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Prevalence of Pressure Ulcers in the ICUs of Iranian Hospitals: A Systematic Review and Meta-analysis

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Abstract

Background: Patient safety is a fundamental right and a core priority in healthcare systems, aiming to prevent harm during diagnosis and treatment. Pressure ulcers are a common problem in intensive care units (ICUs), causing significant physical, psychological, social, and financial burdens. Although several studies have been conducted in Iran, data remain fragmented and region-specific, preventing a comprehensive national estimate.

Aim: This systematic review was conducted with aim to determine the prevalence of pressure ulcers in the ICUs of Iranian hospitals.

Method: This study was conducted as a systematic review and meta-analysis following Gough's nine-stage framework. Searches were performed in the international and national databases up to July 22, 2025, resulting in 16 eligible studies. Study quality was assessed using a modified Newcastle-Ottawa Scale. Statistical analyses were performed with Comprehensive Meta-Analysis software using a random-effects model.

Results: After excluding studies with potential bias, the pooled prevalence of pressure ulcers in Iranian ICU patients was estimated at 6.6% (5.2%-8.4%; 95% CI). The highest prevalence was reported in the eastern provinces. Meta-regression showed a significant positive association between patient age and pressure ulcer prevalence, and an inverse association with sample size ($p<0.05$).

Implications for Practice: Pressure ulcers pose serious physical, psychological, social, and financial challenges for ICU patients. Healthcare facilities must prioritize the implementation of effective prevention protocols tailored to at-risk patients. Regular, ongoing training and workshops for healthcare staff are essential to enhance knowledge and skills in pressure ulcer prevention. Additionally, educating patients and their families about risk factors and preventive measures is vital to reduce the incidence of pressure ulcers and improve overall patient care outcomes.

Keywords: Hospital, Incidence, Intensive Care Unit, Iran, Pressure Ulcers

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Introduction

Patient safety is a fundamental right and a core priority in healthcare systems. It involves preventing or minimizing harm during diagnosis and treatment through effective, evidence-based practices. Recognizing its global importance, the World Health Organization (WHO) launched the World Alliance for Patient Safety in 2004 to improve care quality worldwide (1-3). In intensive care units (ICUs), where patients face serious conditions and complex treatments, safety risks are especially high. Key concerns include medication errors, hospital-acquired infections, and pressure ulcers, the latter being the third most common complication (4, 5).

Pressure ulcers—also known as bedsores—are a widespread issue in healthcare systems worldwide. They involve localized injury to the skin and sometimes the underlying soft tissue, typically caused by prolonged pressure on areas of the body in contact with surfaces such as beds or chairs. This sustained pressure impairs blood circulation, which can lead to thinning of the epidermis, loss of subcutaneous fat, and decreased collagen elasticity, all of which compromise skin integrity (6). According to a 2020 global meta-analysis covering data from 2008 to 2018, the overall prevalence of pressure ulcers was estimated at 12.8% worldwide. Regional figures showed variation, with 14.5% in Europe, 13.6% in North America, 12.7% in South America, 12.6% in the Middle East, 9% in Australia, and as low as 3% in Asia (7). Additionally, the WHO has reported pressure ulcer prevalence in developed countries to range between 10.1% and 14.8% (8). More recently, a 2024 review focusing on intensive care units in the Eastern Mediterranean region identified a notably higher prevalence of 16% for hospital-acquired pressure injuries (6).

Pressure ulcers are divided into four stages based on severity. Stage 1 is the mildest, causing skin discoloration without an open wound. The affected area may feel painful, firm, soft, warmer, or cooler than nearby skin. Stage 2 involves damage to the skin with a shallow open sore or a blister filled with serum. Stage 3 shows full-thickness tissue loss, exposing fat but not bone, tendon, or muscle. Stage 4 is the deepest, with visible or palpable bone, tendons, or muscle, causing extensive damage. Other types include “suspected deep tissue injury,” which looks like a purple or maroon area of intact but discolored skin or a blood-filled blister. “Unstageable” ulcers are full-thickness wounds where the depth cannot be measured due to covering tissue (9-11). Pressure ulcer risk factors fall into two groups: intrinsic and extrinsic. Intrinsic factors include age, poor nutrition, chronic diseases like diabetes and heart conditions, inactivity, ICU stay length, immune status, radiation therapy, and mental health. Extrinsic factors involve pressure, friction, how long pressure or friction lasts, wounds, stress, temperature, humidity, trauma, swelling, infection, quality of nursing care, how often patients are repositioned, bed conditions, and socioeconomic status (12-19).

Pressure ulcers are a serious health issue affecting patients, healthcare teams, and society. They cause significant pain and lower patients’ quality of life (20, 21).These ulcers also prolong hospital stays by causing infections and delaying healing. This increases the workload for healthcare providers (22-24). A 2011 German study showed patients with pressure ulcers had longer hospital stay (19 days) than those without (9.9 days). Pressure ulcers added an extra 2.6 days to the hospital stay. Prolonged stays and infections raise patient mortality. About 60,000 people worldwide die from pressure ulcers each year (25, 26). Pressure ulcers are the third most expensive condition after cancer and heart disease. They consume about 4% of Europe’s annual healthcare budget (23, 27). A 2018 US study found patients with pressure ulcers had 22.5% higher costs than those without (28). In the UK, managing an unhealed ulcer costs 2.4 times more than managing a healed one (29). In recent years, several studies have examined the prevalence of pressure ulcers in the ICUs of Iranian hospitals. Zarei et al. (2016) reported a prevalence of 8.9% (30), while Reihani Kermani (2005) found a prevalence of 22.7% (31). Each study focused on specific regions of the country, resulting in fragmented and region-specific data. Due to this variability and lack of a comprehensive national estimate, a complete understanding of the overall burden of pressure ulcers in Iranian ICUs remains unclear. Therefore, this study was conducted with aim to provide a more accurate and comprehensive estimate of pressure ulcer prevalence across ICUs in Iranian hospitals.

Methods

This systematic review and meta-analysis was conducted in accordance with Gough’s nine-stage framework. This process encompassed formulating the research question, establishing inclusion and exclusion criteria, selecting appropriate search strategies, screening the literature, documenting the

selection process, assessing study quality, extracting relevant data, synthesizing the evidence, and formulating conclusions (32). The PRISMA 2020 flowchart was employed to illustrate the selection process of the studies (33). The review was structured using the PIO model—Population (patients), Intervention (clinical services), and Outcome (pressure ulcers)—which informed both the design and analytical approach. The central research question was: "What is the prevalence of pressure ulcers in the intensive care units of Iranian hospitals based on existing research findings"?

The search strategy was gradually refined through an iterative process, beginning with an initial exploratory search. This step involved examining the keywords and indexing terms used in the early set of identified articles. With guidance from a skilled medical librarian, a search string was first formulated in the MEDLINE database. The selected terms were then adapted for use in additional databases using the Polyglot Search Translator from the Systematic Review Accelerator tool (34), followed by manual adjustments to ensure relevance and consistency. Key search terms included: Prevalence, Frequency, Decubitus Ulcer, Pressure Ulcer, Pressure Sore, Bed Sore, ICU, Hospital, and Iran. Retrieved citations were first imported into EndNote for management and subsequently exported to Rayyan for screening and analysis. The comprehensive search was finalized on July 22, 2025.

The study selection process was conducted in three sequential stages. Initially, the titles and abstracts of retrieved articles were screened to evaluate their potential relevance; this step was primarily performed by P.I. and F.M. In the second stage, full-text articles that met initial criteria were reviewed in detail against the predefined inclusion and exclusion criteria, a phase led by M.S. and F.R. The final stage involved a manual search of the reference lists of the included studies to identify additional eligible sources, carried out mainly by M.P.M. and A.B. Each phase was independently conducted by three reviewers. Any disagreements were addressed through discussion, and when necessary, resolved with the input of a fourth reviewer, typically H.S. or M.A.

A total of 1101 articles were extracted. After removing duplicates and articles lacking full text, 839 studies remained, of which, 804 articles were removed after reviewing the titles and abstracts, and 21 were removed as they did not report prevalence rates. Two papers were obtained by reviewing the reference lists of the articles. As a result, 16 articles were selected for final review (Figure 1).

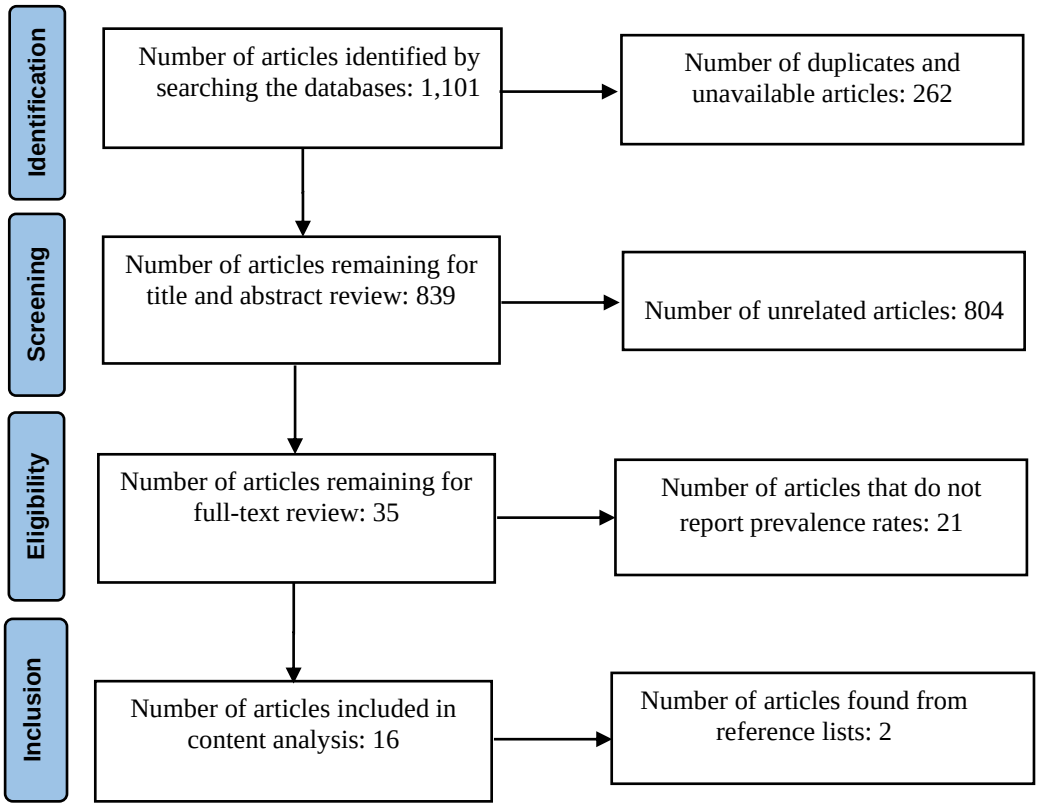

Figure 1. Flowchart of the systematic review selection process

The inclusion criteria for this systematic review were as follows: original quantitative research articles with an observational cross-sectional design, published in Persian or English, that reported the prevalence of pressure ulcers in Iranian hospitals, and the studies conducted in hospital settings. The exclusion criteria were: studies published in languages other than Persian or English, articles published after July 22, 2025, review papers, books, and qualitative studies, studies lacking prevalence data, studies focusing exclusively on a specific stage or type of pressure ulcer, studies limited to non-ICU wards, and sources without full-text availability.

Two authors (P.I. & M.F.) independently assessed the quality of all included studies using a modified version of the Newcastle-Ottawa Scale (35). This adapted tool evaluates three key domains: Selection, Comparability, and Outcome, with a total score that can reach up to 12—exceeding the original maximum of 10 points (Table 1). Studies receiving a score of 10 or higher are typically regarded as high quality, whereas those scoring below this cutoff may be subject to potential biases or methodological limitations. Data were extracted on the first author's name and year, study location, journal, pressure ulcer prevalence, sample size, average patient age, and the instrument used for data collection (Table 2). For some studies that did not mention the year the study was conducted, publication year was used instead.

Table 1: Quality Assessment of Included Studies Using Modified Newcastle-Ottawa Scale

Author / Year	Selection (0-5)	Comparability (0-2)	Outcome (0-5)	Total Score (0-12)
Zarei Z, 2016	4	2	4	10
Reihani Kermani M, 2005	4	2	4	10
Iranmanesh S, 2010	5	2	5	12
Azimian J, 2016	4	2	4	10
Alizadeh Ghavidel A, 2012	4	2	4	10
Rashvand F, 2019	5	2	5	12
Akbari Sari A, 2009	4	2	4	10
Akbari Sari A, 2007	4	2	4	10
Ahmadinejad M, 2009	4	2	4	10
Khoshfetrat M, 2017	4	2	4	10
Suzani A, 2008	4	2	4	10
Shokati Ahmadabad M, 2015	5	2	5	12
Valizadeh L, 2011	4	2	4	10
Nassaji M, 2011	4	2	4	10
Afkar A, 2014	4	2	4	10
Rahimi-Bashar F, 2012	4	2	4	10

Statistical analysis was conducted using Comprehensive Meta-Analysis (CMA) software. Given that each study provided both the prevalence of pressure ulcers and the corresponding sample size, variances were estimated based on a binomial distribution model. A weighted average approach was used to pool the results, assigning weights to studies inversely related to their variance. Between-study heterogeneity was evaluated using Cochran's Q test and the I^2 statistic, with an I^2 value of 96.23% indicating considerable heterogeneity. Due to this high heterogeneity, a random-effects model was selected to estimate the pooled effect size, which was reported with 95% confidence intervals and visualized using a forest plot. Publication bias was assessed using both visual inspection of a funnel plot and Egger's regression test. Additionally, a sensitivity analysis was performed to determine the robustness of the pooled estimate by assessing the impact of each individual study on the overall findings.

Ethical Consideration

All authors are responsible for adhering to the ethical guidelines throughout the publication process.

Table 2. Characteristics of the identified articles

S/N	Author/ Year	Location	Journal	Pressure Ulcer Prevalence (%)					Sample Size	Average Age	Tool
				G1	G2	G3	G4	Total			
1	Zarei 2016 (30)	Tehran	Journal of Tissue Viability	33	-	-	12.2	8.9	642	52.4	Medical files
2	Reihani Kermani 2005 (31)	Kerman	Arak University of Medical Sciences	-	-	-	-	22.7	198	31.4	Braden scale
3	Iranmanesh 2010 (56)	Kerman	International Wound Journal	-	-	-	-	13.4	82	41.4	Braden scale
4	Azimian 2016 (57)	Qazvin	International Journal of Novel Research in Healthcare and Nursing	-	-	-	-	32.9	82	60.9	Braden scale
5	Alizadeh Ghavidel 2012 (58)	Tehran	Razi Journal of Medical Sciences	95.7	4.2	-	-	20.12	333	-	Questionnaire
6	Rashvand 2019 (59)	Qazvin	International Wound Journal	70.11	19.5	10.34	-	20.54	404	-	Braden scale
7	Akbari Sari 2009 (60)	Tehran	Iranian Journal of Public Health	-	-	-	-	20.8	310	-	Checklist
8	Akbari Sari 2007 (61)	Tehran	School of Public Health and Institute of Public Health Research Quarterly	-	-	-	-	19.3	310	-	Questionnaire
9	Ahmadinejad 2009 (62)	Kerman	Iranian Journal of Anesthesiology and Critical Care	-	-	-	-	5.34	1,104	39.8	Medical files
10	Khoshfetrat 2017 (63)	Zahedan	Archives of Anesthesiology and Critical Care	26.8	63.4	9.9	-	9.1	781	-	Medical files
11	Suzani 2008 (64)	Shahrud	Journal of Health and Well-being	-	-	-	-	20.8	158	-	Waterlow assessment tool & Braden scale
12	Shokati Ahmadabad 2015 (65)	Qazvin	International Journal of Epidemiologic Research	41.4	4.3	-	-	45.7	70	63.4	Braden scale
13	Valizadeh 2011 (66)	Urmia	Iranian Journal of Anesthesiology and Critical Care	12.4	4	0.8	-	17.3	249	49.43	Medical files
14	Nassaji 2011 (67)	Semnan	International Journal of Nursing Practice	16.19	7.67	1.70	-	25.6	352	55.7	Checklist
15	Afkar 2014 (68)	Gilan	Kermanshah University of Medical Sciences	-	-	-	-	3.6	673	45.35	Braden scale
16	Rahimi-Bashar 2012 (69)	Hamedan	Journal of Biology and Today's World	-	-	-	-	8.5	248	48.36	Checklist

Results

Up to July 22, 2025, sixteen articles were found which studied the prevalence of pressure ulcers in the ICUs of Iranian hospitals. Of these, ten were published in English and six in Persian. The majority appeared in the International Wound Journal. Most studies were published in the years 2009, 2011, 2012, and 2016. Research on this topic covered nine provinces in Iran, with the highest number of studies conducted in Tehran (4 studies), followed by Kerman and Qazvin (3 studies).

Egger's test was used to evaluate publication bias, resulting in a p-value of about 0.03. This suggests a statistically significant presence of publication bias (Figure 2). As shown in Figure 2,

the primary study effects appeared unevenly distributed around the central axis, indicating possible asymmetry. To address potential heterogeneity and publication bias, a sensitivity analysis was performed to detect and remove outlier or extreme values. Based on this analysis, seven studies that showed signs of publication bias were excluded from the final meta-analysis (Figure 3).

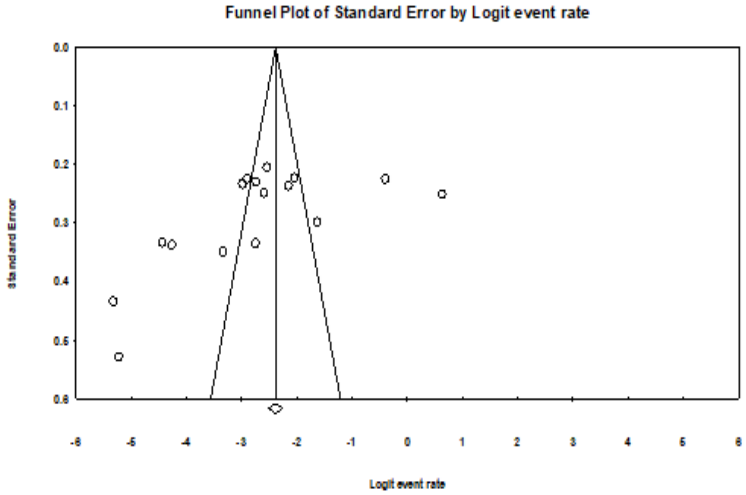

Figure 2: Publication bias detected via Egger's test prior to sensitivity analysis

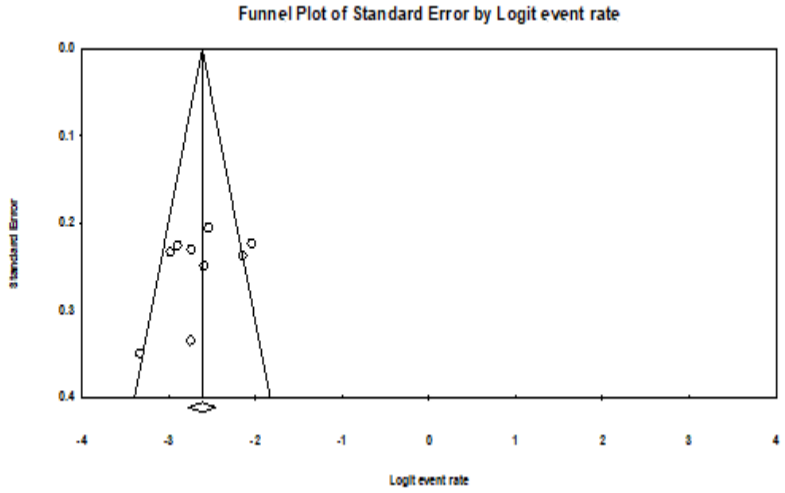

Figure 3: Publication bias detected via Egger's test following sensitivity analysis

After excluding the mentioned studies, Funnel Plot 3 was created, showing better symmetry compared to Funnel Plot 2—indicating a reduction in publication bias. To further assess this bias, the Fail-Safe N test was used. This test estimates how many missing studies with no significant results would be needed to make the overall findings statistically non-significant. The analysis showed that adding 241,300,000 non-significant studies would cancel out the current effect. Consequently, the p-value increased from 0.03 to 0.25 (p>0.05), suggesting that the initial result may not be robust. After removing outlier effect sizes, nine studies remained for the final meta-analysis. Based on the meta-analysis of 9 studies conducted after sensitivity analysis, the prevalence of pressure ulcers in the ICUs of Iranian hospitals was estimated to be 6.6% (5.2%-8.4%; 95% CI) (Table 3).

Table 3: Meta-analysis of prevalence of pressure ulcers in the ICUs of Iranian hospitals Based on the Random-Effects Model Before and After Sensitivity Analysis

	Model	Number	Prevalence	CI (95%)	Standard Error	Variance	Heterogeneity %	Z	P
Before Sensitivity Analysis	Random	16	5.9	5.9-31	7.5	5.68	96.23	-7.94	≤0.0001
After Sensitivity Analysis	Random	9	6.6	5.2-8.4	7.4	0.05	58.73	-20.60	≤0.0001

The prevalence of pressure ulcers in ICU patients was reported higher when using the Braden scale than other instruments. Pressure ulcers were most prevalent in the eastern provinces (Table 4). To test for heterogeneity, the variables suspected of causing heterogeneity (year, sample size, and average age) were incorporated into the meta-regression model. The results in Table 5 show that sample size and average age contributed to the heterogeneity between the findings of the studies (p<0.05).

Table 4. Prevalence of pressure ulcers in the studied subgroups

Variables		Number of Studies	Prevalence	CI (95%)	Heterogeneity	
					%	P
Instrument	Braden	2	11.0	8.2-145	0.00	≤ 0.01
	Braden-Waterlow	1	6.0	3.2-11.0	0.00	≤ 0.01
	Questionnaire	5	5.5	4.5-6.8	15.11	≤ 0.01
	Medical files	1	6.9	4.4-10.8	0.00	≤ 0.01
Region	Northern	1	6.9	4.4-10.8		≤ 0.01
	Central	6	6.4	5.1-8.1	38.87	≤ 0.01
	Eastern	1	11.5	7.7-16.7	-	≤ 0.01
	Western	1	3.4	1.86.6	-	≤ 0.01

Table 5. Results of adjusting for the factors causing heterogeneity between the studies (meta-regression model)

Variable	Correlation Coefficient	P-value
Year	0.01	0.52
Sample Size	-0.002	0.00
Average Age	0.002	0.00

Discussion

The purpose of this study was to determine the prevalence of pressure ulcers in the ICUs of Iranian hospitals. Based on the meta-analysis of 9 studies conducted after sensitivity analysis, the prevalence of pressure ulcers in the ICUs of Iranian hospitals was estimated to be 6.6%. Similar studies have been conducted with different prevalence rates. The prevalence of pressure ulcers in ICU patients was about 10.2% in German hospitals between 2001 and 2007 (36), 24.3% in India in 2015 (37), 15.8% in Ethiopia in 2016 (38), and 10% in Australia and New Zealand in 2016 (39), 52.9% in Brazil in 2015 (40), in 23.7% South Korea in 2015 (41), and 35.7% in Saudi Arabia in 2019 (42). The prevalence of pressure ulcers in ICU patients varies across countries. This difference can partly be attributed to the type of instrument used. In this study, the highest prevalence of pressure ulcers in ICUs was reported

using the Braden scale. This scale is one of the most widely used risk assessment tools for all stages of the disease and all durations of care, especially in ICUs. It measures pressure ulcer risk based on six elements, i.e. sensory perception, mobility, moisture, nutrition, friction/shear, and activity, which are rated from 1 to 4 (43).

A systematic review conducted in 2020 estimated the prevalence of pressure ulcers in the intensive care units of Iranian hospitals to be 19.59%. This study reviewed articles published on this topic and searched both international and national databases, including Scopus, PubMed, Web of Science, Magiran, and SID. A total of nine relevant articles were identified (44). The present study aimed to update the existing evidence and address the limitations of previous reviews. A comprehensive search was conducted across major databases, including PubMed, Scopus, Web of Science, SID, and Magiran, up to July 22, 2025. In addition, Google Scholar was used to enhance search sensitivity and identify any potentially relevant published studies. Although no new studies were published between 2020 and 2024, this review, by employing a broader search strategy and using a wider range of keywords and synonyms, succeeded in identifying 16 eligible studies, which is seven more than those included in the 2020 review. The increased number of included studies was primarily due to the application of a more rigorous methodology, the removal of language restrictions, and manual checking of references from selected articles. Following quality assessment and sensitivity analysis, studies with a high risk of bias were excluded, resulting in a final pool of nine studies for meta-analysis. This process led to an updated and more accurate estimate of the prevalence of pressure ulcers in Iranian ICUs, reported as approximately 6.6%. This substantial difference from the previous estimate of 19.59% reflects the improved methodology and timeliness of the current study.

In the present study, the highest prevalence was observed in the eastern provinces of Iran. However, due to the limited number of studies, the results should be interpreted with caution. Several factors may contribute to the elevated prevalence of pressure ulcers in ICU settings in Iran, especially in certain regions: First, many hospitals in less developed or geographically remote provinces may face resource constraints, including limited access to pressure-relieving equipment (e.g., special mattresses and cushions), staff shortages, and insufficient training in pressure ulcer prevention. Second, ICUs typically manage critically ill patients with impaired mobility, reduced consciousness, and complex medical conditions, all of which significantly increase the risk of pressure ulcer development. Third, variability in adherence to standard preventive protocols, differences in nurse-to-patient ratios, and inconsistent implementation of routine skin assessments across provinces may also explain regional disparities. Finally, climate and socioeconomic conditions may indirectly affect healthcare delivery. For example, high temperatures and humidity can lead to increased sweating and skin breakdown, while underfunded healthcare facilities may lack structured wound care programs (45).

The meta-regression analysis revealed a direct relationship between average age and the prevalence of pressure ulcers in ICU patients; for each one-year increase in age, prevalence rose by 0.002%. This can be attributed to age-related factors such as comorbidities, reduced mobility, and poorer tissue tolerance. Inadequate socioeconomic and psychological conditions in older adults may also limit access to quality care. Despite ongoing prevention efforts, pressure ulcers remain common due to population aging, the expansion of long-term care facilities, and limited clinical research. Effective prevention requires to improve tissue resilience and minimize prolonged pressure, friction, and moisture (46, 47).

The meta-regression analysis revealed an inverse relationship between sample size and the prevalence of pressure ulcers in ICU patients. Specifically, as the sample size increased, the reported prevalence of pressure ulcers tended to decrease by approximately 0.002%. This finding indicates that larger studies generally report lower prevalence rates compared to smaller studies. One possible reason for this inverse association is that larger studies often include more diverse and representative patient populations. This diversity helps reduce selection bias, which can occur in smaller studies where the sample might not fully represent the broader patient group. Consequently, larger studies tend to produce more reliable and generalizable results. Additionally, larger studies usually follow more rigorous methodologies and standardized protocols. These factors improve the accuracy of data collection and reporting, which may lead to a more precise and often lower estimate of pressure ulcer prevalence. In contrast, smaller studies might have methodological limitations that could inflate prevalence rates. The inverse correlation between sample size and pressure ulcer prevalence highlights the importance of including larger, well-designed studies in meta-analyses. Doing so helps

provide a more accurate understanding of the true prevalence of pressure ulcers in ICU patients, reducing the risk of overestimation due to smaller, less representative studies.

Evidence-based pressure ulcer prevention programs are essential. These programs can assess the incidence risk of pressure ulcers and include systematic skin assessment, risk reduction, education of patients and families, and staff, and overall program evaluation (48). The introduction of a formal risk assessment program can significantly reduce the incidence and severity of pressure ulcers in a health center (49). In a statewide Pressure Ulcer Prevention Collaborative, the New Jersey Hospital Association (NJHA) Quality Institute reported a 30% reduction in pressure ulcer incidence in the 150 participating centers in the first year, which increased to more than 70% for many centers that continued the program for a second year (50).

Despite the increase in research on pressure ulcer management, there is alarming evidence that many patients are still susceptible to severe pressure ulcers (51). Therefore, treatment should aimed at improving the overall condition of patients and creating a suitable environment for wound prevention (52). In most cases, the goal of treatment is to achieve complete healing and skin repair. However, in patients with chronic diseases, the goal of treatment may be palliative and more focused on reducing discomfort rather than complete recovery (52). Therefore, it is important to conduct a comprehensive patient assessment, identify relevant risk factors, and adopt appropriate patient-centered goals (53).

Severe degrees of pressure ulcers are manageable in most cases, and treatment should focus on immediate reduction of pressure, incision, and friction. This can partly be done by adopting a proper skin care regimen and managing aggravating factors such as urinary or fecal incontinence (53). In general, pressure ulcer management is based on the three principles: removing the pressure agent, protecting the wound from contamination, and promoting healing through nutrition (54). The dissemination and implementation of these principles plays an important role in pressure ulcer control. The results of a study showed that the Dutch guidelines on some aspects of pressure ulcer prevention and treatment were not properly implemented. Fewer than one-third of the patients were repositioned, received nutritional support, or were educated as required. Moreover, only 33.6% of all pressure ulcers were dressed as recommended (55).

One of the main limitations of this study was incomplete data of some of the included articles, particularly regarding variables such as pressure ulcer stages and detailed demographic information. To address this issue, strict inclusion criteria were applied to ensure that only studies reporting essential data for analysis were included. Additionally, sensitivity analyses were conducted to assess the impact of studies with missing data on the overall results. Studies lacking critical information were carefully evaluated and excluded if necessary to minimize bias. These measures helped improve the validity and reliability of the pooled estimates.

Implications for practice

Pressure ulcers affect a significant portion of ICU patients and lead to serious physical, psychological, social, and financial consequences. Therefore, it is essential to implement effective prevention strategies for at-risk patients in hospital settings. Regular training workshops for healthcare staff, along with continuous education programs, can enhance awareness and skills for pressure ulcer prevention. Additionally, educating patients and their families about risk factors and preventive measures plays a crucial role in reducing the incidence of pressure ulcers and improving patient outcomes.

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Conflicts of interest

The authors declared no conflict of interest regarding the publication of this study.

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Authors' Contributions

M.A., A.B. and P.I. participated in the design of the study. P.I., M.A., F.M., F.R., M.S., F.M., H.S., and M.P.M. undertook the literature review process. All authors drafted the manuscript. All authors read and approved the final manuscript.

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