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Impact of Mindfulness-Based Stress Reduction Programs on Burnout and Resilience Among Emergency Department Nurses: A Systematic Review

Mohammad Saleh Ateg Al Motrafi[1], Joud Sultan Alsaloli[2], Bushra Abdulaziz Alruwaythi[3], Nadia Ghanem Saeed Alrashedi[4], Najat Awad alerwi[5], Renad saud Alqarafi[6], Nora Mohammad Salam[7], Jehan Musallam Thunayyan Aljohani[8], Shouq Ali Abdali[9], Asmaa Abdelkarem S Alshahrani[10]

[1] Registerd Nurse, Jabril Health cerrar
[2] KSAMC, Nursing Specialist
[3] King Salman Medical City – Home Healthcare Department
[4] Nursing Technician, King Salman Bin Abdulaziz Medical City
[5] Nursing Technician, Al-Azhari Health Center
[6] Nursing, Maternity and Children Hospital
[7] King Salman Hospital, Nursing Specialist, Riyadh
[8] Specialist Nursing, Specialized Psychiatric Hospital - King Salman Bin Abdulaziz Medical City
[9] King Salman Hospital, Senior Nursing Specialist, Riyadh
[10] Nursing specialist, Aljefarah PHC

ABSTRACT

Background: Emergency department (ED) nurses face chronic work-related stress that places them at high risk of burnout, yet evidence on mindfulness-based stress reduction (MBSR) in this population is scattered across heterogeneous program formats. This systematic review evaluated the impact of MBSR and MBSR-derived mindfulness and meditation programs on burnout and resilience among ED nurses.

Methods: PubMed/MEDLINE, CINAHL, Embase, PsycINFO, Scopus, Web of Science, and CENTRAL were searched from inception to November 2026. Randomized controlled trials, quasi-experimental, single-group pre-post, quality improvement, and mixed-methods studies with a quantitative component were eligible. Two reviewers independently screened, extracted data, and appraised risk of bias using the Cochrane RoB 2 tool or a structured non-randomized appraisal. Findings were synthesized narratively according to SWiM guidance; pooling was not planned because of clinical and methodological heterogeneity.

Results: Nine studies (approximately 540 participants) were included: five randomized trials, two pre-post studies, one quality improvement project, and one mixed-methods pilot. Only one delivered a classic eight-session MBSR course. Five of the eight studies reporting burnout found improvement, most consistently in emotional exhaustion; three found no significant change. All six studies reporting stress found favorable effects. Mindfulness and wellbeing improved in most studies measuring them. Resilience was directly measured in only one study, with no significant improvement. Methodological quality was variable: three randomized trials were rated as having some concerns and six studies as high concern, mainly due to small samples, absent controls, non-validated measures, and high attrition.

Conclusions: MBSR and related programs may reduce stress and emotional exhaustion in ED nurses, but evidence certainty is low. Rigorous trials with longer follow-up and validated resilience outcomes are needed.

ARTICLE HISTORY

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1. Background

Burnout is a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment that develops in response to chronic work-related stress, and it is found predominantly in caring professions such as nursing (Maslach et al., 1981). These three dimensions form the basis of the Maslach Burnout Inventory, which remains the most widely used instrument for measuring burnout in health care research (Maslach et al., 1981). Because nursing work involves sustained emotional and physical demands, burnout in nurses is considered an occupational problem rather than a purely individual one.

CONTACT Mohammad Saleh Ateg Al Motrafi

Emergency department (ED) nurses work in an environment characterized by unpredictable patient flow, time pressure, exposure to trauma and suffering, and frequent interruptions. Qualitative and survey-based work has described the stress experienced by nurses and doctors in emergency departments (Healy et al., 2011), and stressors specific to ED nurses have been documented in cross-sectional surveys (Alomari et al., 2020). Emergency nurses have also been reported to show higher compassion fatigue and lower compassion satisfaction than nurses in other inpatient specialties (Hooper et al., 2010).

The burden of burnout in this group has been intensified by recent health system pressures. A cross-sectional analysis of emergency nurses working through the COVID-19 pandemic examined burnout, secondary traumatic stress, and compassion satisfaction in this workforce (Lopez et al., 2022), and studies of workplace wellbeing in urban emergency departments have highlighted the need for sustained attention to staff wellbeing (Kumar et al., 2019). Collectively, these reports indicate that ED nurses represent a high-risk group for work-related psychological strain.

The consequences of poor nurse wellbeing extend beyond the individual. Nurses' wellbeing at work has been linked to the quality of patient care and to the efficiency of the health care system (Kumar et al., 2019; Alomari et al., 2020), and effective stress management has been proposed to have implications for job retention, productivity, and career duration (Mäkinen et al., 2024). Protecting ED nurses from burnout is therefore relevant to both workforce sustainability and patient safety.

Resilience is commonly conceptualized as the capacity to adapt to, cope with, and recover from stress and adversity, and it has been operationalized through instruments such as the Connor-Davidson Resilience Scale (Connor et al., 2003). Resilience is of particular interest in emergency nursing because it may protect against the cumulative effect of repeated exposure to stressful events. Interventions that aim to strengthen resilience alongside reducing burnout are consequently of practical interest to nursing managers and educators.

A range of individual-level and organizational-level interventions have been evaluated to reduce occupational stress and burnout among ED staff, and these were synthesized in a systematic review published in JBI Evidence Synthesis (Xu et al., 2020). Mindfulness-based approaches are among the individual-level strategies that have attracted growing interest because they can be taught in groups, practiced in short periods, and adapted to digital delivery.

Mindfulness has been defined as intentionally paying attention to the present moment in a non-judgmental way (Ludwig et al., 2008). The Mindfulness-Based Stress Reduction (MBSR) program originated from the outpatient behavioral medicine program for chronic pain patients described by Kabat-Zinn (1982), and it is delivered as a structured group program that combines formal meditation, body awareness practices, and home practice. MBSR has since been applied well beyond its original clinical population, including in workplace and health care settings.

Evidence in working populations supports the potential of MBSR and related programs. A systematic review of MBSR in employees examined its effects on mental health outcomes (Janssen et al., 2018), and a systematic review and meta-analysis assessed mindfulness-based interventions for reducing stress among health care professionals (Burton et al., 2017). Within nursing, a review of mindfulness meditation concluded that it was effective in decreasing stress and burnout in nurses and could increase resiliency, compassion, and emotional regulation (Green et al., 2021). In emergency and critical care nurses specifically, a systematic review of ten studies reported that nine showed improvement in psychological well-being, compassion, and resilience after mindfulness-based interventions (Joseph et al., 2024), and a narrative review has summarized MBSR and mental health in emergency nurses (Zhou et al., 2025).

Controlled studies in nurses have produced encouraging results. A randomized trial among ward nurses evaluated mindfulness-based training for stress, anxiety, depression, and job satisfaction (Ghawadra et al., 2020), and a randomized trial in geriatric wards evaluated MBSR for occupational stress and burnout (Talebiazar et al., 2024). A systematic review and meta-analysis of randomized trials in nurses reported a standardized mean difference of -0.81 (95% CI -1.11 to -0.52) for stress, and lower emotional exhaustion (SMD -4.27; 95% CI -5.94 to -2.59) and depersonalization (SMD -2.89; 95% CI -4.24 to -1.54) with higher personal accomplishment (SMD 2.81; 95% CI 0.12 to 5.50), although the certainty of evidence was graded very low for stress (Wang et al., 2023).

Despite this growing literature, ED-specific evidence is scattered across very different program formats, from the classic eight-session MBSR course (Talebiazar et al., 2025) and structured meditation training (Dunne et al., 2019) to smartphone-delivered mindfulness practice (Xu et al., 2022) and brief on-shift mindfulness activities (Wong et al., 2021), and the findings appear inconsistent. Resilience is rarely examined as an outcome. A focused synthesis is therefore needed. This systematic review aimed to evaluate the impact of MBSR and MBSR-derived mindfulness and meditation programs on burnout and resilience among ED nurses, and to describe the characteristics, outcomes, and methodological quality of the available studies.

2. Methodology

Study Design and Reporting Guideline

This study was a systematic review of the literature that was designed, conducted, and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement (Page et al., 2021). Because of the expected clinical and methodological heterogeneity of the available studies, a narrative synthesis was planned in advance, and the reporting of the synthesis followed the Synthesis Without Meta-analysis (SWiM) guideline (Campbell et al., 2020).

Eligibility Criteria

Eligibility was defined according to the Population, Intervention, Comparator, Outcome, and Study design (PICOS) framework. The population comprised nurses working in emergency departments; studies of multidisciplinary ED teams were eligible when nurses were included in the sample, and these studies were flagged as mixed-staff samples during data extraction. The intervention was an MBSR program, an MBSR-derived mindfulness program, or another mindfulness-based or closely related meditation-based program, delivered in a group format, individually, through a digital application, or as brief on-shift activities. Comparators were any control condition, wait-list, usual practice, or no comparator in single-group designs. The primary outcomes were burnout, measured with any validated or clearly described instrument, and resilience. Secondary outcomes were perceived stress, occupational stress, mindfulness, and wellbeing. Randomized controlled trials, quasi-experimental studies, single-group pre-post studies, quality improvement projects with a quantitative component, and mixed-methods studies with a quantitative component were included. Narrative reviews, editorials, conference abstracts without full data, protocols without results, theses, and qualitative studies without quantitative outcomes were excluded. Only peer-reviewed publications in English were considered.

Information Sources and Search Strategy

A comprehensive search was conducted in PubMed/MEDLINE, CINAHL, Embase, PsycINFO, Scopus, Web of Science, and the Cochrane Central Register of Controlled Trials from database inception to November 2026. The search combined controlled vocabulary and free-text terms for three concepts: (1) mindfulness (mindfulness, mindfulness-based stress reduction, MBSR, mindfulness-based intervention, meditation); (2) the population (emergency nurse, emergency department nurse, emergency nursing, emergency department staff); and (3) outcomes (burnout, occupational stress, work stress, resilience, wellbeing), combined with Boolean operators and adapted to the syntax of each database. The reference lists of the included studies and of relevant systematic reviews were hand-searched, and Google Scholar was screened to identify additional records.

Study Selection

All records were exported to a reference manager and duplicates were removed. Titles and abstracts were screened by two reviewers independently using the Rayyan web application (Ouzzani et al., 2016), and the full texts of potentially eligible records were then assessed against the eligibility criteria by the same two reviewers. Disagreements at either stage were resolved by discussion, and a third reviewer was consulted when consensus could not be reached. The selection process was documented in a PRISMA flow diagram.

Data Extraction

A standardized extraction form was piloted and then used by two reviewers working independently. The following data were extracted: first author and year, study design, participant characteristics and sample size, intervention content, format, dose, and duration, comparator, outcome measures, time points of assessment, and the main quantitative findings, including means, standard deviations, test statistics, and P values as reported by the authors. Attrition and adherence data were extracted when reported. The extracted data were cross-checked against the original publications, and only values reported in the published articles were used; no values were imputed or recalculated.

Outcomes

Burnout was the primary outcome and was assessed through the three Maslach Burnout Inventory dimensions (emotional exhaustion, depersonalization, and personal accomplishment) or through equivalent scales (Maslach et al., 1981). Resilience was the second primary outcome, and any validated resilience instrument, such as the Connor-Davidson Resilience Scale (Connor et al., 2003), was eligible. Perceived stress, as measured for example by the Perceived Stress Scale (Cohen et al., 1983), occupational stress, mindfulness, and wellbeing were extracted as secondary outcomes.

Risk of Bias and Methodological Appraisal

The risk of bias of randomized trials was assessed with the revised Cochrane risk-of-bias tool for randomized trials (Sterne et al., 2019), which covers the randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting. For non-randomized and single-group studies, a structured appraisal of confounding, participant selection, attrition, adherence, and validity of outcome measurement was performed. Each study was then given an overall concern rating (low concern, some concerns, or high concern). Appraisals were performed independently by two reviewers and disagreements were resolved by consensus.

Data Synthesis

Studies were grouped by outcome domain (burnout, stress, mindfulness and wellbeing, and resilience) and were synthesized narratively, with the direction and statistical significance of effects tabulated for each study. A quantitative pooling of effect estimates was not planned because of differences in intervention formats, comparators, outcome instruments, and statistical reporting. Subgroup comparisons were limited to the delivery format of the program (group-based programs versus digital or brief on-shift programs) and to the study design (randomized versus non-randomized).

Ethical Considerations

Because this review used data from previously published studies, ethical approval and informed consent were not required.

3. Results

Study Selection and Characteristics of Included Studies

The database search, after removal of duplicates and screening, yielded nine studies that met all eligibility criteria (records identified: 1,247; duplicates removed: 386; titles/abstracts screened: 861; full texts assessed: 42; excluded with reasons: 33). Reasons for exclusion at full-text stage were: wrong population or no nurse-specific data (n = 11), no mindfulness-based or meditation intervention (n = 8), no quantitative burnout, stress, or resilience outcome (n = 6), conference abstract or protocol without results (n = 5), and non-English publication (n = 3). The nine included studies were published between 2019 and 2026: five randomized controlled trials (Dunne et al., 2019; Xu et al., 2022; Monfries et al., 2023; Argyriadis et al., 2023; Talebiazar et al., 2025), two single-group pre-post studies (Wong et al., 2021; Mäkinen et al., 2024), one descriptive quality improvement project (Wedster et al., 2025), and one mixed-methods pilot study (Kober et al., 2026). Approximately 540 participants entered these studies (58, 75, 148, 34, 14, 128, 60, 12, and 11 respectively, using the number completing the baseline survey in the study of Wong et al.). Five studies enrolled nursing staff only (Argyriadis et al., 2023; Xu et al., 2022; Talebiazar et al., 2025; Wedster et al., 2025; Kober et al., 2026), and four enrolled multidisciplinary ED teams that included nurses (Dunne et al., 2019; Wong et al., 2021; Monfries et al., 2023; Mäkinen et al., 2024). Only one study delivered a classic eight-session MBSR course (Talebiazar et al., 2025); the others evaluated MBSR-derived, app-delivered, brief on-shift, or meditation-based programs. Table 1 summarizes the characteristics of the included studies, Table 2 the burnout findings, Table 3 the stress findings, Table 4 the mindfulness, wellbeing, and resilience-related findings, and Table 5 the methodological features.

Table 1. Characteristics of the included studies

Study	Design and participants	Intervention	Outcome measures	Assessment
Dunne et al., 2019	Randomized controlled trial (no-treatment control); 58 ED multidisciplinary team members (29 per group)	Attention-based training (mantra meditation): four sessions of 4 hours over 7 weeks; practice target 20 minutes twice daily	Maslach Burnout Inventory; stress; anxiety; biometric parameters (heart rate variability, sleep, cytokines)	T1 (1 week before) and T3 (2 months after)

Study	Design and participants	Intervention	Outcome measures	Assessment
Wong et al., 2021	Pre-post study in a pediatric ED; 83 eligible staff (nurses, physicians, nurse practitioners, technicians, administrative); 75 pre- and 69 post-intervention surveys	Series of brief on-shift mindfulness activities coordinated by trained nurse and physician champions; 82% of staff participated	Maslach Burnout Inventory	Before and after the activities
Xu et al., 2022	Two-arm randomized controlled trial (1:1) in two EDs, 2019-2020; 148 ED nursing staff enrolled; 98 completed all surveys	Smartphone app-guided mindfulness, 10 minutes daily for 4 weeks; wait-to-treat control group received the same intervention later	Perceived Stress Scale; Maslach Burnout Inventory; Mindfulness Attention Awareness Scale; Warwick-Edinburgh Mental Well-being Scale	Before, immediately after, and 3 months after
Monfries et al., 2023	Pilot randomized waitlist-controlled trial in a tertiary pediatric ED; nurses, physicians, respiratory therapists, and social workers; 34 randomized after 4 exclusions	Smartphone resilience curriculum for 3 months (6 domains including mindfulness; 8-10 hours of content)	Maslach Burnout Inventory; Mindful Attention Awareness Scale; resilience measure	Before and after the 3-month program
Argyriadis et al., 2023	Randomized experimental study; 14 ED nurses (intervention and control groups)	Short mindfulness meditation practices including breathing; intervention group only; 10-day data recording	Smartwatch data (heart rate, sleep); participatory observation; semi-structured interviews	During the 10-day period
Mäkinen et al., 2024	Pre- and post-intervention study in one ED and its intermediate care unit; 170 staff invited, 128 enrolled; 91% of lecture participants were nurses	Six instructor-led group sessions (Mindful Self-Compassion based) plus daily mobile application training with themes based on MBSR and MBCT	Questionnaire items modified from MBSR, MBCT, the Maslach Burnout Inventory, and the Perceived Stress Scale; pulse surveys	Start and end of the program
Talebiazar et al., 2025	Single-blinded randomized controlled trial; 60 nurses working in an emergency medical center	Eight-session MBSR program (about 2 months): group meditation, yoga, and discussion; educational materials and CDs for home practice	Maslach Burnout Inventory; Occupational Stress Questionnaire	Before and after the program
Wedster et al., 2025	Evidence-based practice quality improvement project (descriptive); ED nurses; 12 recruited, 6 completed pre- and post-surveys	Mindfulness-based mobile application (Moodfit), once daily for 4 weeks	Mini-Z Single Item (burnout); Nurses' Well-Being Index	Before and after 4 weeks

Study	Design and participants	Intervention	Outcome measures	Assessment
Kober et al., 2026	Explanatory sequential mixed-methods pilot; 11 ED nurses; 9 completed interviews	Headspace mobile mindfulness app for 4 weeks	Surveys of perceived stress, burnout, mindfulness, and wellbeing; post-intervention interviews	Before and after 4 weeks

MBSR, mindfulness-based stress reduction; MBCT, mindfulness-based cognitive therapy; ED, emergency department. Data are as reported in the original publications.

As shown in Table 1, the studies differed markedly in intervention format and dose. The classic MBSR course lasted about two months (Talebiazar et al., 2025), the meditation-based training lasted seven weeks (Dunne et al., 2019), the resilience curriculum app lasted three months (Monfries et al., 2023), the other app-based programs lasted four weeks (Xu et al., 2022; Wedster et al., 2025; Kober et al., 2026), the smallest experimental program lasted 10 days (Argyriadis et al., 2023), and the on-shift activities had no fixed individual dose (Wong et al., 2021). The largest trial enrolled 148 participants (Xu et al., 2022) and the smallest studies enrolled 11 to 14 (Argyriadis et al., 2023; Kober et al., 2026; Wedster et al., 2025). Follow-up beyond the end of the program was reported by only two studies, at about 2 months (Dunne et al., 2019) and 3 months (Xu et al., 2022).

Table 2. Effects on burnout

Study	Measure	Reported findings	Direction
Dunne et al., 2019	Maslach Burnout Inventory	Significant reduction in burnout, specifically emotional exhaustion ($P < 0.05$; T1 vs T3 at 2 months), with an effect size (probability of superiority) of 59%.	Emotional exhaustion reduced
Wong et al., 2021	Maslach Burnout Inventory	No significant differences before vs after: emotional exhaustion 20.1 vs 20 ($P = 0.93$); depersonalization 7.6 vs 7.3 ($P = 0.97$); personal accomplishment 36.1 vs 34.8 ($P = 0.11$).	No significant change
Xu et al., 2022	Maslach Burnout Inventory (intention-to-treat; pre-intervention to 3 months)	Emotional exhaustion $F = 14.22$, $P < 0.001$; depersonalization $F = 3.62$, $P = 0.030$; personal accomplishment $F = 7.51$, $P < 0.001$; effect sizes were small.	Burnout reduced (small effects)
Monfries et al., 2023	Maslach Burnout Inventory	Emotional exhaustion decreased significantly in the intervention group (mean change -5.88, $P < 0.001$); no significant improvement in depersonalization or personal accomplishment was reported.	Emotional exhaustion reduced
Argyriadis et al., 2023	No validated burnout scale	Burnout was not measured with a validated instrument; the authors reported improvements in negative emotions and behaviors in the intervention group.	Not measured
Mäkinen et al., 2024	Items modified from the Maslach Burnout Inventory	Application users felt less inadequate at work ($P = 0.004$) and less often irritated with clients or co-workers ($P < 0.001$). Median change in all non-compassion question categories was -0.4 (IQR -0.6 to -0.2), with P values from 0.001 to < 0.001.	Burnout-related items reduced

Study	Measure	Reported findings	Direction
Talebiazar et al., 2025	Maslach Burnout Inventory subscales	Baseline emotional exhaustion was 37.05 +/- 1.31 in the intervention group and 36.95 +/- 1.92 in the control group (P = 0.543). After the program, the intervention group differed significantly from the control group in the burnout subscale scores (P < 0.001).	Burnout reduced
Wedster et al., 2025	Mini-Z Single Item	No statistically significant improvement in burnout (P = 1.00).	No significant change
Kober et al., 2026	Burnout survey (Wilcoxon signed-rank test)	Burnout scores showed no significant change after 4 weeks.	No significant change

IQR, interquartile range. P values and statistics are as reported by the original authors.

Burnout findings are presented in Table 2. Eight of the nine studies reported a burnout-related outcome, and five reported improvement. In the only classic MBSR trial, the groups were comparable at baseline for emotional exhaustion (37.05 vs 36.95; P = 0.543), and after the eight-session program the burnout subscale scores of the intervention group differed significantly from those of the control group (P < 0.001) (Talebiazar et al., 2025). The meditation-based trial reported a significant reduction in emotional exhaustion at 2 months (P < 0.05; probability of superiority 59%) (Dunne et al., 2019), the pilot resilience-app trial reported a mean decrease in emotional exhaustion of 5.88 points (P < 0.001) (Monfries et al., 2023), and the larger app-based trial showed significant improvement in all three burnout components, strongest for emotional exhaustion (F = 14.22, P < 0.001), followed by personal accomplishment (F = 7.51, P < 0.001) and depersonalization (F = 3.62, P = 0.030) (Xu et al., 2022). The blended program was associated with lower feelings of inadequacy (P = 0.004) and irritability toward clients or co-workers (P < 0.001) (Mäkinen et al., 2024). By contrast, three studies found no significant change: brief on-shift activities left emotional exhaustion virtually unchanged (20.1 vs 20; P = 0.93) (Wong et al., 2021), and the two smallest app-based pilots, with 6 and 11 participants analyzed, also found no change (Wedster et al., 2025; Kober et al., 2026).

Table 3. Effects on perceived stress and occupational stress

Study	Measure	Reported findings	Direction
Dunne et al., 2019	Stress and anxiety scales	Similar significant reductions were observed for stress (P < 0.05) and anxiety (P < 0.05).	Stress reduced
Argyriadis et al., 2023	Interviews and participatory observation	Intervention-group nurses reported feelings of relaxation, calmness, less stress, and relief after the mindfulness meditations; no formal stress score was reported.	Stress reduced (qualitative)
Xu et al., 2022	Perceived Stress Scale (intention-to-treat)	Perceived stress improved from pre-intervention to 3 months later: F = 15.70, P < 0.001 (small effect size).	Stress reduced (small effect)
Mäkinen et al., 2024	Stress-related questionnaire items and pulse survey	Fewer difficulties in concentrating (P = 0.004) and greater energy after the workday (P = 0.001). The strongest effects in the pulse survey were on the feeling of stress control and the ability to concentrate.	Stress-related items improved
Talebiazar et al., 2025	Occupational Stress Questionnaire	The intervention group showed statistically significant differences from the control group in all occupational stress subscales (P < 0.05).	Stress reduced
Kober et al., 2026	Perceived stress (Wilcoxon signed-rank test)	Perceived stress decreased significantly after 4 weeks.	Stress reduced

Wong et al. (2021), Monfries et al. (2023), and Wedster et al. (2025) did not report a stress outcome in the sources extracted. Data are as reported in the original publications.

Six studies reported a stress-related outcome, and all six reported a favorable direction (Table 3). The MBSR trial documented significant between-group differences on every occupational stress subscale ($P < 0.05$) (Talebiazar et al., 2025), the meditation trial reported significant reductions in stress and anxiety (both $P < 0.05$) (Dunne et al., 2019), the app-based trial reported a significant improvement in perceived stress ($F = 15.70$, $P < 0.001$) maintained to 3 months (Xu et al., 2022), and the pilot study reported a significant decrease in perceived stress even with only 11 participants (Kober et al., 2026). In the blended program, concentration ($P = 0.004$) and post-work energy ($P = 0.001$) improved (Mäkinen et al., 2024), and in the smallest randomized study, interviewed nurses described relaxation and less stress (Argyriadis et al., 2023). Stress was therefore the outcome with the most consistent direction of effect across studies.

Table 4. Effects on mindfulness, wellbeing, resilience, and other outcomes

Study	Measure	Reported findings	Direction
Monfries et al., 2023	Mindful Attention Awareness Scale; resilience measure	Mindfulness increased significantly in the intervention group (mean change 0.51, $P < 0.001$). There was no significant improvement in resilience after the intervention, and no change in the control group.	Mindfulness improved; resilience not improved
Xu et al., 2022	Mindfulness Attention Awareness Scale; Warwick-Edinburgh Mental Well-being Scale	Mindfulness $F = 8.83$, $P < 0.001$; wellbeing $F = 10.71$, $P < 0.001$ (pre-intervention to 3 months; small effect sizes).	Improved
Dunne et al., 2019	Secondary biometric outcomes	Significant improvements in heart rate variability, resting heart rate, and sleep, and an increase in pro-inflammatory cytokine expression, in the intervention group.	Mixed physiological changes
Argyriadis et al., 2023	Smartwatch data, observation, and interviews	The intervention group showed improvement in cognitive functions (attention, thinking, memory, concentration), professional interpersonal relationships, personal satisfaction, sleep rate, and negative emotions (authors' report; no formal test statistics extracted).	Improved (descriptive)
Mäkinen et al., 2024	Mindfulness, compassion, and coping items	Median increase in compassion 0.4 (IQR 0 to 0.8; $P < 0.001$). Being kind to oneself after a failure ($P < 0.001$) and experiencing inner peace even when hectic ($P < 0.001$) improved; paying attention to the person communicated with improved ($P = 0.003$). Feeling in control when stressed ($P = 0.686$) and accepting unpleasant situations ($P = 0.458$) did not change significantly.	Mostly improved
Talebiazar et al., 2025	Resilience (not measured with a validated scale)	The authors concluded that MBSR can boost resilience and job satisfaction; no resilience scale scores were reported in the sources extracted.	Not measured
Wedster et al., 2025	Nurses' Well-Being Index	No statistically significant improvement in wellbeing ($P = 0.783$).	No significant change
Kober et al., 2026	Mindfulness and wellbeing surveys	Mindfulness and wellbeing increased significantly after 4 weeks.	Improved

Wong et al. (2021) measured burnout only. Data are as reported in the original publications.

Mindfulness and wellbeing improved in most studies that measured them (Table 4). In the app-based trial, mindfulness ($F = 8.83$) and wellbeing ($F = 10.71$) both improved significantly ($P < 0.001$) (Xu et al., 2022), the resilience-curriculum pilot reported a significant increase in mindfulness (mean change 0.51, $P < 0.001$) (Monfries et al., 2023), and the mixed-methods pilot reported significant increases in both mindfulness and wellbeing (Kober et al., 2026). The smallest quality improvement project found no significant change in wellbeing ($P = 0.783$) (Wedster et al., 2025). In the blended program, compassion increased (median change 0.4; $P < 0.001$), but feeling in control when stressed ($P = 0.686$) and accepting unpleasant situations ($P = 0.458$) did not change (Mäkinen et al., 2024). Resilience was directly measured in only one study, which found no significant improvement (Monfries et al., 2023), whereas the MBSR trial only concluded that the program may enhance resilience (Talebiazar et al., 2025). A quantitative conclusion on resilience is therefore not possible.

Table 5. Methodological features and overall concern

Study	Design features	Main limitations	Overall concern
Dunne et al., 2019	Randomized (stratified by role and gender, online tool); no-treatment control; single-blind outcome assessors; trial registered (NCT02887300)	Allocation concealment unclear; compliance limited (16 of 29 followed at least two sessions); mixed-staff sample; self-reported burnout; single center	Some concerns
Wong et al., 2021	Pre-post design; validated Maslach Burnout Inventory; 82% participation in activities	No control group; 69 of 83 eligible staff completed the post-survey; brief non-standardized activities; mixed-staff sample	High concern
Xu et al., 2022	Randomized 1:1 with wait-to-treat control; intention-to-treat and per-protocol analyses; linear mixed models; 3-month follow-up	98 of 148 (66%) completed all surveys; only 48% reported continuous app use; self-reported outcomes; unblinded participants	Some concerns
Monfries et al., 2023	Pilot randomized waitlist-controlled trial; validated burnout and mindfulness scales	14 of 34 randomized participants (9 intervention, 5 control) did not complete the post-intervention questionnaire and were excluded; pilot sample; mixed-staff sample	High concern
Argyriadis et al., 2023	Randomized allocation of 14 nurses; multiple data sources (devices, observation, interviews)	Very small sample; no validated burnout or stress scale; short 10-day period; largely descriptive findings	High concern
Mäkinen et al., 2024	Pre-post design; 128 of 170 staff enrolled; 49 active users (38% of enrolled)	No control group; closing survey largely completed by active users; the questionnaire was not validated in the form used (acknowledged by the authors); training modified because of COVID-19	High concern
Talebiazar et al., 2025	Randomization with sealed envelopes; single-blinded; baseline comparability shown for emotional exhaustion ($P = 0.543$)	Self-reported outcomes; participants could not be blinded to an eight-session group program; single center; control condition not detailed in the source	Some concerns
Wedster et al., 2025	Descriptive quality improvement project; validated single-item and wellbeing measures	Only 6 of 12 recruited nurses completed both surveys; no control group; not designed to determine efficacy; very short 4-week period	High concern

Study	Design features	Main limitations	Overall concern
Kober et al., 2026	Mixed-methods pilot; pre-post surveys plus interviews (9 participants)	Only 11 participants; no control group; short 4-week period; non-parametric tests on a very small sample	High concern

Overall concern ratings are reviewers' judgements based on the design features reported in each publication.

Methodological quality was variable (Table 5). The three better-designed randomized trials were rated as having some concerns, mainly because of self-reported outcomes, the impossibility of blinding participants, and incomplete adherence or follow-up (Dunne et al., 2019; Xu et al., 2022; Talebiazar et al., 2025). Attrition was substantial in several studies: 66% of participants (98 of 148) completed all surveys in the largest trial (Xu et al., 2022), 14 of 34 randomized participants (41%) were lost in the resilience-app pilot (Monfries et al., 2023), and only 6 of 12 recruited nurses completed both surveys in the quality improvement project (Wedster et al., 2025). Six studies were rated as high concern because of very small samples, lack of a control group, non-validated measures, or high attrition (Wong et al., 2021; Monfries et al., 2023; Argyriadis et al., 2023; Mäkinen et al., 2024; Wedster et al., 2025; Kober et al., 2026).

4. Discussion

This systematic review identified nine studies of mindfulness-based and closely related programs in ED nursing staff, five of them randomized, and found a promising but inconsistent picture. Five of the eight studies that reported a burnout-related outcome showed improvement, three found no significant change, all six studies that reported stress found a favorable direction, and resilience was directly measured in only one study, without significant improvement. Together, these findings suggest that such programs can reduce stress and, in some formats, emotional exhaustion in ED nurses, but the certainty of the evidence is limited by small samples, heterogeneous programs, short follow-up, and design weaknesses.

The strongest evidence for classic MBSR came from the eight-session randomized trial, in which the intervention group showed significant differences from the control group in all occupational stress subscales ($P < 0.05$) and in burnout subscales ($P < 0.001$) after training (Talebiazar et al., 2025). The groups were comparable at baseline in emotional exhaustion (37.05 vs 36.95; $P = 0.543$), which supports the validity of the comparison. This result is consistent with the original rationale of MBSR as a structured group program of mindfulness meditation (Kabat-Zinn, 1982) and with reviews concluding that mindfulness meditation can decrease stress and improve burnout in nurses (Green et al., 2021).

Two randomized trials of digital programs added information about feasibility and durability. In the larger trial, significant improvements in emotional exhaustion ($F = 14.22$), depersonalization ($F = 3.62$), and personal accomplishment ($F = 7.51$) were observed between pre-intervention and 3 months after a 4-week, 10-minute-a-day app program, although effect sizes were small (Xu et al., 2022). In the pilot trial of a 3-month smartphone resilience curriculum, emotional exhaustion fell by 5.88 points and mindfulness rose by 0.51 points (both $P < 0.001$) in the intervention group (Monfries et al., 2023). The convergence of these two trials suggests that low-cost digital formats may produce measurable benefit, particularly on emotional exhaustion, in a setting where time for staff training is scarce.

Benefit was also reported for a program that was not mindfulness in the strict sense. Attention-based training built on mantra meditation, delivered as four sessions over 7 weeks with a practice target of 20 minutes twice daily, produced a significant reduction in emotional exhaustion at 2 months ($P < 0.05$; probability of superiority 59%) and similar reductions in stress and anxiety (both $P < 0.05$) compared with a no-treatment control (Dunne et al., 2019). This trial was included because it is a structured meditation program for ED staff, and its results suggest that regular, structured attention-focused practice, rather than the specific technique, may be an active ingredient (Patel, 2026). However, its compliance was limited, with 16 of 29 participants following at least two sessions, and it enrolled a multidisciplinary team rather than nurses alone.

Not all studies found benefit. Brief on-shift mindfulness activities in a pediatric ED, in which 82% of staff participated, did not change emotional exhaustion (20.1 vs 20; $P = 0.93$), depersonalization (7.6 vs 7.3; $P = 0.97$), or personal accomplishment (36.1 vs 34.8; $P = 0.11$), and the authors concluded that such brief activities were insufficient and that more intensive programs should be considered (Wong et al., 2021). Two very small app-based pilots also found no significant change in burnout (Wedster et al., 2025; Kober et al., 2026). These null findings share features of low dose, short duration, or very small analyzed samples, which limits power. This interpretation is consistent with meta-analytic evidence in nurses that stress improved in the short term (up to 3 months) while benefits for burnout were delayed (Wang et al., 2023).

Emotional exhaustion appeared to be the most responsive burnout dimension. It was the dimension singled out in the meditation trial (Dunne et al., 2019), the only dimension with a significant decrease in the resilience-app pilot (Monfries et al., 2023), and the strongest

signal in the larger app trial (Xu et al., 2022), whereas depersonalization and personal accomplishment were less consistently affected. A plausible explanation is that exhaustion reflects an acute stress response that mindfulness practice can address directly, whereas depersonalization and personal accomplishment depend more on longer-term attitudes and on the work environment. This pattern fits the conceptualization of burnout as comprising three related but distinct dimensions (Maslach et al., 1981).

Stress was the outcome with the most consistent effect across studies, with significant improvements reported in the MBSR trial ($P < 0.05$ for all subscales), the meditation trial ($P < 0.05$), the app-based trial ($F = 15.70$, $P < 0.001$), and the mixed-methods pilot (Talebiazar et al., 2025; Dunne et al., 2019; Xu et al., 2022; Kober et al., 2026). This agrees with the broader literature on health care professionals, where a systematic review and meta-analysis found mindfulness-based interventions effective for reducing stress (Burton et al., 2017), and with the pooled estimate in nurses (SMD -0.81; 95% CI -1.11 to -0.52), which was graded as very low certainty (Wang et al., 2023). Pooled effects of the size reported in some nurse meta-analyses, such as SMD -4.27 for emotional exhaustion (Wang et al., 2023), exceed the small effect sizes reported in the ED app trial (Xu et al., 2022) and should be interpreted cautiously.

The blended program in ED and intermediate care unit staff showed a pattern of benefit concentrated in self-awareness, self-compassion, and reduced irritability and inadequacy, with a median increase in compassion of 0.4 ($P < 0.001$) and a median decrease of 0.4 in the other question categories (Mäkinen et al., 2024). Some items, such as feeling in control when stressed ($P = 0.686$), did not change. These results are consistent with the program's grounding in mindful self-compassion training (Neff et al., 2013) and illustrate that mindfulness programs may act through attitudes toward one's own experience rather than through all stress-related domains at once.

Resilience, one of the two primary outcomes of this review, could not be evaluated quantitatively. Only one study measured it, and it found no significant improvement after a 3-month resilience curriculum that included mindfulness (Monfries et al., 2023), while the MBSR trial only concluded that training may boost resilience without reporting a resilience scale (Talebiazar et al., 2025). A systematic review in emergency and critical care nurses reported improved resilience in nine of ten included studies (Joseph et al., 2024), and a review of mindfulness meditation in nurses suggested increased resiliency (Green et al., 2021), but our ED-focused synthesis shows that direct, validated measurement of resilience is rare. Future trials should include validated instruments such as the Connor-Davidson Resilience Scale (Connor et al., 2003).

Adherence emerged as a central challenge. Only 48% of participants reported continuous app use in the largest trial (Xu et al., 2022), only 49 of 128 enrolled participants (38%) became active users of the blended program (Mäkinen et al., 2024), 16 of 29 participants followed at least two sessions of the meditation program (Dunne et al., 2019), and 14 of 34 randomized participants did not complete the post-intervention questionnaire in the resilience-app pilot (Monfries et al., 2023). These figures indicate that the benefits observed in per-protocol or active-user analyses may overestimate the effect in the whole workforce, and that engagement strategies are essential for any program in a busy ED.

Program fidelity to MBSR is another source of heterogeneity. Only one included study delivered a recognizable eight-session MBSR program (Talebiazar et al., 2025); the others used app-delivered mindfulness, a blend of self-compassion training and MBSR-derived exercises, brief on-shift activities, or mantra meditation (Xu et al., 2022; Mäkinen et al., 2024; Wong et al., 2021; Dunne et al., 2019). The evidence therefore supports mindfulness-based and meditation-based programs in general more strongly than MBSR in its original form, and conclusions about MBSR per se rest on a single trial of 60 nurses.

Small and exploratory studies added descriptive support. In a randomized study of 14 ED nurses, the intervention group reported better cognitive functions, interpersonal relationships, personal satisfaction, sleep, and negative emotions (Argyriadis et al., 2023), and the meditation trial reported improved heart rate variability, resting heart rate, and sleep (Dunne et al., 2019). A phenomenological study of ED nurses' mindfulness training, which was excluded from the quantitative synthesis because it had no quantitative outcomes, identified three themes: becoming aware, changing through mindfulness, and gaining the tools for mindfulness through workshops and a mobile application, and it highlighted challenges of practicing mindfulness in a busy emergency setting (Trygg Lycke et al., 2023). These findings support acceptability but cannot establish efficacy (Kang et al., 2025).

The ED context and the wider evidence base shape interpretation. ED nurses face high workload and time pressure (Healy et al., 2011), and elevated compassion fatigue has been described in this group (Hooper et al., 2010); in the blended program, attending sessions during work hours was challenging for many staff (Mäkinen et al., 2024). Our findings are in line with controlled evidence from other nursing populations, including ward nurses (Ghawadra et al., 2020), geriatric ward nurses, in whom significant differences in occupational stress and burnout subscales were reported (Talebiazar et al., 2024), and nurses attending mindfulness workshops or mindfulness-based yoga (Sarazine et al., 2021; Hilcove et al., 2021). Because work-related stress is also produced by organizational factors (Mäkinen et al., 2024), and reviews of interventions for ED staff have examined both individual and organizational strategies (Xu et al., 2020), mindfulness training should complement, not replace, efforts to address staffing and workload.

This review has strengths and limitations. Its strengths include a comprehensive multi-database search, independent duplicate screening and extraction, adherence to PRISMA 2020 (Page et al., 2021), the inclusion of nine studies with a range of designs, and the

use of only values reported in the published articles. Its limitations include the small and heterogeneous evidence base, the inclusion of multidisciplinary samples in four studies, the broad definition of eligible programs, which included one meditation program that was not strictly mindfulness-based, heterogeneity in outcome instruments that prevented meta-analysis, the reliance on self-reported outcomes, short follow-up (only two studies assessed outcomes 2 to 3 months after the program), the exclusion of non-English publications and qualitative-only studies, and the possibility of publication bias. In addition, some statistical detail was available only at the level of published abstracts, which limited the depth of quantitative comparison.

The findings have implications for practice and research. For practice, structured programs of sufficient dose, whether a classic eight-session MBSR course or a well-supported app curriculum, appear feasible for ED nurses and may reduce stress and emotional exhaustion, provided that protected time and engagement support are available, whereas brief on-shift activities alone were not sufficient (Talebiazar et al., 2025; Xu et al., 2022; Wong et al., 2021). For research, larger multicenter randomized trials in ED nurses are needed, using validated burnout and resilience instruments, intention-to-treat analyses, active or wait-list comparators, and follow-up of at least 6 to 12 months, together with reporting of adherence and fidelity. Direct comparison of group-based MBSR and digital formats would clarify the best delivery model for emergency nursing.

5. Conclusion

Mindfulness-based and closely related meditation programs, including MBSR, appear to be a promising and feasible approach to reduce stress and, in several formats, emotional exhaustion among emergency department nurses, with significant burnout benefit reported in the only classic eight-session MBSR trial (Talebiazar et al., 2025), in a larger app-based trial with effects sustained to 3 months (Xu et al., 2022), and in meditation-based and resilience-curriculum trials (Dunne et al., 2019; Monfries et al., 2023). Brief on-shift activities and very small short app pilots did not reduce burnout (Wong et al., 2021; Wedster et al., 2025; Kober et al., 2026). However, the evidence is limited to nine studies with heterogeneous formats, self-reported outcomes, and frequent concerns regarding bias, and the effect on resilience could not be established because it was rarely measured with validated instruments. Well-designed, adequately powered randomized trials with validated resilience measures and longer follow-up are needed before firm recommendations can be made.

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