

Prevalence of Post-Traumatic Stress Disorder in Iranian Intensive Care Unit Survivors and Related Factors: A Systematic Review and Meta-Analysis

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Received: 30 July 2025

Revised: 05 January 2026

Accepted: 13 March 2026

What's Known

- Post-traumatic stress disorder (PTSD) is one of the serious psychological issues with different causes in patients who survived the intensive care unit (ICU).
- No systematic review and meta-analysis study related to the overall prevalence of PTSD in Iranian ICU survivors is available.

What's New

- The overall prevalence of PTSD in Iranian ICU survivors was 36.4%.
- Our study determined some common related factors in Iranian ICU survivors, such as older age, prolonged ICU hospitalization, history of psychiatric disorders, mechanical ventilation, and drug abuse.

Abstract

Background: Intensive care unit survivors are discharged with various psychological complications, among which post-traumatic stress disorder (PTSD) is one of the most significant. The main aim of this study was to determine the prevalence of PTSD and its associated factors among Iranian intensive care unit (ICU) survivors.

Methods: This systematic review and meta-analysis included studies published in English and Persian from 2000 to 2025. Electronic gateways and databases, including MEDLINE via PubMed, MEDLINE via OVID, ISI Web of Knowledge, Scopus, Embase, Cochrane Library, Magiran, Wiley, Scientific Information Database (SID), and Google Scholar, were searched. Study quality was assessed using the Joanna Briggs Institute (JBI) critical appraisal checklist. Data were analyzed using STATA software (version 17.0, StataCorp/LC, USA). Statistical heterogeneity was assessed using the I^2 statistic, and a random-effects model was applied to estimate pooled prevalence. A significant level of $P < 0.001$ was considered.

Results: The pooled prevalence of PTSD in Iranian ICU survivors was 36.4% (95% CI: 23.5–48.3; $I^2 = 98.75\%$; $P < 0.001$). The prevalence in Iranian women, 51.47% (95% CI: 45.01–57.92; $I^2 = 97.52\%$), was higher than in Iranian men, 48.53% (95% CI: 42.08–54.99; $I^2 = 97.52\%$). Common related factors included older age, prolonged ICU hospitalization, history of psychiatric disorders, mechanical ventilation, and drug abuse.

Conclusion: The prevalence of PTSD among Iranian ICU survivors is relatively high. Identification of associated factors underscores the need for early screening, comprehensive follow-up programs, and targeted psychological interventions, particularly for high-risk populations.

Please cite this article as: Salehi Tali S, Molavynejad S, Imani A, Shafiei E. Prevalence of Post-Traumatic Stress Disorder in Iranian Intensive Care Unit Survivors and Related Factors: A Systematic Review and Meta-Analysis. Iran J Med Sci. doi: 10.30476/ijms.2026.108012.4269.

Keywords • Post-traumatic stress disorder • Intensive care units • Survivors • Meta-analysis

Introduction

Patients with serious clinical conditions who require advanced care and continuous monitoring are transferred to intensive care units (ICUs).¹ The ICU environment is characterized by specific stressors, including restricted visitation, social isolation,

exposure to numerous monitoring and life-support devices, frequent painful procedures, and uncertainty regarding prognosis during the recovery process.² These stressors may persist in patients' memories even after discharge, and studies have shown that despite survival, many ICU survivors report adverse psychological experiences related to their stay.³ Following discharge, ICU survivors often face a wide range of physical and psychological complications. However, psychological sequelae are frequently under-recognized, as post-discharge care primarily focuses on physical recovery.⁴ Nevertheless, psychological well-being plays a critical role in improving physical recovery, functional outcomes, and overall quality of life.⁵

Among psychological complications, post-traumatic stress disorder (PTSD) is recognized as one of the most severe and long-lasting consequences experienced by ICU survivors after discharge.⁶ PTSD develops following exposure to traumatic events and is characterized by persistent symptoms such as intrusive memories, hyperarousal, avoidance behaviors, and emotional distress.⁷ Individuals with PTSD often experience a diminished sense of control over their environment, leading to impaired decision-making and reduced ability to perform physical and psychological self-care.⁸ Previous studies have demonstrated that PTSD among ICU survivors is associated with reduced self-confidence,⁹ impaired quality of life¹⁰ and chronic psychological disturbances.¹¹

The reported prevalence of PTSD among ICU survivors varies considerably across countries, with rates ranging from 25.3% in Italy,¹² 17.7% in China,¹³ 18% in the United Kingdom,¹⁴ and 8% in Saudi Arabia.¹⁵ These variations may be attributed to differences in healthcare systems, ICU practices, availability of post-discharge psychological support, cultural perceptions of mental health, and methodological differences across studies. In Iran, several regional studies have examined PTSD among ICU survivors.¹⁶⁻²⁰ However, the reported prevalence and associated factors vary substantially across regions, and no comprehensive synthesis has been conducted to estimate the national overall prevalence.

Determining the pooled prevalence of PTSD and identifying related factors among Iranian ICU survivors can provide valuable evidence for healthcare planners and policymakers, facilitating effective resource allocation, prioritization of mental health services, and identification of vulnerable populations. Such evidence may also highlight the need to integrate psychological assessment and follow-up into routine post-ICU care. Therefore, the present

systematic review and meta-analysis aimed to determine the prevalence of PTSD and to identify factors associated with its occurrence among Iranian ICU survivors. Accordingly, this study was designed to address the following research questions: (1) What is the pooled prevalence of PTSD among ICU survivors in Iran? (2) What factors are associated with the development of PTSD among Iranian ICU survivors?

Methods and Materials

Search Strategy

Given the variability in the prevalence of PTSD across different clinical contexts and study designs, a comprehensive literature search was conducted from 2000 to 2025. All published articles in English or Persian were considered. Electronic gateways and databases, including MEDLINE via PubMed, MEDLINE via OVID, ISI Web of Knowledge, Scopus, Embase, Cochrane Library, Magiran, Wiley, Scientific Information Database (SID), and Google Scholar, were systematically searched.

The search strategy incorporated Medical Subject Headings (MeSH) terms, including post-traumatic stress disorder, intensive care unit, ICU survivors, stress disorder, post-traumatic stress, post-traumatic neuroses, and chronic post-traumatic stress disorder. Boolean operators (AND, OR, NOT) were applied as appropriate across databases. The main search combinations were as follows: post-traumatic stress disorder AND intensive care unit; post-traumatic stress disorder AND ICU discharge; post-traumatic stress disorder OR stress disorder; post-traumatic stress disorder NOT post-traumatic growth (table 1). Moreover, we used Mendeley reference management software version 1.19.8 (Mendeley Desktop, London) for removal of duplication in the manuscripts.

Inclusion and Exclusion Criteria

Inclusion Criteria

- Articles reporting the PTSD in ICU survivors.
- Articles conducted in Iranian ICU settings.
- Articles published in Persian or English.

Exclusion Criteria

- Studies with no access to full-text articles.
- Articles with substantial methodological limitations or insufficient data.
- Articles with a qualitative approach, case reports, conference abstracts, and letters to the editor.

Studies Evaluation

All included studies were assessed using the JBI Critical Appraisal Checklist.²¹

Table 1: Database search queries

Database	Date of last search	Search strategy
PubMed	[July, 2025]	("PTSD" OR "stress disorder" OR "post-traumatic stress" OR "post-traumatic neuroses" OR "chronic post-traumatic stress disorder" AND "ICU survivors" OR "intensive care unit" OR "Iran") NOT ("post-traumatic grow")
MEDLINE (via OVID)	[July, 2025]	("PTSD" OR "stress disorder" OR "post-traumatic stress" OR "chronic post-traumatic stress disorder" AND "ICU survivors" OR "intensive care unit" OR "Iran") NOT ("post-traumatic grow")
ISI Web of Knowledge	[July, 2025]	TS=("PTSD" OR "stress disorder" OR "post-traumatic stress" OR "post-traumatic neuroses" OR "chronic post-traumatic stress disorder" NOT "post-traumatic grow") AND TS=("ICU survivors" OR "intensive care unit" OR "Iran")
Scopus	[July, 2025]	TITLE-ABS-KEY("PTSD" OR "stress disorder" OR "post-traumatic stress" OR "post-traumatic neuroses" OR "chronic post-traumatic stress disorder") AND TITLE-ABS-KEY("ICU survivors" OR "intensive care unit" OR "Iran") NOT TITLE-ABS-KEY(" post traumatic grow")
Embase	[July, 2025]	("PTSD" OR "stress disorder" OR "post-traumatic stress" OR "post-traumatic neuroses" OR "chronic post-traumatic stress disorder") AND ("ICU survivors" OR "intensive care unit" OR "Iran") NOT ("post traumatic grow")
Cochrane Library	[July, 2025]	("PTSD" OR "post-traumatic stress disorder" OR "stress disorder") AND ("ICU survivors" OR "intensive care unit" OR "Iran")
Magiran	[July, 2025]	(PTSD OR "post-traumatic stress disorder" OR "stress disorder") AND (ICU OR Iran)
Wiley Online Library	[July, 2025]	("PTSD" OR "post-traumatic stress disorder" OR "stress disorder") AND ("ICU survivors" OR "intensive care unit" OR "Iran")
SID	[July, 2025]	(PTSD OR "post-traumatic stress disorder") AND (ICU OR Iran)
Google Scholar	[July, 2025]	("PTSD in Iran" OR "PTSD in ICU survivors" OR "stress disorder" OR "chronic post-traumatic stress disorder")

Each relevant item was scored as "1" if the criterion was met and "0" otherwise. Studies that achieved a total score greater than 8 were considered of sufficient methodological quality and were therefore included in the meta-analysis (table 2).

Data Extraction

Initially, all eligible articles were independently reviewed by two members of the research team. In cases of disagreement, consensus was reached through discussion with the entire team. To comprehensively describe PTSD among ICU survivors, the following data were extracted from each study: authors, year of publication, study design, study location, total sample size, number of male and female participants, mean PTSD Checklist (PCL) score, overall prevalence

of PTSD, and PTSD-related factors.

Analysis Approach

Prevalence estimates were transformed using the hyperbolic tangent (tanh) function to stabilize variances and approximate normality, improving the robustness of pooled analyses. This variance-stabilizing transformation was selected because prevalence estimates near 0 or 1 can lead to skewed distributions and heteroscedasticity. Therefore, using the tanh function provided normalized effect measures suitable for meta-analytic pooling.

Heterogeneity was evaluated with the I^2 statistic and Cochran's Q test. I^2 values less than 25%, 25-75%, and greater than 75% indicated low, moderate, and high heterogeneity, respectively. Due to heterogeneity, a random-effects model

Table 2: JBI Critical Appraisal Checklist

Study reference →	16	17	18	19	26	27	28	29	30	31
JBI criteria ↓										
1. Appropriate sample frame	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Appropriate sampling	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Adequate sample size?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Subjects & setting described	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Adequate coverage of sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Valid PTSD identification method	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Standard/reliable measurement?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8. Appropriate statistical analysis	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Confounders accounted?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10. Subpopulations identified objectively	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No
11. Adequate response rate managed	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Total score	11	11	9	11	11	11	9	11	11	10

was adopted to compute pooled prevalence estimates. Meta-regression analysis explored sources of heterogeneity, including study year, sample size, and geographic region. Subgroup and sensitivity analyses were conducted as applicable.

Publication bias was assessed visually using funnel plots and statistically using Egger's regression test. Statistical analyses were conducted with STATA software version 17 (StataCorp/LC, USA), utilizing commands such as metan, metareg, and diagnostic plotting tools. Forest plots were generated based on back-transformed data to illustrate the true pooled prevalence and the contribution weight of each study.

To clarify, the term "effect size" in this study specifically refers to the prevalence of PTSD rather than PTSD severity or score. Given that prevalence was expressed as a proportion, applying and subsequently reversing the tanh transformation did not alter the interpretive meaning of effect size, it only allowed for statistical stability and accurate reporting of the final, real-scale prevalence values. The focus on prevalence enables clear quantification of the proportion of ICU survivors affected by PTSD, which constituted the primary outcome

of this meta-analysis.

Results

Although 1,100 records were initially retrieved from multiple databases, only 10 studies met the eligibility criteria and were included in the final analysis after removing duplicates, applying inclusion criteria, and excluding studies with insufficient data (figure 1).

All of the included studies were conducted on Iranian ICU survivors. A summary of the key characteristics of these studies is presented in table 3.

Our analysis included 2,044 participants with a mean age of 51.38 ± 6.28 years and a mean post-traumatic stress disorder checklist (PCL) score of 42.31 ± 11.45 . The heterogeneity index (I^2) was 98.9%, indicating substantial heterogeneity; therefore, a random-effects model was applied for the meta-analysis. The pooled estimate showed that the overall prevalence of PTSD among Iranian ICU survivors was 36.4% (95% CI: 23.5–48.3; $I^2=98.75\%$; $P<0.001$) (figure 2).

The prevalence of PTSD among male and female ICU survivors was 48.53% (95% CI: 42.08–54.99; $I^2=97.52\%$) and 51.47% (95% CI: 45.01–57.92; $I^2=97.52\%$), respectively (figures 3 and 4).

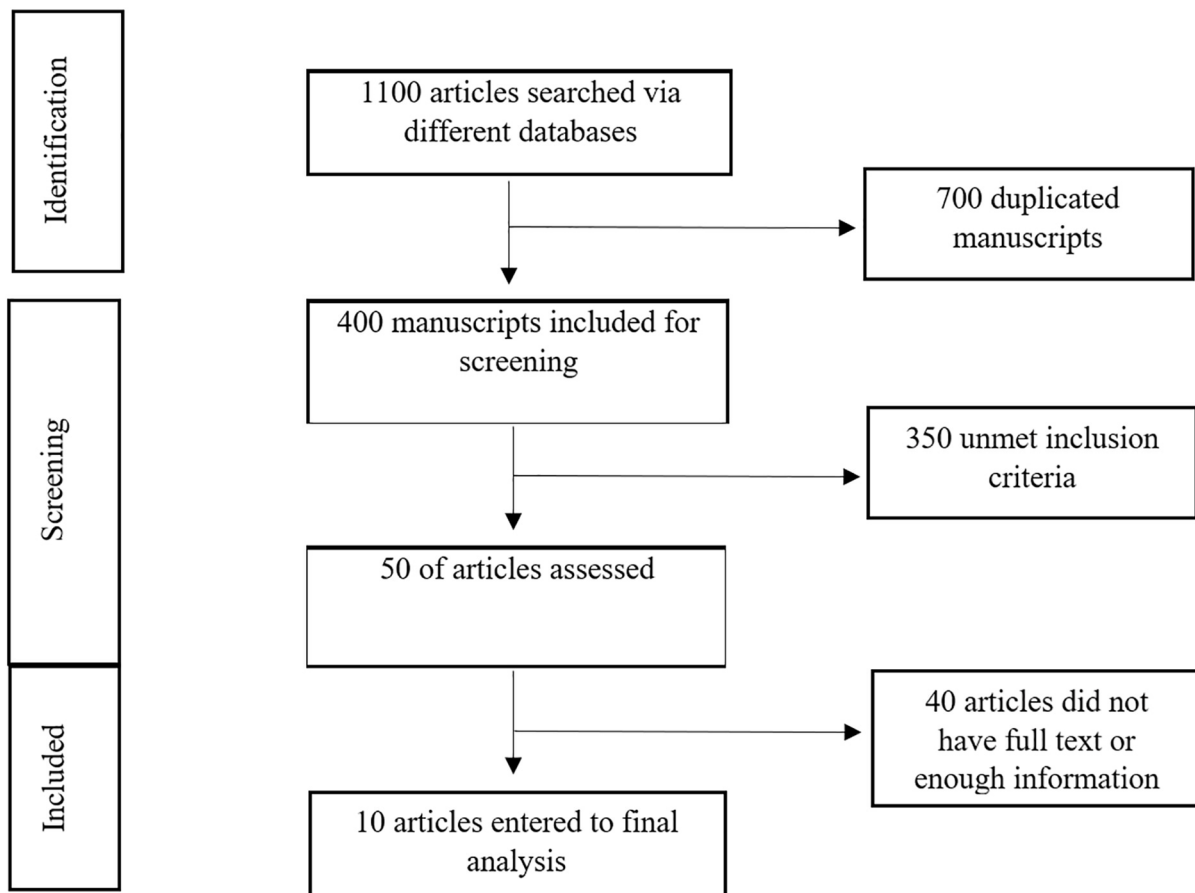


Figure 1: The PRISMA flow diagram shows the study identification, screening, and selection process.

Table 3: Characteristics of the analyzed articles

Reference	Year	Study type	City	Sample size	Men N (%)	Women N (%)	Mean age	Mean PCL score	Prevalence of PTSD	PTSD related factors
Askari Hosseini et al., ¹⁹	2021	Descriptive correlational study	Kerman	100	27 (27%)	73 (73%)	50.63±16	20.74±11.79	13%	Delusional Memories, Mechanical Ventilation
Sedadi et al., ¹⁶	2024	Prospective study	Rasht	152	72 (47.4%)	80 (52.6%)	54.5±19.19	58.38±15.59	75%	Hospitalization Reason, Self and Familial History of Psychological Disorders, Richmond Agitation Sedation Score
Rasooli et al., ¹⁸	2022	Cross-Sectional Study	Babol	106	59 (55.7%)	47 (44.3%)	49.1±19.8	-	17.9%	Duration of ICU Hospitalization
Faramarzi et al., ²²	2024	Descriptive-analytical cross-sectional study	Gorgan	120	66 (55%)	54 (45%)	41.1±19.6	67.8±5.2	67.8%	Older Age, Female Gender
Astaneh et al., ¹⁷	2024	Cross-sectional Study	Sari	200	93 (46.5%)	107 (53.5%)	49.74±12.17	-	36.4%	Older Age, Longer Hospitalization, Having a Family Member with COVID-19, History of Death in a Family Member Due to COVID-19
Ahmadi-Forg et al., ²³	2022	Descriptive study	South Khorasan	172	74 (43%)	98 (57%)	46.2±19.7	42.98±15.01	34.3%	Older age, Vaccination
Faramarzi et al., ²⁴	2023	Descriptive study	Babol	477	220 (46.1%)	257 (53.9%)	60.5±17.9	-	8.1%	Duration of ICU Hospitalization, High Education Level
Saeidi et al., ²⁵	2021	Cross-sectional study	Kashan	310	181 (58.4%)	129 (41.6%)	55.11±1.62	19.69±1.48	57.8%	Old Age, Unemployment, Longer Hospitalization, Low-Level education, Increasing Number of Children, Drug Abusers, Mechanical Ventilation
Sharafi et al., ²⁶	2025	Descriptive-analytical cohort study	Tehran	75	-	-	46.46	-	23.1%	Positive Past Psychiatric History
Sadat et al., ²⁷	2015	Descriptive prospective study	Kashan	332	191 (57.7%)	141 (42.3%)	60.49±16.80	44.24±19.89	48.2%	Increasing Age, Increased Length of Hospital Stay, More Children, Having Additional Comorbidities, Unemployed, Use of Mechanical Ventilation, Drug Abuse, Single Patients

PCL: Post- traumatic stress disorder checklist; PTSD: Post- traumatic stress disorder; N: number

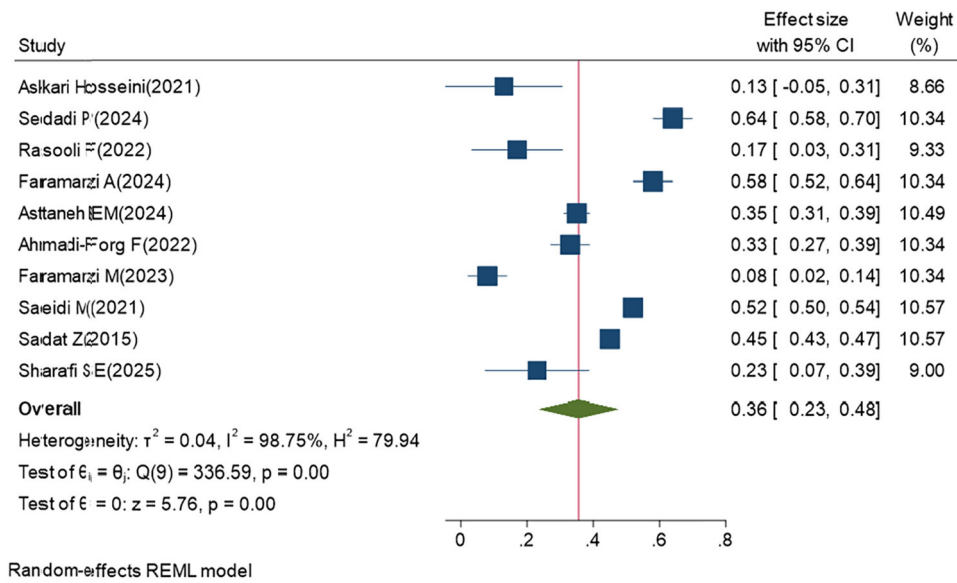


Figure 2: The forest plot shows the prevalence of overall post-traumatic stress disorder in Iranian ICU survivors with a 95% confidence interval.

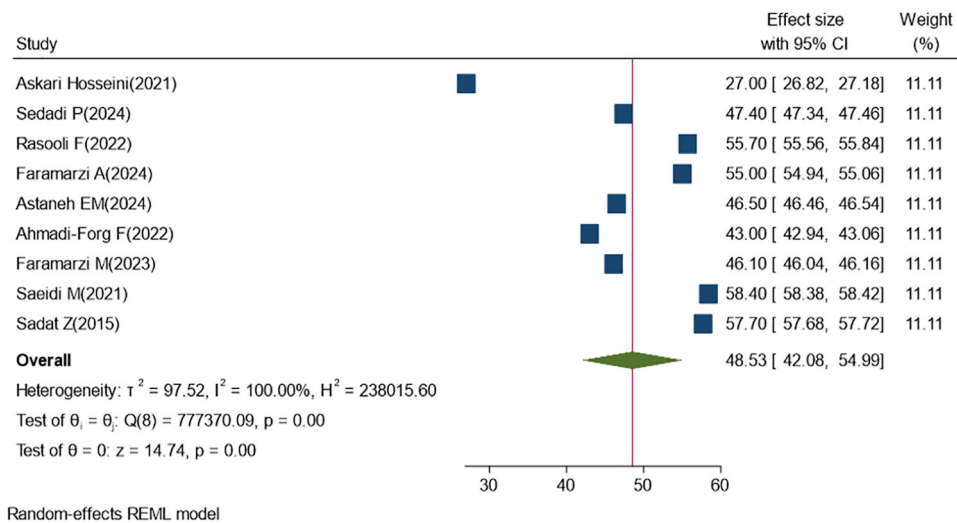


Figure 3: The forest plot shows the prevalence of post-traumatic stress disorder in Iranian men ICU survivors with a 95% confidence interval.

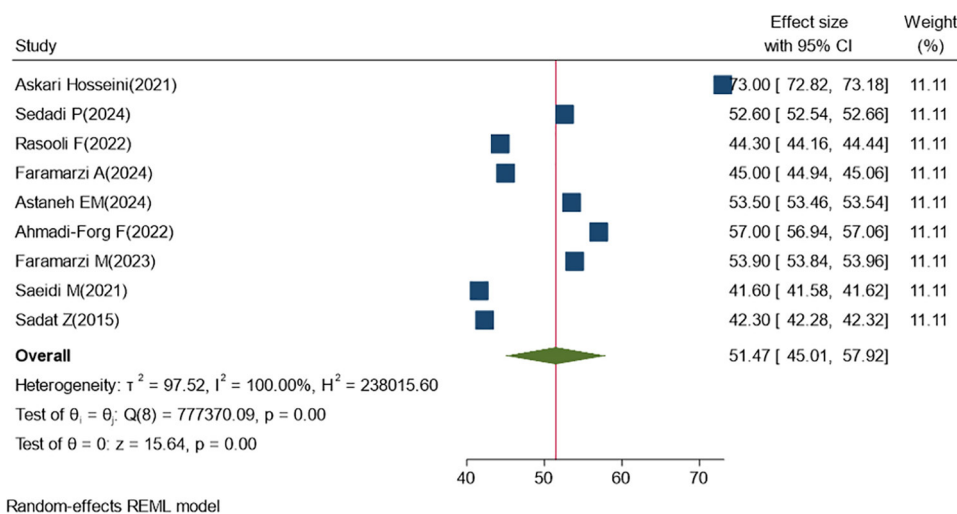


Figure 4: The forest plot shows the prevalence of post-traumatic stress disorder in Iranian women ICU survivors with a 95% confidence interval.

We conducted meta-regression analyses assessing the impact of sample size and study location on pooled PTSD prevalence and heterogeneity. The results indicated that both sample size ($P=0.04$) and study location ($P=0.03$) significantly influenced the pooled effect size and explained a proportion of the heterogeneity across studies.

Furthermore, subgroup analyses based on sample size categories and geographic regions revealed significant differences in PTSD prevalence estimates among subgroups. These findings suggest that sample size and study location are important moderators contributing to variability in prevalence estimates. Due to the limited number of studies in some subgroups, these results were interpreted with caution. Subgroup analysis by place of four studies estimated, and results showed that the highest prevalence of PTSD in Iranian ICU survivors was observed in the center of Iran in Kashan (figure 5).

Furthermore, subgroup analysis by sample size of 10 studies estimated and results showed the prevalence of PTSD among samples with a size of <217 and >217 was 36.2% (95% CI: 21.7–50.17; $I^2=96.56\%$) and 35 % (95% CI: 8–62.01; $I^2=99.75\%$), respectively (figure 6).

As shown in figure 7, meta-regression analysis demonstrated a statistically significant overall association between PTSD prevalence in Iranian ICU survivors and the year of the study ($P<0.001$). However, the observed increase in PTSD prevalence, specifically between 2021 and 2024, was not statistically significant ($P>0.01$). These findings indicate a significant

long-term trend over the full study period, but no clear evidence of a significant change in the most recent years.

Assessment of publication bias was carried out using the funnel plot, Egger's regression test, and the trimandfill procedure. The funnel plot demonstrates marked asymmetry, particularly in the lower part, where several studies with smaller standard errors are missing on the left side of the funnel. This pattern indicates potential publication bias toward studies reporting higher prevalence estimates. Egger's regression test confirmed this asymmetry ($P=0.001$), suggesting the presence of small study effects. Applying the trimandfill method resulted in the imputation of one potentially missing study on the left side of the plot. The reestimated pooled prevalence after imputation was slightly lower than the original estimate, indicating that publication bias may have led to a modest overestimation of the pooled PTSD prevalence among ICU survivors. The updated funnel plot, including the imputed study, has been provided in figure 8.

To assess the robustness of the pooled prevalence estimates, a sensitivity analysis was performed by systematically omitting each study one at a time (leave-one-out method). The pooled prevalence remained within the overall 95% confidence interval in all repetitions, indicating that no single study disproportionately influenced the overall estimate. Furthermore, excluding outlier or high-risk-of-bias studies did not materially alter the summary prevalence. These findings confirm that the pooled results are stable and the conclusions are not unduly driven by any one individual study.

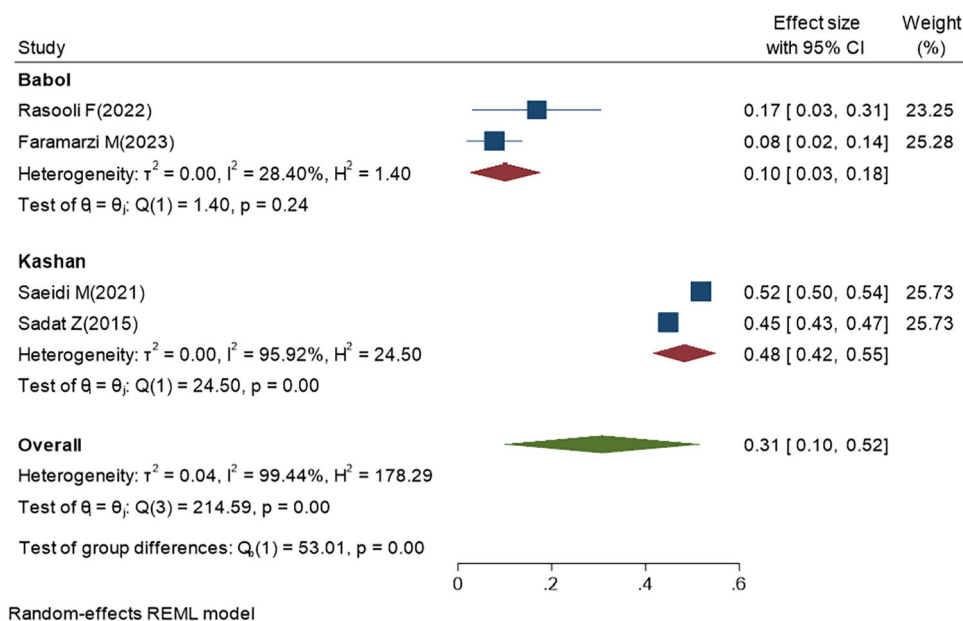


Figure 5: Forest plot represents the subgroup analysis by study location and prevalence of post-traumatic stress disorder in Iranian ICU survivors.

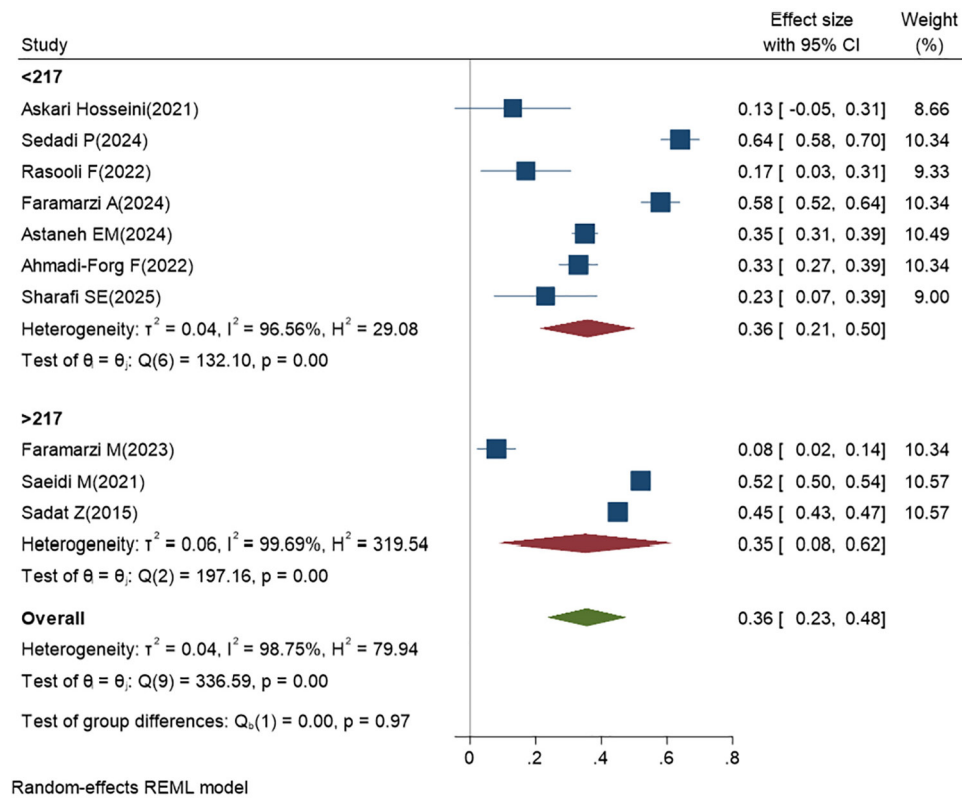


Figure 6: Forest plot shows the subgroup analysis by sample size and prevalence of post-traumatic stress disorder.

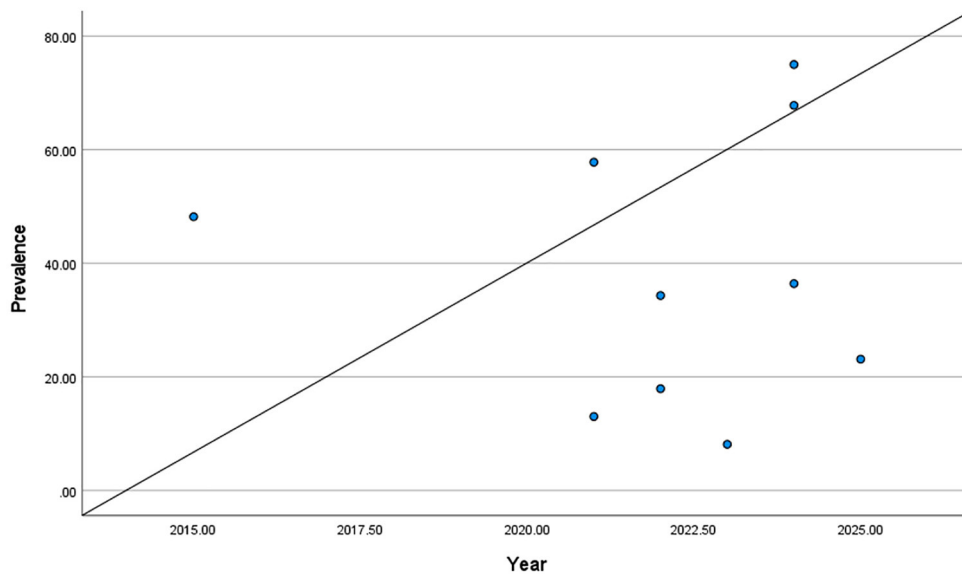


Figure 7: The meta-regression analysis demonstrated a statistically significant association between PTSD prevalence in Iranian ICU survivors and the year of the study.

Sensitivity analysis using leave-one-out (LOO) meta-analysis confirmed the robustness of the pooled prevalence. Excluding any single study did not substantially alter the overall estimate (range: 0.030-0.038 vs. original 0.035; maximum change <10%) or heterogeneity (I^2 50-94%) (figure 9).

Discussion

In the present study, the overall prevalence of

PTSD among Iranian ICU survivors was 36.4%. ICU survivors commonly experience a wide range of physical and psychological complications, among which PTSD is a major psychological consequence. Previous international studies have reported different prevalence rates of PTSD among ICU survivors, including 18%,²⁸ 19.83%,²⁹ 13.2%,³⁰ and 22%.¹⁴ These discrepancies may be explained by differences in study settings, sample sizes, and methodological designs.

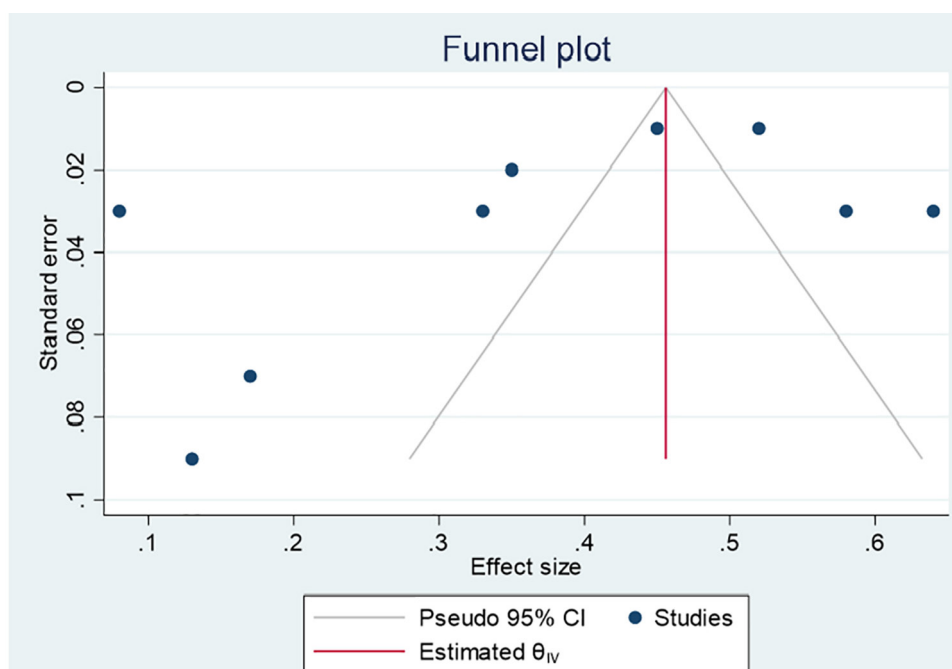


Figure 8: The updated funnel plot is represented with the imputed study.

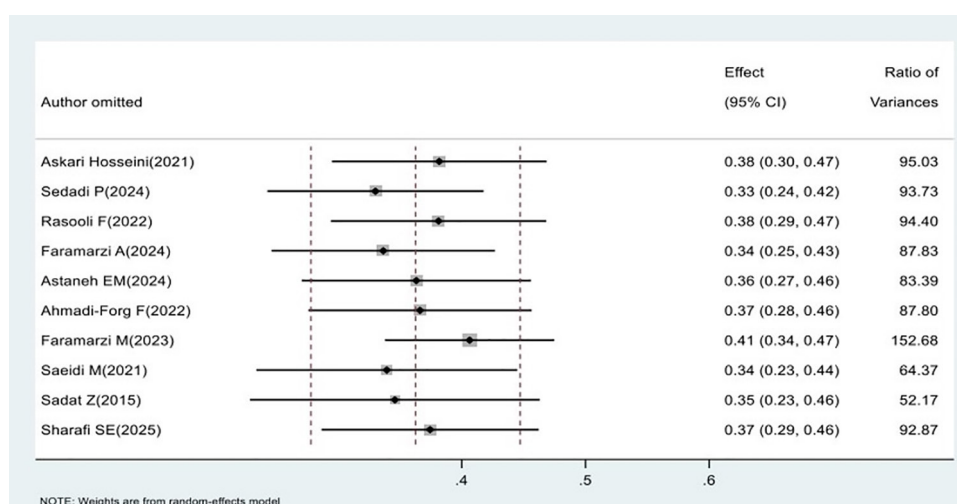


Figure 9: Sensitivity analysis using leave-one-out (LOO) meta-analysis confirmed the robustness of pooled prevalence.

Additionally, in Iran, patients discharged from the ICU are typically left without structured psychological follow-up or a designated system of post-discharge guardianship. This deficiency may contribute to the progression or persistence of psychiatric symptoms. Accordingly, it is recommended that future studies and healthcare programs pay greater attention to the psychological needs of ICU survivors following discharge.

In addition, the results of our meta-analysis indicated that Iranian female ICU survivors (51.47%) had a higher prevalence of PTSD than Iranian males (48.53%). Consistent with our findings, Schandl and colleagues³¹ and Kang and colleagues²⁸ also reported that women are

more susceptible to developing PTSD following ICU survival. Therefore, women, as a high-risk group for psychological disorders, should be specifically considered in post-ICU follow-up and mental healthcare programs.

In this study, several common factors associated with PTSD in ICU survivors were identified including older age,^{17, 22, 23, 25, 27} prolonged ICU hospitalization,^{16-18, 24, 25, 27} history of psychiatric disorders,^{16, 26, 27} mechanical ventilation,^{19, 25, 27} and drug abuse.^{25, 27} With respect to age, the findings of previous studies by Calsavara and colleagues,³² Parker and colleagues,³³ and Marra and colleagues³⁴ are consistent with our results, indicating that elderly individuals are at higher risk of developing

psychological trauma following severe psycho-physical experiences. Similarly, regarding the relationship between prolonged ICU hospitalization and PTSD, the studies by Chang and colleagues,³⁵ Wawer and colleagues,³⁶ and Sullivan and colleagues³⁷ support our findings. Additionally, a systematic review has reported that longer ICU length of stay is a risk factor for PTSD.³⁸ Undoubtedly, extended ICU hospitalization imposes a greater burden on both physical and psychological well-being, thereby increasing the likelihood of PTSD. Comorbid psychiatric disorders were also identified as a common risk factor in the studies included in our review. This finding is consistent with previous reports by Sprah and colleagues,³⁹ Hyland and colleagues,⁴⁰ and Karatzias and colleagues.⁴¹ It is evident that individuals with pre-existing psychological conditions are more vulnerable to developing additional psychiatric complications following critical illness and ICU admission.

The present study found that Iranian ICU survivors who underwent mechanical ventilation during hospitalization were at a greater risk of developing PTSD. Mechanical ventilation typically prolongs the duration of ICU stay, which was also identified as a risk factor for PTSD in our findings. Therefore, the simultaneous occurrence of these two factors may exert a synergistic effect, further increasing the likelihood of PTSD. Furthermore, in the present study, drug abuse was identified as a common associated factor. In one study, it was reported that 62% to 79% of trauma survivors who used one or more substances experienced PTSD.⁴²

Given the considerable heterogeneity identified across included studies, we acknowledge the recommendation for further subgroup analyses to identify sources of variability. However, detailed data on additional factors such as hospital type, length of stay, and other clinical variables were inconsistently reported among studies, limiting our ability to conduct comprehensive subgroup analyses. Instead, we performed meta-regression using available moderators such as study year, sample size, and geographic region to explore heterogeneity. We have highlighted this limitation and suggest that future research incorporate more granular clinical and institutional data to enable detailed heterogeneity assessments.

Based on the findings of the present study, the prevalence of PTSD among Iranian ICU survivors has shown an increasing trend in recent years. This observation may serve as an alarming signal for health policymakers in Iran, indicating the need for timely preventive strategies and structured interventions before

the problem becomes more severe.

The sensitivity analysis demonstrated that the pooled prevalence estimate was robust to the exclusion of individual studies and potential outliers. This increases confidence in the generalizability and reliability of our results, as the primary conclusions remained consistent under multiple analytic scenarios. Our results are thus supported by both the main and sensitivity analyses.

The adjusted funnel plot and Egger's test collectively revealed evidence of non-trivial publication bias. The visual asymmetry in the lower region of the funnel plot and the imputation of a missing study using the trim-and-fill method suggest that small studies with lower effect sizes were under-represented. Although the trim-and-fill adjusted pooled prevalence remained within a similar range to the original estimate, the correction slightly reduced the pooled value, indicating mild inflation caused by publication bias.

Conclusion

This study found that the prevalence of PTSD among Iranian ICU survivors was 36.4%, indicating a relatively high level. The prevalence was higher in Iranian women than in men. In addition, several common factors were identified as being associated with PTSD in this population, including older age, prolonged ICU hospitalization, history of psychiatric disorders, mechanical ventilation, and drug abuse. Given the increasing trend of PTSD observed in recent years, comprehensive planning and targeted interventions are warranted, particularly for high-risk groups characterized by these related factors.

Acknowledgement

The authors sincerely thank all researchers whose articles were included in this study for their valuable contributions to the scientific literature.

Authors' Contribution

Sh.ST: Conceptualization, study design, and reviewing the manuscript; Sh.M: Conceptualization, study design, and reviewing the manuscript; A.I: Conceptualization, study design, data analysis and interpretation, and drafting; E.SH: Conceptualization, study design, data analysis and interpretation, and reviewing the manuscript; All authors have read and approved the final manuscript and

agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declaration of AI

The authors declare that they have not used any AI tools to prepare this manuscript.

Conflict of Interest: None declared.

References

- 1 Karwa ML, Naqvi AA, Betchen M, Puri AK. In-Hospital Triage. *Crit Care Clin.* 2024;40:533-48. doi: 10.1016/j.ccc.2024.03.001. PubMed PMID: 38796226.
- 2 Liu SB, Wu HY, Duan ML, Yang RL, Ji CH, Liu JJ, et al. Delirium in the ICU: how much do we know? A narrative review. *Ann Med.* 2024;56:2405072. doi: 10.1080/07853890.2024.2405072. PubMed PMID: 39308447; PubMed Central PMCID: PMC11421129.
- 3 Adineh M, Molavynejad S, Elahi N, Jahani S, Savaie M. "I was lying on a bed just like the wounded in the war": a qualitative study explaining the experiences of brain injury patients hospitalized in ICU. *Jundishapur J Chronic Dis Care.* 2023;12:e137572. doi: 10.5812/jjcdc-137572.
- 4 Klimasinski MW. Spiritual care in the intensive care unit. *Anaesthesiol Intensive Ther.* 2021;53:350-7. doi: 10.5114/ait.2021.109920. PubMed PMID: 34714016; PubMed Central PMCID: PMC10165982.
- 5 Kynoch K, Chang A, Coyer F, McArdle A. The effectiveness of interventions to meet family needs of critically ill patients in an adult intensive care unit: a systematic review update. *JBI Database System Rev Implement Rep.* 2016;14:181-234. doi: 10.11124/JBIS-RIR-2016-2477. PubMed PMID: 27532144.
- 6 Milton A, Bruck E, Schandl A, Bottai M, Sackey P. Early psychological screening of intensive care unit survivors: a prospective cohort study. *Crit Care.* 2017;21:273. doi: 10.1186/s13054-017-1813-z. PubMed PMID: 29121983; PubMed Central PMCID: PMC5679508.
- 7 Zaretsky TG, Jagodnik KM, Barsic R, Antonio JH, Bonanno PA, MacLeod C, et al. The Psychedelic Future of Post-Traumatic Stress Disorder Treatment. *Curr Neuropsychopharmacol.* 2024;22:636-735. doi: 10.2174/1570159X22666231027111147. PubMed PMID: 38284341; PubMed Central PMCID: PMC10845102.
- 8 Levi P, Patrician PA, Vance DE, Montgomery AP, Moss J. Post-Traumatic Stress Disorder in Intensive Care Unit Nurses: A Concept Analysis. *Workplace Health Saf.* 2021;69:224-34. doi: 10.1177/2165079920971999. PubMed PMID: 33357068.
- 9 Lane-Fall MB, Kuza CM, Fakhry S, Kaplan LJ. The Lifetime Effects of Injury: Postintensive Care Syndrome and Posttraumatic Stress Disorder. *Anesthesiol Clin.* 2019;37:135-50. doi: 10.1016/j.anclin.2018.09.012. PubMed PMID: 30711227.
- 10 Kim SJ, Park K, Kim K. Post-intensive care syndrome and health-related quality of life in long-term survivors of intensive care unit. *Aust Crit Care.* 2023;36:477-84. doi: 10.1016/j.aucc.2022.06.002. PubMed PMID: 35843808.
- 11 Gravante F, Trotta F, Latina S, Simeone S, Alvaro R, Vellone E, et al. Quality of life in ICU survivors and their relatives with post-intensive care syndrome: A systematic review. *Nurs Crit Care.* 2024;29:807-23. doi: 10.1111/nicc.13077. PubMed PMID: 38622971.
- 12 Dell'Oste V, Martelli M, Fantasia S, Andreoli D, Rimoldi B, Bordacchini A, et al. Post-Traumatic Stress Disorder in ICU Survivors: Correlations with Long-Term Psychiatric and Physical Outcomes. *Int J Environ Res Public Health.* 2025;22. doi: 10.3390/ijerph22030405. PubMed PMID: 40238519; PubMed Central PMCID: PMC11942171.
- 13 Li R, Zhou Y, Liu X, Huang J, Chen L, Zhang H, et al. Functional disability and post-traumatic stress disorder in survivors of mechanical ventilation: a cross-sectional study in Guangzhou, China. *J Thorac Dis.* 2021;13:1564-75. doi: 10.21037/jtd-20-2622. PubMed PMID: 33841948; PubMed Central PMCID: PMC8024792.
- 14 Hatch R, Young D, Barber V, Griffiths J, Harrison DA, Watkinson P. Anxiety, Depression and Post Traumatic Stress Disorder after critical illness: a UK-wide prospective cohort study. *Crit Care.* 2018;22:310. doi: 10.1186/s13054-018-2223-6. PubMed PMID: 30466485; PubMed Central PMCID: PMC6251214.
- 15 Ageel M, Shbeer A, Tawhari M, Darraj H, Baiti M, Mobaraki R, et al. Prevalence of Depression, Anxiety, and Post-traumatic Stress Syndrome Among Intensive Care Unit Survivors in Jazan, Saudi Arabia. *Cureus.* 2024;16:e60523. doi: 10.7759/cureus.60523. PubMed PMID: 38883092; PubMed Central PMCID: PMC11180542.

- 16 Sedadi P, Ashraf A, Pourramazni A, Zareh R. Prevalence of post-traumatic stress disorder among intensive care unit survivors: a prospective study in Rasht, Iran. *Acad J Surg*. 2024;7:113-8. doi: 10.18502/ajs.v7i4.17467.
- 17 Astaneh EM, Alipour A, Sheikhmoonesi F. Prevalence and risk factors for post-traumatic stress disorder in ICU-hospitalized and non-ICU-hospitalized COVID-19 patients: a one-year follow-up study in Iran. *Curr Psychol*. 2024;43:22701-7. doi: 10.1007/s12144-024-05664-8.
- 18 Rasooli F, Alijanpour E, Moudi S, Bijani A. Depression, anxiety, and post-traumatic stress disorder in ICU survivors. *Zahedan J Res Med Sci*. 2022;24:109435. doi: 10.5812/zjrms-109435.
- 19 Askari Hosseini SM, Arab M, Karzari Z, Razban F. Post-traumatic stress disorder in critical illness survivors and its relation to memories of ICU. *Nurs Crit Care*. 2021;26:102-8. doi: 10.1111/nicc.12532. PubMed PMID: 32734674.
- 20 Imani A, Molavynejad S, Khademi M, Adineh M, Shafiei E, Savaie M. Epidemiology of Post-traumatic Stress Disorder in Iranian Population From 2019 to 2024: A Systematic Review and Meta-analysis. *Arch Iran Med*. 2024;27:588-94. doi: 10.34172/aim.31230. PubMed PMID: 39492566; PubMed Central PMCID: PMC11532654.
- 21 Hilton M. JBI critical appraisal checklist for systematic reviews and research syntheses (product review). *J Can Health Libr Assoc*. 2024;45:1-3. doi: 10.29173/jchla29801. PubMed Central PMCID: PMC11881645.
- 22 Faramarzi A, Esmaeili R, Shorofi SA, Yazdi K, Tatari M. Relationship between sleep quality and post-traumatic stress disorder in family caregivers of traumatic patients hospitalized in the intensive care unit (ICU). *Iran J Nurs Res*. 2024;19:36-46.
- 23 Ahmadi-Forg F, Hasani H. Relationship between the post-traumatic stress and post-traumatic growth in patients discharged from the COVID-19 intensive care unit of the selected hospitals in South Khorasan, Iran, 2020-2021. *J Birjand Univ Med Sci*. 2022;29:380-9.
- 24 Faramarzi M, Chehrazhi M, Kheirkhah F, Hamidia A, Gheisari F, Khoozan M, et al. Prevalence of Psychological Distress and Posttraumatic Stress Symptoms and Associated Factors in Hospitalized Iranian COVID-19 Patients. *Oman Med J*. 2023;38:e480. doi: 10.5001/omj.2023.59. PubMed PMID: 37113749; PubMed Central PMCID: PMC10127223.
- 25 Saeidi M, Safaei A, Sadat Z, Abbasi P, Sarcheshmeh MSM, Dehghani F, et al. Prevalence of Depression, Anxiety and Stress Among Patients Discharged from Critical Care Units. *J Crit Care Med (Targu Mures)*. 2021;7:113-22. doi: 10.2478/jccm-2021-0012. PubMed PMID: 34722912; PubMed Central PMCID: PMC8519366.
- 26 Sharafi SE, Pourgharib Shahi MH, Vatankhah V. Prevalence of post-traumatic stress disorder among COVID-19 survivors: a 6-month follow-up study in a few referral hospitals of Tehran, Iran. *J Iran Med Council*. 2025;8:87-95. doi: 10.18502/jimc.v8i1.17064.
- 27 Sadat Z, Abdi M, Aghajani M. Prevalence of Posttraumatic Stress Disorder and Related Factors Among Patients Discharged From Critical Care Units in Kashan, Iran. *Arch Trauma Res*. 2015;4:e28466. doi: 10.5812/at.28466. PubMed PMID: 26848472; PubMed Central PMCID: PMC4733532.
- 28 Kang JY, An GJ. Prevalence and risk factors of anxiety, depression, and post-traumatic stress disorder in critical care survivors. *J Korean Crit Care Nurs*. 2020;13:62-74. doi: 10.34250/jkccn.2020.13.3.62.
- 29 Righy C, Rosa RG, da Silva RTA, Kochhann R, Migliavaca CB, Robinson CC, et al. Prevalence of post-traumatic stress disorder symptoms in adult critical care survivors: a systematic review and meta-analysis. *Crit Care*. 2019;23:213. doi: 10.1186/s13054-019-2489-3. PubMed PMID: 31186070; PubMed Central PMCID: PMC6560853.
- 30 Chen Y, Huang X, Zhang C, An Y, Liang Y, Yang Y, et al. Prevalence and predictors of posttraumatic stress disorder, depression and anxiety among hospitalized patients with coronavirus disease 2019 in China. *BMC Psychiatry*. 2021;21:80. doi: 10.1186/s12888-021-03076-7. PubMed PMID: 33557776; PubMed Central PMCID: PMC7868672.
- 31 Schandl A, Bottai M, Hellgren E, Sundin O, Sackey P. Gender differences in psychological morbidity and treatment in intensive care survivors--a cohort study. *Crit Care*. 2012;16:R80. doi: 10.1186/cc11338. PubMed PMID: 22578016; PubMed Central PMCID: PMC3580623.
- 32 Calsavara AJ, Costa PA, Nobre V, Teixeira AL. Prevalence and risk factors for post-traumatic stress, anxiety, and depression in sepsis survivors after ICU discharge. *Braz J Psychiatry*. 2021;43:269-76. doi: 10.1590/1516-4446-2020-0986. PubMed PMID: 33053073; PubMed Central PMCID: PMC8136386.
- 33 Parker AM, Sricharoenchai T, Raparla S,

- Schneck KW, Bienvenu OJ, Needham DM. Posttraumatic stress disorder in critical illness survivors: a metaanalysis. *Crit Care Med*. 2015;43:1121-9. doi: 10.1097/CCM.0000000000000882. PubMed PMID: 25654178.
- 34 Marra A, Pandharipande PP, Patel MB. Intensive Care Unit Delirium and Intensive Care Unit-Related Posttraumatic Stress Disorder. *Surg Clin North Am*. 2017;97:1215-35. doi: 10.1016/j.suc.2017.07.008. PubMed PMID: 29132506; PubMed Central PMCID: PMC5747308.
- 35 Chang CS, Tsai FJ, Liao CH. Associations Between Elevated Rates of Depression, Anxiety, and PTSD Among ICU Survivors and Increased Mortality and Readmissions. *Brain Behav*. 2025;15:e70319. doi: 10.1002/brb3.70319. PubMed PMID: 39957084; PubMed Central PMCID: PMC11830751.
- 36 Wawer E, Viprey M, Floccard B, Saoud M, Subtil F, Wafa H, et al. Early Detection of Patients at Risk of Developing a Post-Traumatic Stress Disorder After an ICU Stay. *Crit Care Med*. 2020;48:1572-9. doi: 10.1097/CCM.0000000000004551. PubMed PMID: 32885939.
- 37 Sullivan E, Shelley J, Rainey E, Bennett M, Prajapati P, Powers MB, et al. The association between posttraumatic stress symptoms, depression, and length of hospital stay following traumatic injury. *Gen Hosp Psychiatry*. 2017;46:49-54. doi: 10.1016/j.genhosp-psych.2017.03.004. PubMed PMID: 28622816.
- 38 Abdelbaky AM, Eldelpshany MS. Intensive Care Unit (ICU)-Related Post-traumatic Stress Disorder: A Literature Review. *Cureus*. 2024;16:e57049. doi: 10.7759/cureus.57049. PubMed PMID: 38681363; PubMed Central PMCID: PMC11046361.
- 39 Sprah L, Dernovsek MZ, Wahlbeck K, Haaramo P. Psychiatric readmissions and their association with physical comorbidity: a systematic literature review. *BMC Psychiatry*. 2017;17:2. doi: 10.1186/s12888-016-1172-3. PubMed PMID: 28049441; PubMed Central PMCID: PMC5210297.
- 40 Hyland P, Vallieres F, Cloitre M, Ben-Ezra M, Karatzias T, Olf M, et al. Trauma, PTSD, and complex PTSD in the Republic of Ireland: prevalence, service use, comorbidity, and risk factors. *Soc Psychiatry Psychiatr Epidemiol*. 2021;56:649-58. doi: 10.1007/s00127-020-01912-x. PubMed PMID: 32632598.
- 41 Karatzias T, Hyland P, Bradley A, Cloitre M, Roberts NP, Bisson JI, et al. Risk factors and comorbidity of ICD-11 PTSD and complex PTSD: Findings from a trauma-exposed population based sample of adults in the United Kingdom. *Depress Anxiety*. 2019;36:887-94. doi: 10.1002/da.22934. PubMed PMID: 31268218.
- 42 Nguyen J, Whiteside LK, Bulger EM, Veach L, Moloney K, Russo J, et al. Post-traumatic stress disorder (PTSD) symptoms and alcohol and drug use comorbidity at 25 US level I trauma centers. *Trauma Surg Acute Care Open*. 2022;7:e000913. doi: 10.1136/tsaco-2022-000913. PubMed PMID: 35979039; PubMed Central PMCID: PMC9358953.