleep problems being 64.15% (Wu et al., 2020). Another study found that the prevalence of insomnia for first-line medical staff in Hubei was as high as 79% (Guo et al., 2021), a result corroborated by this study. However, we have paid less attention to the sleep problems of medical workers during the pandemic. Insomnia can adversely affect an individual's physical, mental, emotional and overall health (Zhou and Recklitis, 2020) by reducing alertness toward cognitive and psychomotor performances (Harrison and Horne, 2000), thus leading to reduced work efficiency (Kessler et al., 2011). A good night's sleep not only helps medical staff to better treat patients but also maintains optimal immune function and prevents COVID infection (Lange et al., 2010). Therefore, efforts to prevent and alleviate insomnia should be made across the globe, especially for those working on the first-line anti-COVID-19 battlement.

In addition, gender was found to be a significant influencer on the level of insomnia among medical workers. One possible reason for this phenomenon might be the high ratio of females among nurses, who accounted for the majority of anti-COVID forces in China. Nurses are at higher risk of suffering from psychological problems (Liu et al., 2020c) due to frequent night shifts (Eldevik et al., 2013). The intense workload during the COVID outbreak aggravated insomnia for doctors and nurses alike.

Furthermore, the prevalence of anxiety might interact with insomnia among first-line health workers. The relationship between sleep and mood disorders is complex (Weaver et al., 2018). Sleep disorders were often found to be accompanied by anxiety and depression (Weaver et al., 2018). Sleep quality might be improved through the management of anxiety levels (Edwards et al., 2015). Therefore, more attention should be given to the sleep problems of medical staff, especially female staff on the first-line with anxiety symptoms.

For the significant mental problems of the medical staff in China, three possible reasons account for this. First, the data included in this study were mainly collected in the early period of COVID-19 when the pandemic was the most severe in China. Second, we have little understanding of the pandemic in the early stage, and there is a lack of sufficient material and medical preparation, as well as unified deployment and planned psychological intervention activities for the pandemic (Duan and Zhu, 2020). Third, mental care for medical staff seems to be neglected in the early stage. Most medical staff in China seem to lack coping strategies for stress. Overall, it is very important to pay more attention to medical staff when they deal with the public health crisis, especially for first-line workers in the early stage of the crisis.

4.3. Measures to alleviate mental health problems among medical staff during COVID-19

Challenges faced by first-line medical staff need to be addressed promptly. Regarding methods aiming to alleviate mental conditions, prevention proves more effective than treatment (Walton et al., 2020). Preventive measures such as adequate supplies of protective equipment, detailed rules for the management of protective equipment and more comprehensive prejob training might reduce the risk of infection among first-line medical staff and would help reduce stress and anxiety in the event of an outbreak (Chen et al., 2020). At the national level, psychological emergency response plans should be formulated to address a major public health crisis, with sufficient emergency personnel reserved. In the face of a pandemic, contingency plans related to mental health should be launched in time, for instance, a unified command and deployment of psychological assistance. Psychological intervention should include overall planning and the actual implementation of intervening measures. Psychological problems must be graded for treatments to be distributed reasonably according to different severities. Additionally, to improve the effectiveness of psychological interventions, intense personnel training along with targeted intervention measures should be considered (Duan and Zhu, 2020).

Moreover, it was previously noted that symptoms of insomnia may be due to long working hours, isolation, fear of being infected, and lack of control of the outbreak (Ran et al., 2020; Zhang et al., 2020a). Medical workers and hospitals should be encouraged to ensure regular sleeping hours and take measures to improve existing sleep conditions (Belingheri et al., 2020). In individualized treatment, psychosocial factors need to be addressed as potential risk factors for insomnia(Ferini-Strambi et al., 2020). Studies have found online cognitive–behavioral therapy (CBT) to be effective in treating insomnia (Freeman et al., 2017), which indicated that internet CBT is a good choice for alleviating insomnia for medical staff (Schutte-Rodin et al., 2008). Traditional Chinese medicine and/or martial arts such as Taijiquan and Qigong might also reduce psychological pressure and improve the quality of sleep for medical staff (Wu and Wei, 2020). Fortunately, China has endeavored to reduce the adverse impact caused by COVID-19 (Kang et al., 2020; Lai et al., 2020; Li et al., 2020a). Based on the results of this study, we suggest that psychological assistance to first-line medical staff be carried out specifically.

4.4. Limitations for this meta-analysis

Several limitations are noted in this study. First, the articles included in the study used divergent measurements to assess mental health, which might have led to heterogeneity in the pooled prevalence. Second, most studies adopt online surveys and convenient sampling, which may lack the representativeness of the samples. Third, potential influencing factors chosen in this study are still limited, and future studies may benefit from larger sample sizes and more relevant factors. Long-term effects of COVID-19 on the mental health of medical staff warrant further investigation.

5. Conclusions

This meta-analysis, which included 98,533 medical staff from 71 studies, found prevalent mental problems among Chinese medical staff during the COVID-19 outbreak. Among the different dimensions of mental problems, the prevalence of insomnia was generally high, especially for first-line workers. With a relatively large sample size, our study provided evidence that helps facilitate psychological care policy-making for medical staff during this ongoing public health crisis.

Declaration of Competing Interest

None

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Supplementary materials

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