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Risk Factors for Post-Traumatic Stress Disorder Among Nurses in Regional Medical Alliances During the COVID-19 Pandemic: A Prospective Cross-Sectional Study

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ABSTRACT

During the COVID-19 pandemic, nursing professionals have faced increasing mental health challenges. Despite this, there is a lack of research examining post-traumatic stress disorder (PTSD) specifically among nurses in Medical Alliances. This study sought to explore factors contributing to PTSD in nurses working within the Regional Medical Alliance (MA) in Shantou, China, during the early stages of the pandemic. From February to March 2020, 1,286 nurses across four MA hospitals participated in the study. The findings showed that 15.6% of nurses experienced PTSD, while rates of depression, anxiety, and sleep disturbances were 35.5%, 18.3%, and 36.4%, respectively. PTSD was found to be significantly associated with higher levels of depression, anxiety, and sleep problems. Further analysis using logistic regression revealed that nurses working in tertiary hospitals, older nurses, and those with more severe depression, anxiety, or sleep disorders were at greater risk for developing PTSD. These results underscore the need for targeted mental health support for nurses at higher risk within Medical Alliances.

words: Post-traumatic stress disorders, COVID-19, Nursing, Mental health, Sleep quality, Depression

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Introduction

Post-traumatic stress disorder (PTSD) is a mental health condition that can develop after an individual experiences or witnesses events that are extremely threatening or traumatic [1, 2]. It is commonly characterized by persistent re-experiencing of traumatic events through flashbacks or intrusive thoughts, avoidance of reminders associated with the trauma, and heightened arousal or vigilance [2, 3]. When prolonged, PTSD can severely impair psychological functioning, social interactions, and overall quality of life [1].

The COVID-19 pandemic, caused by the novel coronavirus, has contributed to a global rise in PTSD prevalence, affecting individuals across all demographics [4]. Since its emergence in Wuhan, China, in December 2019, the virus has spread rapidly, profoundly impacting public health systems and daily life worldwide [5–8]. Healthcare systems in China and other nations have been under considerable strain since the onset of the pandemic [9, 10]. Among healthcare workers, nurses have faced heavy workloads, abrupt changes in work patterns, and increased exposure risk to infection [10, 11]. Additionally, the presence of physical symptoms has been identified as an independent risk factor for adverse psychological outcomes [12]. These circumstances underscore the importance of implementing evidence-based mental health interventions and assessing the psychological well-being of frontline nurses during the pandemic.

Research from previous epidemics, such as SARS and MERS, indicates that PTSD, depression, anxiety, and sleep disturbances are among the most prevalent mental health challenges and can have long-term consequences [1, 3, 7–11, 13]. However, studies examining all four of these critical psychological dimensions simultaneously are limited. To date, no quantitative research has assessed PTSD, depression, anxiety, and sleep disorders collectively among nurses working in Medical Alliances (MA) during COVID-19. In China, a Regional Medical Treatment

Alliance typically centers around a grade-A-class-3 hospital that coordinates regional medical resources and integrates education and research to enhance healthcare efficiency [13, 14]. Such alliances offer advantages, including optimal resource distribution, continuity of care, and improved accessibility [13, 15, 16]. Nonetheless, there is a lack of research on the mental health of nurses within regional MAs during the COVID-19 outbreak.

This study therefore aimed to examine the prevalence of PTSD and its associated risk factors among nurses in the MA during the early stages of the COVID-19 pandemic in China. The findings are expected to provide evidence to inform healthcare policymakers and administrators in identifying key contributors to poor mental health and in developing strategies to support the psychological well-being of nurses in these regional medical networks.

Materials and Methods

Study design and participants

This prospective cross-sectional study recruited clinical nurses from four hospitals between February and March 2020. The study utilized the resources of the Regional Medical Alliance (MA) in Shantou, China, with the First Affiliated Hospital of Shantou University Medical College serving as the core institution.

Eligibility criteria included: 1) possession of a valid nursing qualification, and 2) consistent nursing practice beginning no later than December 2019. Exclusion criteria were: 1) nurses employed in non-clinical roles or without routine patient contact (e.g., administrative positions), 2) nursing students or interns, and 3) questionnaires that were incomplete or contained responses deemed implausible.

Ethical approval was obtained from the Clinical Research Ethics Committee of the First Affiliated Hospital of Shantou University Medical College (Approval No. 2020-008). Participants completed the study via an anonymous online self-administered questionnaire, distributed through WeChat and Wenjuanxing platforms via a QR code or direct website link. Electronic informed consent was obtained prior to participation; the consent form presented two options, “yes” or “no,” and only those who selected “yes” could proceed to the questionnaire. Participants were free to withdraw at any time. To enhance response rates, participants who completed and submitted the survey were given random incentives, such as verbal recognition or small rewards like snacks and gifts.

Measures

Information on participants’ demographics included age, sex, marital status, education level, professional qualifications, department, years of nursing experience, managerial roles, type of employment, work shifts, changes in responsibilities during the pandemic, and involvement in frontline medical teams in Wuhan.

Post-traumatic stress symptoms were measured using the PTSD Self-Rating Scale (PTSD-SS) [17], which comprises 24 items spanning five domains: perceived impact of traumatic events, re-experiencing symptoms, avoidance behaviors, hypervigilance, and social functioning impairment. Responses were recorded on a 5-point Likert scale, with a total score of 50 or higher considered indicative of PTSD. The scale demonstrated excellent internal consistency (Cronbach’s $\alpha = 0.921$) [18].

Depression was assessed via the Self-Rating Depression Scale (SDS) [19], employing a 4-point Likert scoring system. Severity levels were categorized as normal (<50), mild (50–59), or moderate-to-severe (≥60). Reliability analysis showed good consistency, with a Cronbach’s α of 0.802 [20].

Anxiety was evaluated using the Self-Rating Anxiety Scale (SAS) [21], also based on a 4-point Likert scale. Anxiety severity was classified similarly to depression: normal (<50), mild (50–59), or moderate-to-severe (≥60). The instrument displayed excellent reliability, with Cronbach’s $\alpha = 0.931$ [22].

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) [23], which includes 24 items covering seven aspects: overall sleep quality, time to fall asleep, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep aids, and daytime dysfunction. Each item was rated on a 5-point Likert scale, and scores of 7 or higher indicated a sleep disorder. The PSQI demonstrated good internal reliability (Cronbach’s $\alpha = 0.842$) [24].

Statistical analysis

Data analysis was carried out using SPSS version 20.0 (IBM Corp., Armonk, NY, USA). For continuous variables, the Kolmogorov-Smirnov test was applied to assess distribution normality, and results are presented as mean ± standard deviation. Categorical variables were summarized as frequencies and percentages, with comparisons

performed using either the chi-square test or Fisher's exact test when appropriate. Relationships between mental health measures were examined using Pearson correlation coefficients. To determine independent predictors of PTSD, logistic regression analysis was conducted employing the backward Wald approach. Statistical significance was defined as a two-tailed p-value less than 0.05.

Results and Discussion

Analysis of baseline characteristics of 1286 nurses

Initially, 1,334 questionnaires were collected. After removing 40 surveys due to incompleteness or questionable responses, 1,286 valid questionnaires remained, corresponding to a response rate of 96.4%. Participants' ages ranged from 19 to 55 years, with a mean of 30.0 ± 8.3 years, and females comprised the vast majority (96.6%). The overall rate of PTSD among the nurses was 15.6% (200 of 1,286). Analysis revealed that PTSD prevalence varied significantly according to hospital grade, age, administrative responsibilities, department, shift schedules, and changes in duties during the pandemic, including participation in frontline teams (all $p < 0.05$). No significant differences were observed with respect to gender, education level, professional certification, marital status, employment type, years of experience, or frontline nursing status (all $p > 0.05$) **(Table 1).**

Table 1. Baseline characteristics of 1,286 nurses categorized by the presence or absence of PTSD, n (%).

Variable	Total (n = 1286)	No PTSD (n = 1086)	PTSD (n = 200)	χ^2	P-value
Hospital Level				20.299	0.002*
Secondary hospitals	256 (19.9%)	232 (90.6%)	24 (9.4%)		
Tertiary hospitals	1030 (80.1%)	854 (82.9%)	176 (17.1%)		
Age Group (years)				18.579	0.001*
≤25	476 (37.0%)	422 (88.7%)	54 (11.3%)		
26–30	385 (29.9%)	328 (85.2%)	57 (14.8%)		
31–35	151 (11.7%)	125 (82.8%)	26 (17.2%)		
36–40	87 (6.8%)	68 (78.2%)	19 (21.8%)		
>40	187 (14.5%)	143 (76.5%)	44 (23.5%)		
Gender				0.040	0.540
Male	44 (3.4%)	37 (84.1%)	7 (15.9%)		
Female	1242 (96.6%)	1049 (84.5%)	193 (15.5%)		
Education				1.696	0.638
Secondary school	494 (38.4%)	412 (83.4%)	82 (16.6%)		
Junior college	328 (25.5%)	277 (84.5%)	51 (15.5%)		
Undergraduate	448 (34.8%)	382 (85.3%)	66 (14.7%)		
Master's degree	16 (1.2%)	15 (93.8%)	1 (6.2%)		
Professional Rank				2.241	0.692

Trainee nurse	450 (35.0%)	382 (84.9%)	68 (15.1%)		
General nurse	528 (41.1%)	440 (83.3%)	88 (16.7%)		
Nurse in charge	257 (20.0%)	223 (86.8%)	34 (13.2%)		
Deputy chief nurse	45 (3.5%)	36 (80.0%)	9 (20.0%)		
Chief nurse	6 (0.5%)	5 (83.3%)	1 (16.7%)		
Administrative Role				4.410	0.030*
None	1201 (93.4%)	1021 (85.0%)	180 (15.0%)		
Head nurse	85 (6.6%)	65 (76.5%)	20 (23.5%)		
Marital Status				1.364	0.505
Unmarried	498 (38.7%)	417 (83.7%)	81 (16.3%)		
Married	782 (60.8%)	663 (84.8%)	119 (15.2%)		
Divorced or widowed	6 (0.5%)	6 (100%)	0 (0%)		
Department				18.974	0.002*
Infection & respiratory	71 (5.5%)	64 (90.1%)	7 (9.9%)		
Internal medicine (other)	243 (18.9%)	220 (90.5%)	23 (9.5%)		
Surgery	328 (25.5%)	295 (89.9%)	33 (10.1%)		
Emergency/critical care	146 (11.4%)	112 (76.7%)	34 (23.3%)		
Gynecology/pediatrics	215 (16.7%)	188 (87.4%)	27 (12.6%)		
Other departments	283 (22.0%)	250 (88.3%)	33 (11.7%)		
Employment Type				0.451	0.996
Government	164 (12.8%)	144 (87.8%)	20 (12.2%)		
Agency	239 (18.6%)	211 (88.3%)	28 (11.7%)		
Contract	883 (68.7%)	774 (87.7%)	109 (12.3%)		
Work Experience (years)				0.495	0.920
1–5	606 (47.1%)	512 (84.5%)	94 (15.5%)		
5.1–10	367 (28.5%)	307 (83.7%)	60 (16.3%)		
10.1–15	103 (8.0%)	89 (86.4%)	14 (13.6%)		
>15	210 (16.3%)	178 (84.8%)	32 (15.2%)		

Shift Arrangement				16.943	<0.001*
Day shift	350 (27.2%)	318 (90.9%)	32 (9.1%)		
Night shift	700 (54.4%)	581 (83.0%)	119 (17.0%)		
Irregular night shift	236 (18.4%)	187 (79.2%)	49 (20.8%)		
Duty Reassignment During Pandemic				4.479	0.022*
No	922 (71.7%)	791 (85.8%)	131 (14.2%)		
Yes	364 (28.3%)	295 (81.0%)	69 (19.0%)		
Applied to Join Medical Team				3.614	0.033*
No	1139 (88.6%)	954 (83.7%)	185 (16.3%)		
Yes	147 (11.4%)	132 (89.8%)	15 (10.2%)		
Frontline Participation				1.009	0.184
No	1085 (84.4%)	921 (84.8%)	164 (15.1%)		
Yes	201 (15.6%)	165 (82.1%)	36 (17.9%)		

PTSD, post-traumatic stress disorder self-rating scale; *denotes the statistically significant at $P < 0.05$.

Analysis of PTSD-SS, SDS, SAS, and PSQI scores among nurses

The mean PTSD-SS score among participants was 37.55 ± 14.15, with the highest contributions coming from the re-experiencing subscale (11.34 ± 4.41) and the avoidance subscale (10.29 ± 4.22). The average scores for depression (SDS) and anxiety (SAS) were 47.91 ± 11.91 and 40.93 ± 10.06, respectively. Sleep quality, assessed via the PSQI, yielded a mean total score of 6.52 ± 3.69, with sleep latency (1.50 ± 0.99) accounting for the largest subscale contribution **(Table 2).**

Table 2. Assessment of PTSD severity, depressive symptoms, anxiety, and sleep quality among participants.

Variable	Mean ± SD
PTSD Symptom Scale (PTSD-SS)	37.55 ± 14.15
Subjective perception of traumatic events	2.12 ± 0.96
Re-experiencing symptoms	11.34 ± 4.41
Symptom avoidance	10.29 ± 4.22
Hyperarousal symptoms	9.21 ± 3.75
Impaired social functioning	3.27 ± 1.45
Self-Rating Depression Scale (SDS)	47.91 ± 11.91
Self-Rating Anxiety Scale (SAS)	40.93 ± 10.06
Pittsburgh Sleep Quality Index (PSQI)	6.52 ± 3.69
Sleep quality component	1.07 ± 0.75
Sleep latency	1.50 ± 0.99
Sleep duration	0.98 ± 0.81
Habitual sleep efficiency	0.97 ± 0.95
Sleep disturbances	1.06 ± 0.62
Use of sleep medication	0.08 ± 0.39
Daytime dysfunction	0.86 ± 0.83

Abbreviations: PTSD-SS, Post-Traumatic Stress Disorder Self-Rating Scale; SDS, Self-Rating Depression Scale; SAS, Self-Rating Anxiety Scale; PSQI, Pittsburgh Sleep Quality Index.

Correlation analyses indicated a clear link between PTSD symptoms and other mental health outcomes. Nurses reporting higher PTSD-SS scores also tended to experience more severe depressive and anxious symptoms, as well as poorer sleep quality. Specifically, PTSD-SS was moderately correlated with depression ($r = 0.49$), strongly correlated with anxiety ($r = 0.64$), and moderately correlated with sleep disturbance ($r = 0.49$), with all associations reaching statistical significance ($p < 0.001$). When examining symptom severity, the prevalence of PTSD rose progressively with higher levels of depression and anxiety. Similarly, differences in PTSD occurrence were observed across varying grades of sleep disturbance, highlighting that nurses with more pronounced psychological or sleep problems were more likely to meet criteria for PTSD (all $p < 0.001$) **(Table 3).**

Table3. PTSD prevalence among nurses according to severity categories of depression, anxiety, and sleep disorders, n (%).

Variable	Total (n = 1286)	No PTSD (n = 1086)	PTSD (n = 200)	χ^2	P-value
Anxiety Level				336.163	< 0.001*
Normal	1051 (81.7%)	973 (92.6%)	78 (7.4%)		
Mild	181 (14.1%)	103 (56.9%)	78 (43.1%)		
Moderate–Severe	54 (4.2%)	10 (18.5%)	44 (81.5%)		
Depression Level				165.548	< 0.001*
Normal	830 (64.5%)	768 (92.5%)	62 (7.5%)		
Mild	363 (28.2%)	275 (75.8%)	88 (24.2%)		
Moderate–Severe	93 (7.2%)	43 (46.2%)	50 (53.8%)		
Sleep Disorder				172.893	< 0.001*
No	818 (63.6%)	773 (94.5%)	45 (5.5%)		
Yes	468 (36.4%)	313 (66.9%)	155 (33.1%)		

*denotes the statistically significant at $P < 0.05$.

Analysis of risk factors affecting the occurrence of PTSD in nurses

Age was identified as a significant factor associated with PTSD, with nurses aged 36–40 exhibiting more than twice the risk compared to younger staff (OR = 2.15; 95% CI: 1.02–4.49; p = 0.043), and those over 40 years showing an even higher likelihood (OR = 2.36; 95% CI: 1.32–4.21; p = 0.004). Working in a tertiary hospital was also linked to an increased risk of PTSD (OR = 1.92; 95% CI: 1.12–3.31; p = 0.018). Among psychological factors, moderate-to-severe depression more than doubled the odds of PTSD (OR = 2.35; 95% CI: 1.18–4.69; p = 0.004), while anxiety had the strongest effect, elevating the risk nearly eighteenfold (OR = 18.46; 95% CI: 7.75–43.97; p < 0.001). Sleep disturbances were another independent contributor, increasing the likelihood of PTSD by over four times (OR = 4.15; 95% CI: 2.78–6.20; p < 0.001) **(Table 4).**

Table 4. Multivariate logistic regression analysis identifying factors independently associated with PTSD among nurses.

Variable	OR	95% CI	P-value
Hospital Grade			
Secondary hospitals (reference)	1	—	—
Tertiary hospitals	1.92	1.12–3.31	0.018*
Age (years)			
≤ 25 (reference)	1	—	—
26–30	1.55	0.94–2.56	0.087
31–35	1.64	0.88–3.04	0.118
36–40	2.15	1.02–4.50	0.043*
>40	2.36	1.32–4.21	0.004*
Administrative Role			
No (reference)	1	—	—
Yes	1.88	0.99–3.60	0.055
Department Type			
Infectious & Respiratory (reference)	1	—	—
Other Internal Medicine	0.97	0.55–1.70	0.918
Surgery	1.50	0.81–2.76	0.194
Emergency & Critical Care	1.65	0.88–3.09	0.122

Gynecology, Surgery & Pediatrics	0.66	0.35–1.23	0.187
Other Departments	1.12	0.44–2.82	0.816
Anxiety Severity			
Normal (reference)	1	—	—
Mild	4.21	2.65–6.70	<0.001*
Moderate–Severe	18.46	7.75–43.97	<0.001*
Depression Severity			
Normal (reference)	1	—	—
Mild	1.74	1.11–2.74	0.016*
Moderate–Severe	2.35	1.18–4.69	0.016*
Sleep Disorders			
No (reference)	1	—	—
Yes	4.15	2.78–6.20	<0.001*

*P-values are significant at 95% confidence interval (P < 0.05). OR, odds ratio; CI, confidence interval.

The COVID-19 pandemic has exposed weaknesses in healthcare systems, forcing hospitals around the world to make challenging decisions regarding patient triage and admission. In hindsight, the pandemic provides a critical opportunity to examine and rectify these systemic gaps, enhancing preparedness for future public health crises [25]. Understanding the factors that contribute to PTSD among nurses working on the frontlines is therefore essential, both for safeguarding their mental health and for maintaining the overall effectiveness of healthcare delivery. Our study found that working in higher-level hospitals within the Medical Alliance, advanced age, and more severe symptoms of depression, anxiety, and sleep disturbances were independently associated with PTSD among nurses during the COVID-19 outbreak. In contrast, changes in job duties during the pandemic and direct frontline experience did not show a significant relationship with PTSD development in this cohort. These insights may inform future research and guide the design of targeted psychological interventions during public health emergencies.

Risk factors associated with PTSD in nurses

Numerous studies have investigated PTSD among nurses during the COVID-19 pandemic, identifying a variety of contributing factors. For instance, Jiang *et al*. [26] reported that PTSD prevalence was linked to average monthly income, length of professional experience, number of children, and scores on the Post-Traumatic Growth Inventory and Nurses' Perceived Professional Benefits Scale. Marcomini *et al*. [27] found that employment in emergency departments, irregular work shifts, and prior experience in mental health wards increased the likelihood of a provisional PTSD diagnosis. Chen *et al*. [28] observed that female nurses working in critical care units, COVID-19-designated hospitals, or COVID-19-specific departments were more susceptible to traumatic stress and emotional exhaustion. Similarly, Bassi *et al*. [29] noted that being female, working as a nurse, serving on the frontline, or experiencing job-related languishing were associated with higher PTSD risk among healthcare workers. In Korea, factors such as employment in designated COVID-19 hospitals, staffing shortages, and experiencing COVID-19 symptoms were linked to PTSD [30]. In Uganda, inadequate social support, fear of infection, and increased workload contributed to PTSD in nurses [31]. Lazar *et al*. [32] further highlighted that simply caring for COVID-19 patients represented a significant trauma risk. The diversity of identified risk factors likely reflects differences in healthcare systems, management practices, and study designs across countries. Nevertheless, factors consistently reported across multiple studies may serve as reliable predictors of PTSD in nurses during pandemics.

Hospitals in a medical alliance

Variations in levels of specialized care are influenced by factors such as patient volume, case complexity, and staff turnover. Nurses working in higher-grade hospitals often face increased workloads and greater psychological strain [33]. In the context of this study, tertiary hospitals were responsible for admitting critically ill patients, including those with COVID-19, transferred from other units. Our multiple linear regression analysis revealed that nurses in tertiary hospitals had a 1.92-fold higher likelihood of experiencing PTSD compared with their counterparts in secondary hospitals. These results indicate that nurses in tertiary settings are exposed to greater physical and mental stress, highlighting the need to account for hospital grade when designing targeted interventions to support their well-being.

Characteristics of nurses

A multicenter study conducted across the Asia-Pacific region demonstrated that healthcare workers were susceptible to psychological distress during the COVID-19 pandemic, regardless of local case numbers or mortality rates [34]. Emergency departments, which manage suspected cases, and intensive care units, which treat confirmed patients, place nurses at particularly high risk for PTSD due to prolonged and intense exposure [27, 35, 36]. In the present study, nurses in emergency and critical care units showed higher PTSD rates compared with those in internal medicine and surgical departments, though these differences did not reach statistical significance, consistent with prior research [28, 37, 38]. The elevated PTSD prevalence in these units may reflect the deployment of more senior or head nurses to manage complex situations, including patient conflicts, heavy workloads, and staffing shortages. This observation aligns with our finding that older nurses were more prone to developing PTSD.

Relationship of anxiety, depression, sleep disorders, and PTSD

Anxiety, depression, sleep disturbances, and PTSD appear to interact in a mutually reinforcing manner. Previous research has shown that nurses experiencing PTSD are more likely to suffer from comorbid anxiety, depression, and burnout, and that PTSD itself can worsen these psychological conditions [39]. Other studies suggest that symptoms of anxiety and depression may be secondary manifestations of PTSD [40]. Sleep disturbances, a core component in diagnosing PTSD, can also serve as indicators of its severity and trajectory, and interventions targeting sleep problems have been found to reduce PTSD symptom burden [41, 42]. In line with these findings, nurses in the present study reported heightened levels of anxiety, depression, and sleep difficulties during the COVID-19 pandemic [35, 37]. Correlation analyses further indicated that higher scores on depression, anxiety, and sleep quality assessments were associated with greater PTSD severity, highlighting that these psychological and sleep-related problems increase vulnerability to PTSD. This bidirectional relationship suggests that impaired sleep can both result from and contribute to elevated anxiety and depressive symptoms. Therefore, strategies aimed at supporting nurses' mental health during pandemics should focus on alleviating anxiety, depression, and sleep disturbances to help prevent the development or worsening of PTSD.

Mechanism for resource integration of MA

The Medical Alliance (MA) model offers several structural and operational advantages that may strengthen healthcare responses to large-scale crises, such as the COVID-19 pandemic. In this study, the prevalence of PTSD among clinical nurses within MAs was 15.6%, slightly lower than the 22–32.1% range reported in previous studies [33, 43]. This reduced incidence may reflect the coordinated organization and collaboration inherent to the MA system. During the early stages of the pandemic, lead hospitals within MAs implemented uniform epidemic prevention and control strategies, provided technical support, and delivered professional training to lower-tier hospitals [44]. These measures likely enhanced medical care quality and facilitated the integration of resources across units. Additionally, preventive actions—such as routine disinfection and efficient distribution of medical supplies—were rapidly executed through centralized coordination, ensuring that all MA hospitals were adequately prepared for COVID-19. The lead hospitals also extended psychological support to nursing staff across all units, including mental health training and both online and in-person counseling services. Collectively, these factors may help explain why PTSD prevalence in MA nurses was lower than that observed in other countries.

Centralized management within MAs can also influence nurses' confidence and perceived support. Prior research has suggested that inadequate leadership increases the likelihood of PTSD among nurses [45]. By consolidating oversight under competent management, the MA model may enhance staff trust and resilience. These observations highlight the potential value of the MA system in improving preparedness and mental health outcomes during pandemics, though further research is needed to evaluate its broader applicability and effectiveness in large-scale healthcare responses.

Practical implications

These findings carry important implications for theory, policy, and clinical practice. Our study identified clear links between psychosocial factors and adverse mental health outcomes among nurses working in Medical Alliances (MA) during the COVID-19 pandemic. Considering the bidirectional relationship between PTSD and other mental health issues such as anxiety, depression, and sleep disturbances, it is essential for healthcare

administrators to implement comprehensive, integrated interventions. Such approaches might include psychological counseling, cognitive-behavioral therapy, stress management programs, and relaxation techniques. Policymakers and healthcare authorities should establish protocols, guidelines, and supportive practices specifically aimed at high-risk groups, including nurses in tertiary hospitals, older staff, and those with more severe depression, anxiety, or sleep disorders. Simultaneously, psychiatrists, psychologists, and psychotherapists should take these factors into account when designing individualized treatment and support plans for clinical nurses. Furthermore, the findings suggest that centralized resource management and coordinated care, as exemplified by the MA model, can enhance healthcare system responsiveness during large-scale crises. Future research should prioritize the evaluation and refinement of targeted interventions to prevent and mitigate PTSD and other psychological difficulties among nurses during major public health events.

Limitations and strengths

This study has several limitations. First, its cross-sectional design prevents any conclusions about causality. Although we observed a strong relationship between physical symptoms and psychological distress, it remains unclear whether mental health issues contributed to the physical symptoms or vice versa. Second, due to strict hospital infection control measures, the survey was administered online rather than in person, and symptom reports could not be verified by medical professionals, which may have affected data accuracy. Third, the study focused only on nurses from tertiary and secondary hospitals within the MA, excluding those from community hospitals due to limited staffing and resources. Finally, the subset of nurses experiencing moderate-to-severe anxiety and depression was relatively small. These findings warrant confirmation through multicenter, large-scale, and longitudinal studies.

Despite these limitations, the study also has several notable strengths. To our knowledge, this is the first study to assess four key psychological factors—PTSD, anxiety, depression, and sleep disturbances—among clinical nurses within the MA during the COVID-19 pandemic. The use of self-rated scales allowed for detailed evaluation and subgroup analyses of participants. Additionally, the sample size (n = 1,286) was larger than that of most comparable studies, and it included nurses from multiple hospital levels and diverse departments, enhancing the generalizability of the results.

Conclusion

The findings of this study emphasize the importance of prioritizing the mental health of nurses during a pandemic, particularly for those at elevated risk of developing PTSD. Timely and targeted psychological interventions are essential to mitigate further adverse outcomes. Additionally, the results underscore the value of centralized management systems, such as the Medical Alliance model, in enhancing the efficiency and effectiveness of healthcare responses during large-scale public health emergencies.

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Conflict of Interest: None

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