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Review Article

Epidemiology of Post-Traumatic Stress Disorder in Intensive Care Nurses: A Systematic Review

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Abstract

Background: The intensive care unit environment poses a substantial risk for Post-Traumatic Stress Disorder (PTSD) among nurses, stemming from frequent exposure to traumatic events and patient death This systematic review aimed to determine the epidemiology of PTSD among ICU nurses.

Methods: We systematically searched PubMed, Scopus, and Web of Science from Jan 2000 to Dec 2024 for studies reporting PTSD prevalence among ICU nurses. Inclusion criteria were observational studies with validated PTSD assessment tools; Exclusion criteria included case reports and non-English publications. Data were synthesized using a random-effects model.

Results: The study reviewed 25 papers that provided quantitative data and were included in the analysis; the sample sizes varied from 98 to 748 ICU nurses. The published frequency of PTSD among ICU nurses has been identified to range between 3.3% and 64%. The pooled prevalence was estimated to be approximately 32.78 % (CI 95%[31.6%, 33.9%]). The specific factors influencing risk for PTSD included exposure to traumatic events: having a high workload, staff shortage, and organizational issues with the absence of psychological support, as well as individual characteristics, including younger age and prior mental health disorders. The impacts of PTSD included psychological distress, poor sleep quality, feelings of loneliness, and a reduced health-related quality of life.

Conclusion: The high prevalence of PTSD among ICU nurses underscores an urgent need for targeted interventions and support programs. Providing essential support through staffing, psychological resources, and resilience training is critical. Further research should examine the longitudinal course of PTSD and evaluate intervention outcomes.

Keywords: Post-traumatic stress disorder; Nurses; Epidemiology; Intensive care unit; Systematic review

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Introduction

Post-Traumatic Stress Disorder (PTSD) is a severe mental illness that can develop following exposure to a traumatic event. It is characterized by intrusive thoughts, avoidance behavior, negative alterations in cognition and emotion, and increased tension or irritability (1). While PTSD has traditionally been associated with experiences such as combat or natural disasters, growing attention is now being paid to its prevalence among healthcare workers, particularly those in Intensive Care Units (ICUs) (2).

ICU nurses are frequently exposed to potentially traumatic events, including patient deaths, severe injuries, and life-threatening situations (3). The nature of their work entails significant responsibility, rapid decision-making, and constant operation under high-pressure conditions where life-and-death outcomes are common. These factors collectively increase their vulnerability to developing PTSD (4). The COVID-19 pandemic further intensified these circumstances, exacerbating stress levels and worsening the mental health of ICU nurses worldwide (3).

Multiple authors pointed out the high rate of PTSD among nurses working in the ICU. For example, in a narrative synthesis of quantitative data, the pre-pandemic PTSD rates among workers in the ICU varied from 3.3% to 24%, rising to 16 %to 73.3% after the pandemic (5). Another systematic review and meta-analysis concluded that post-traumatic stress disorder symptoms occurred in approximately 19.83% of the adult critical care survivors, which accounted for a dominant share of the mental health burden in the concerned population. These results bear testament to the fact that there is a dire need for intervention and support to ICU nurses (6).

Risk factors for PTSD in ICU nurses encompass several key elements: the nature and frequency of traumatic incidents, individual coping strategies, and the availability of both formal and informal support (7). Common stressors include witnessing patient suffering, navigating ethical dilemmas, and managing heavy workloads (8). Additional factors include exposure to invasive treatments, constant noise from medical devices such as ventilators and monitors, and, particularly during epidemics, fears of infecting family members and associated feelings of guilt (9, 10). The inherently unpredictable, high-stress, and emotionally demanding environment of the ICU renders its healthcare workers especially susceptible to PTSD.

PTSD can profoundly affect both the personal and professional lives of ICU nurses. It may impair cognitive and emotional functioning and hinder the ability to interact effectively with others (11). In the workplace, PTSD is associated with reduced job performance, increased absenteeism, and higher turnover rates. Preserving the mental well-being of ICU nurses is therefore essential both for their own health and for maintaining high-quality patient care (12). Addressing PTSD in this population is critical for healthcare organizations aiming to sustain an optimal and effective workforce.

Although current research has identified PTSD as a major concern among ICU nurses, there continue to be inadequate and inefficient interventions for PTSD (13). Despite the critical need to explore PTSD among ICU nurses, no systematic review has yet been carried out. The existing studies are primarily narrative in nature. For instance, Zhang et al. conducted a narrative study focusing on PTSD within the entire treatment team during the COVID period (14). Similarly, study Deltour et al. addressed the broader treatment team and did not specifically target ICU nurses (5). As of now, the risk factors, effects, and management strategies for PTSD in ICU nurses have not been analyzed through a systematic approach. While previous reviews have provided valuable insights, they have often been narrative in nature or focused on broader groups of healthcare workers within the ICU setting. This systematic review and meta-analysis specifically focuses on ICU nurses, providing a quantitative synthesis of the prevalence, risk factors, and im-

pacts of PTSD within this distinct and highly vulnerable population, thereby addressing a notable gap in the existing literature. Therefore, this review study was conducted to investigate the epidemiology of post-traumatic stress disorder in intensive care nurses.

Methods

Study Design

The current systematic review study was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist, to provide a comprehensive review of epidemiological studies of PTSD in ICU nurses (15).

Search Strategy

A systematic search was performed using PubMed, Web of Science, and Scopus databases for literature related to the research question. The keywords included both MeSH terms and free-text words that relate to PTSD and ICU nurses. The search terms included but were not limited to: "Post-Traumatic Stress Disorder", "PTSD", "Intensive Care Unit", "ICU", "nurses", and "epidemiology" and "prevalence". Boolean operators (AND, OR) were used to combine the search terms. The final search strategy was as follows:
("post-traumatic stress disorder" OR "stress disorder, post-traumatic" OR "post-traumatic stress disorder" OR posttraumatic OR "post traumatic" OR PTSD) AND (nurs* OR caregiver OR "health care provider" OR "health care professional" OR "medical staff") AND ("intensive care" OR ICU OR "critical care") AND (epidemiology OR prevalence OR incidence OR frequency OR occurrence OR rate)

Inclusion and exclusion criteria

Inclusion criteria encompassed peer-reviewed research articles published in scientific journals, studies offering estimates of PTSD prevalence, risk factors, and impacts, as well as research on PTSD management strategies specifically for intensive care unit nurses. Only studies published in English were included.
The exclusion criteria encompassed all research articles unrelated to ICU nurses, studies on trauma or illness that did not address PTSD, case studies, review articles, editorials, and non-English publications. Additionally, during the full-text review, qualitative studies that only explored themes without addressing the study's primary objective were excluded. Studies that included all intensive care providers but did not report separate results for ICU nurses were also excluded. Finally, studies focusing solely on one dimension or symptom of PTSD or those examining only post-traumatic growth were omitted from the analysis.

Data Extraction

Two qualified reviewers independently conduct the title and abstract screening for all identified studies. Both the title and abstract, as well as the full text of potentially relevant studies, will be reviewed. In cases of disagreement, a discussion with peers or consultation with an additional reviewer will be conducted to reach a consensus. Following established practices in systematic reviews, a data extraction form will be created a priori. This form will capture study characteristics (e.g., author, publication date, country), participant details (e.g., sample size, demographics), PTSD outcomes (e.g., prevalence), and the assessment tools used for evaluating PTSD.

Quality Assessment

The quality of the included studies was assessed using the Newcastle-Ottawa Scale (NOS) for observational studies (16). This scale evaluates studies based on three main criteria: the selection of study groups, the comparability of groups, and the assessment of exposure or outcome. For each study, two independent reviewers assigned scores based on the presence of positive indicators in each category. In cases of discrepancy, the reviewers reached a consensus or consulted a third reviewer to resolve any differences in scoring.

Data Synthesis and Analysis

To address the first and second research questions, a narrative synthesis was conducted to report the prevalence of PTSD among ICU nurses and to identify associated risk factors. When sufficient data, both cross-sectional and pooled, were available, a meta-analysis was performed using a random-effects model (DerSimonian–Laird method) to account for between-study variability and to calculate pooled prevalence estimates with 95% confidence intervals. Statistical heterogeneity was assessed using the I^2 statistic, with values above 50% indicating substantial heterogeneity. To test the robustness of the results, sensitivity analyses were conducted by sequentially excluding individual studies, including those with a potentially high risk of bias, and re-analyzing the data to evaluate the impact on the findings (17).

Publication Bias

Publication bias was assessed visually using funnel plots and statistically using Egger's test, if a sufficient number of studies (e.g., >10) were available for meta-analysis. If asymmetry was detected, its potential causes were explored.

Ethical Approval and Consent to participate

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. As it involved analysis of previously published studies, no ethical approval was required.

Results

A comprehensive search of the PubMed, Web of Science, and Scopus databases yielded 1,210 articles. After removing 308 duplicate records, the titles and abstracts of 902 articles were screened for relevance. Subsequently, 127 full-text articles were evaluated for eligibility. Ultimately, 25 articles met the inclusion criteria and were included in the systematic review and meta-analysis (Fig. 1).

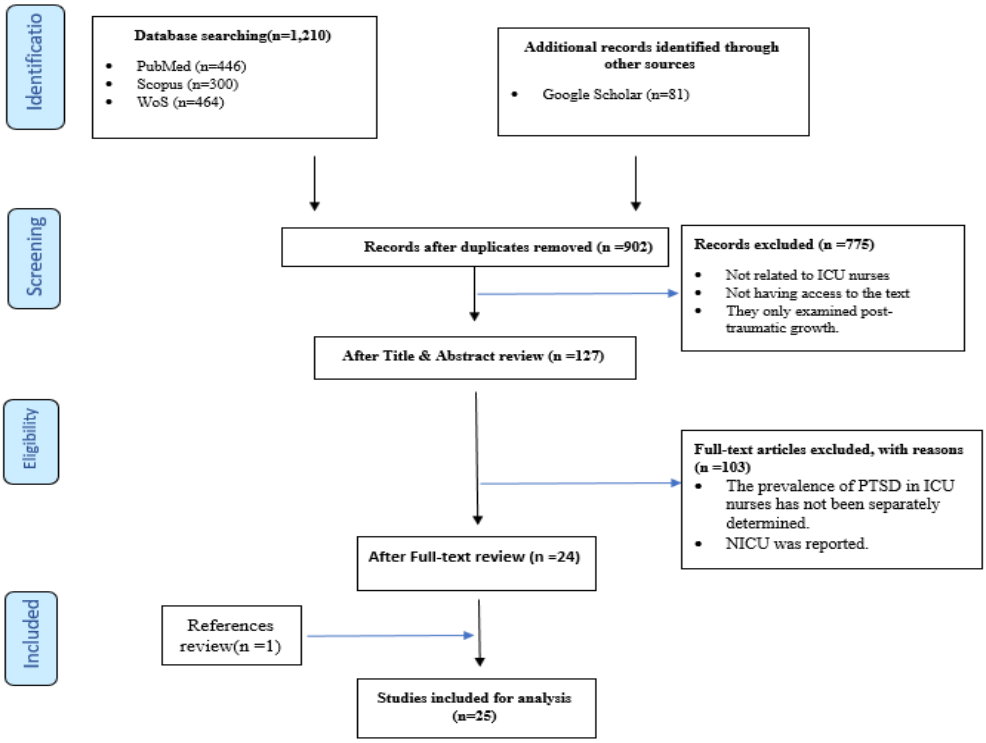

Fig. 1: PIRISMA diagram for review studies

Study Characteristics

The included studies were conducted across North America, Europe, and Asia and were published between 2000 and 2024. Sample sizes across the studies ranged from 98 to 748 ICU nurses. Most studies utilized a cross-sectional design, while a few employed a longitudinal approach to assess PTSD incidence and predictors. Notably, there were no randomized controlled trials or quasi-experimental studies included in this review (Table 1).

Table 1: Studies specifically investigated the epidemiology of PTSD in ICU nurses

Author, year, country	Design, Sample size	Prevalence	Risk factors	Impact	Management
Gooden, 2024, Nepal. (18)	Mixed-methods, n=113	40%	Social stigmatism, physical and emotional safety, enforced role change and the absence of organisational support	-	-
Kim, 2024, South Korea. (19)	Cross-sectional, n=153	45.1%	Experience of traumatic events, trusted alliance, which is a subarea of coworker support, and both control and alternative, which are subareas of cognitive flexibility.	-	-
Taheri, 2023, Iran. (20)	Cross-sectional, n=102	60.8%	No significant relationship	-	-
Mathew, 2023, India. (21)	Cross-sectional, n=383	29% (CI 95%,18–37)	Not report		
Hovland et al., 2023, Norway. (22)	Prospective, longitudinal, observational cohort Study., n=229 (79.8)	7.4%(Baseline) –7.9% (12 months)	Self-reported previous symptoms of depression, Fear of infection, Feeling of loneliness	Nurses reported higher levels of psychological stress than physicians and administrators.	Advice on psychological and emotional support
Vadi; 2022, India. (23)	Cross-sectional, n=150	21%	Low-to-moderate perceived self-efficacy, Age less than 30 yr, female gender, and lack of social support	-	-
Stafseth, 2022, Norway. (24)	Cross-sectional, n=305	7%	Risk factors include working under stressful conditions and lack of psychological support		
Mehta, 2022, Canada. (12)	Cross-sectional, n=279	35%	Female gender, lack of personal protective equipment (PPE), and inadequate training on PPE		

Table 1: Continued…

Hall, 2022, UK. (25)	Cross-sectional, n=428	64%	Younger age, less work experience, and working under stressful conditions		
Guttormson, 2022, USA. (26)	Cross-sectional, n=428	47%	Lack of perceived support from administration and shortage of PPE		
Damico, 2022, Italy. (13)	Cross-sectional, 359	18.7%(6month) - 24.1%(1year)	Age 31-40, Female gender, 0-5 yr of professional experience	-	-
Pan, 2021, China. (27)	Cross-sectional, n=573	14.48%	Chronic diseases, social isolation, and job dissatisfaction	Reduced sleep quality, feelings of loneliness, lower quality of life, and a tendency to quit (self state)	
Li, 2021, China. (28)	Cross-sectional, n=148	22.38%	Health status, years of experience, age, Connor-Davidson Resilience Scale (CD-RISC) scores, and Social Support Scale (SSRS) scores.	-	-
Heesakkers, 2021, Netherlands. (29)	Cross-sectional, n=726	22.2%	Hospital Type, Number of ICU beds, Fear of being infected, Fear of infecting relative, Been on holiday, Insufficient number of personnel, Inadequate Personal Protection Equipment , Inadequate support of supervisor , Inadequate logistic support Well- perceived communication with relatives, Working hours during the surge, Well-perceived support of relatives, and friends, Change in NRS-stress score		
Crowe, 2021, Canada. (7)	Convergent parallel mixed method n=109	23%	Lack of personal protective equipment (PPE), high workload, and inadequate psychological support	Increased anxiety, depression, and stress	Providing psychological support, improving working conditions, and increasing training related to stress management

Table 1: Continued…

Zhang, 2020, China. (30)	Cross-sectional, n=717	57.7%	Clinical experience in the ICU, poor physical health status, and low scores on social support (SSRS) and resilience (CD-RISC) scales.	-	-
Azoulay, 2021, France. (31)	Cross-sectional, n=498	30.2%	Female gender, younger age, and lack of psychological support	-	-
Mealer, 2017, USA. (32)	Cross-sectional, n=744	50%	Working in a medical intensive care unit and having a graduate degree in nursing		
Cho, 2017, South Korea. (33)	Cross-sectional, n=179	38.8%	Type D personality, low resilience, and external control (external LOC)	-	-
Ong, 2016, Singapore. (34)	Cross-sectional, n=144	41%	High work pressure, lack of psychological support, and the experience of facing patient mortality	-	-
Janda, 2015, , Czech. (35)	Cross-sectional, n=200	3.3%	Insufficient number of Nurses and pathological anxiety scoresf job dissatisfactiopathological depression score	-	-
Mealer, 2012, USA. (36)	Cross-sectional, n=744	21%	High resilience is protective	-	-
Mealer, 2009, USA. (37)	Cross-sectional, n=98	23%	Years practicing, How often charge nurse	Difficulty in their life outside of the work environment	-
Su, 2007, Taiwan. (38)	Prospective, SARS units: n=70, non-SARS units: n=32	33% in SARS units, 18.7% in non-SARS units	Direct exposure to SARS, previous mood disorder, younger age, perceived negative feelings	-	-
Meredith, 2007, USA. (39)	Cross-sectional, n=230	24%	Married, Evening or night shif, Working days per week, Takes position as charge nurse	-	-

PTSD is a prevalent and impactful condition among ICU nurses, influenced by multiple occupational and psychosocial factors, and associated with significant adverse outcomes. To provide readers with a concise overview before presenting the detailed results, a conceptual summary of the pooled prevalence, identified risk factors, impacts, management strategies, study quality, and publication bias is presented in Fig. 2.

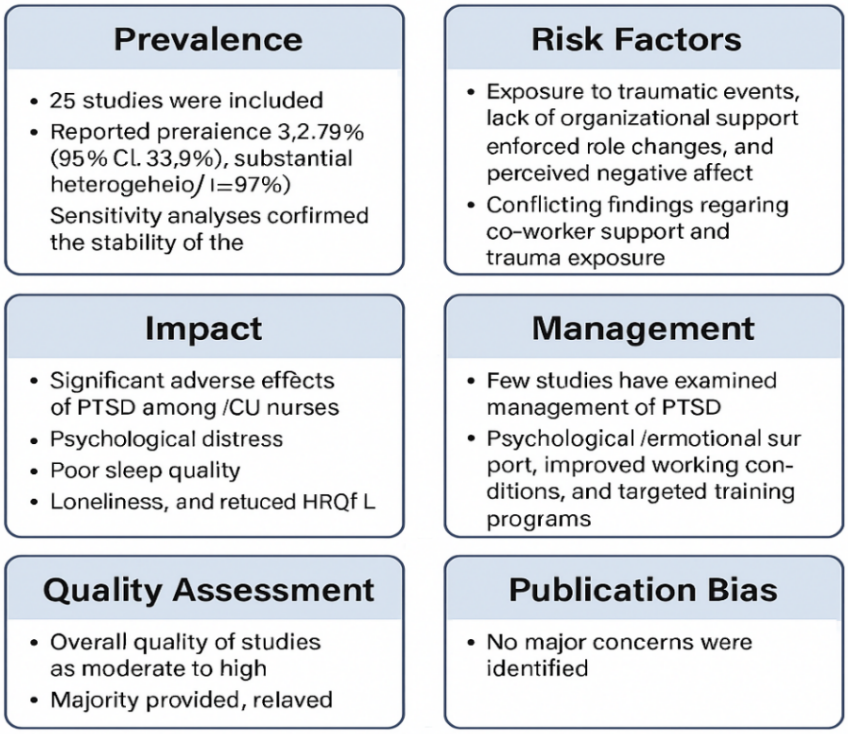

Fig. 2: Conceptual summary of key findings on the epidemiology, risk factors, impacts, and management of PTSD among ICU nurses

Prevalence of PTSD

Overall, 25 studies were reviewed, each focusing on the epidemiology of PTSD among ICU nurses. These studies revealed considerable variability in reported PTSD prevalence within this population, with rates ranging from 3.3% to 64%. Such variations may be influenced by factors such as geographical differences, methodological approaches, and the diverse working conditions experienced by study participants. The pooled prevalence of PTSD among ICU nurses was 32.78% (95% CI [31.6%, 33.9%]), with substantial heterogeneity (I^2 = 97%). Sensitivity analyses, conducted by sequentially excluding individual studies, did not materially change the results, confirming the stability of the estimates.

Risk Factors

The studies reviewed present conflicting information regarding the risk factors for PTSD among ICU nurses. For instance, a study in South Korea, identified trauma exposure and co-worker support as significant predictors of PTSD (19), whereas a study in Iran found no significant correlation between these risk factors and PTSD (20). However, overall, the primary antecedents of PTSD among ICU nurses appear to include exposure to traumatic events, lack of organizational support, enforced role changes, and perceived negative affect.

Impact

PTSD was found to have significant adverse effects on ICU nurses, including psychological distress, poor sleep quality, loneliness, and a reduced health-related quality of life. For example, in China, a significant association was found between PTSD and both sleep quality and perceived loneliness (27).

Management

Few studies have examined the management of PTSD among ICU nurses. Interventions for ICU nurses with PTSD typically include providing psychological and emotional support, improving working conditions, and offering targeted training

programs. For instance, in Canada, anxiety and stress levels could be reduced through a combination of psychological support and improvements in workplace conditions (7).

Quality Assessment

The overall quality of the included studies was moderate to high, as assessed by the Newcastle-Ottawa Scale. The majority provided a clear rationale, employed reliable PTSD measurement tools, and described their procedures in detail. However, some studies assessing effectiveness had notable limitations, including small sample sizes and potential selection bias.

Publication Bias

Publication bias was assessed using sensitivity analysis and funnel plots. The Egger's regression test resulted in a *P*-value of 0.130, which is greater than 0.05. The changes in standard error did not significantly affect the effect size, suggesting that publication bias was not a major concern and that the results are robust (Table 2, Fig. 3).

Table 2: Results of sensitivity analysis test

Model[a]	B	Std. Error	Beta	t	Sig.
(Constant)	0.439	0.078	-	5.626	0.001
Inv_SE[b]	-0.003	0.002	-.3.11	-1.571	0.130
a. Dependent Variable: Effect Size b. Inv_SE: inverse of the standard error					

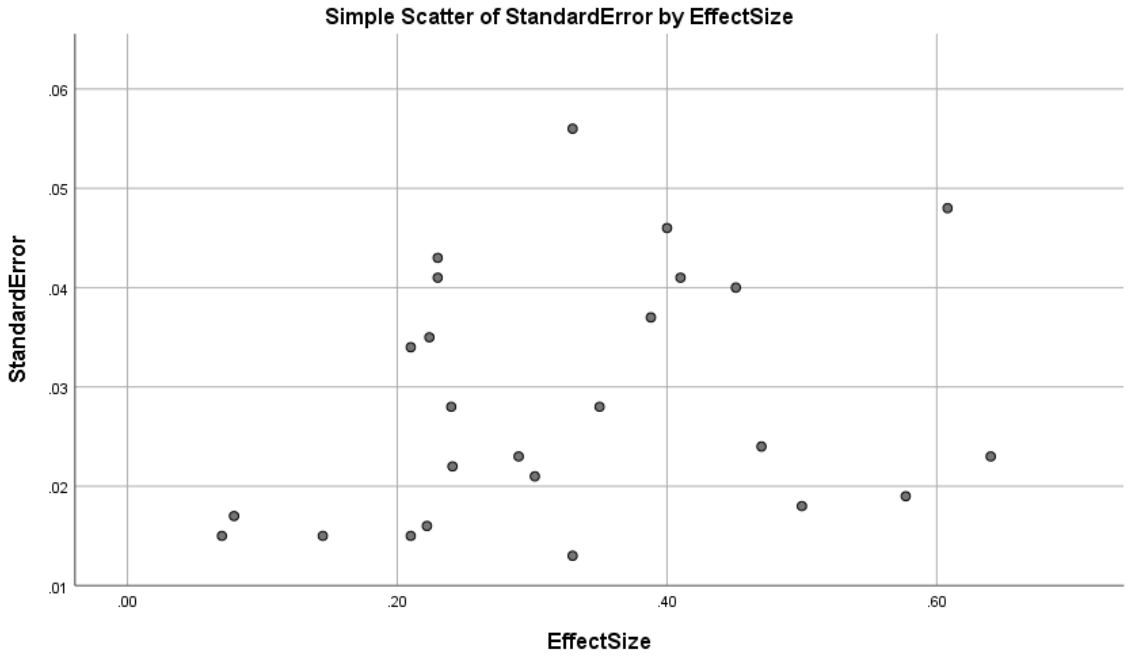

Fig. 3: Funnel plot displays assessment of publication

Discussion

The findings of this systematic review highlight the significant prevalence of Post-Traumatic Stress Disorder (PTSD) among ICU nurses, with an overall prevalence of approximately 32.78 % (CI 95%[31.6%, 33.9%]). This high prevalence underscores the urgent need to develop and implement specialized support programs for this high-risk population.

We found empirical literature reporting that PTSD prevalence rates among ICU health care professionals differ, and our findings are in line with the previous literature. For example, a narrative review determined that PTSD incidence among professionals in ICUs was from 3.3% to 73.3%, which increased during COVID-19 (5). These findings are consistent with our study, although the study population included all ICU staff. The studied population includes different groups, such as nurses, doctors, and assistant nurses, who may have different characteristics that could affect the prevalence and presentation of PTSD. For example, nurses may be more exposed to traumatic events due to their continuous presence in the ICU environment, while doctors may have more mobility and varied responsibilities. It is therefore important to consider these potential differences when examining mental disorders in different healthcare personnel groups. The prevalence of PTSD in ICU nurses was higher than that of other caregivers (22). Moreover, Righy et al. conducted a systematic review and meta-analysis, which resulted in the overall PTSD prevalence of 19.83% among the adult critical care survivors (6). The population studied in this study were patients, however, the rate of PTSD is high in both groups of patients and ICU nurses. Therefore, as evidenced by the social environment, ICU nurses are at a significant risk of developing PTSD due to the pressure exerted by the working conditions as well as the contacts with disasters. Such results corroborate the importance of mental health interventions for ICU nurses to receive after training (40, 41).

Therefore, ICU nurses had high rates of PTSD, which emphasized the critical degree of the mental health consequences experienced by such healthcare workers. The results are also in line with the prior studies showing that, because of the work environment, ICU nurses are more susceptible to PTSD (41, 42). Such unusual stressors are brought into sharp focus, and the COVID-19 experience has compounded their effects, further suggesting a pattern of increased rates during extraordinary stress. Hence, ICU nurses should be given specific mental health assault strategies to counter PTSD.

The following risk factors for PTSD among ICU nurses were brought out by the included studies. Possible risk factors include the occurrence of traumatic events, aversive conditions at the workplace, lack of organizational support, and high workload (7). For instance, traumatic events and coworker support were all significant risk factors (19). Others included the absence of personal protective gear and insufficient mental health resources were other common complaints as well. Hence, this work made a recommendation that better workplace conditions, and adequate support can help reduce PTSD (18). Some potential risk factors, such as exposure to specific procedures like cardiopulmonary resuscitation or limb amputation, were not quantitatively synthesized in this review due to limited data. Future studies should investigate these factors to inform more comprehensive preventive strategies.

The high prevalence of PTSD among ICU nurses has a vital impact on their health, such as difficulty managing work-life balance, depression, and stress (7). Clinically, PTSD impacts psychological stress, poor sleep quality, and compromised quality of life which has implications for patient outcomes (27). That is why, there is a need for intervention to promote the proper functioning of ICU nurses, including such measures as psychological assistance, working conditions improvement, and targeting training concerning stress or burnout. Research has also proved that such intercessions do help in lowering the levels of stress and anxiety among healthcare workers (43).

It is important for the practice because the study aimed at identifying key risk factors for PTSD among the ICU nurses. The mental status of staff should be protected to the highest level, and therefore, health care organizations should ensure that staff support structures are offered to employees (29). This is done through the offering of counseling services on psychological problems, support groups, as well as stress-related programs. Also, factors such as staffing levels and workload of the organization can be effective in minimizing the chances of developing PTSD.

Other gains can also be achieved through training courses that aim at developing coping abilities and strength.

Knowledge Gap

Our review identified several critical knowledge gaps. There is a notable lack of interventional studies specifically designed for ICU nurses with PTSD. The effectiveness of management strategies for this population has not been rigorously evaluated, and the long-term impact of interventions remains unexplored. Furthermore, preventive psychological training programs are not widely implemented or studied.

Limitations

This review has several limitations. Significant heterogeneity was observed among the included studies, likely due to variations in methodology, sample sizes, and geographical settings. Furthermore, the predominance of cross-sectional studies in the literature limits the ability to establish causal relationships between risk factors and PTSD. Future research should employ longitudinal designs to better understand the development of PTSD over time and to rigorously evaluate the efficacy of targeted interventions.

Conclusion

The conclusion emphasized the necessity of further research with a focus on the development of special programs and unique resources for the improvement of the mental state of the ICU nurses. Stakeholders in healthcare bear a great stake in benefiting from improving the mental health of these ICU nurses, who are an asset to the organizations.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interests.

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