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Non-pharmacological interventions for ICU nurses' burnout syndrome: A meta-analysis

Chetan Ramesh Sangati[1]*, Bhairgouda Patil[2], Sanjay Alagundi[2], Veerupayya Pujar[3]

[1]*Dept. of Medical Surgical Nursing, Smt, Shantadevi Memorial college of Nursing, Badagandi, Karnataka, India*
[2]*KAHER Institute of Nursing Sciences, Belgavi, Karnataka, India*
[3]*SGV Institute of Nursing, Baihongal, Karnataka, India*

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ABSTRACT

Background: Burnout syndrome is a critical issue among Intensive Care Unit (ICU) nurses due to high workloads, emotional distress, and constant exposure to life-threatening situations. Characterized by emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment, burnout negatively impacts both the well-being of nurses and the quality of patient care. While pharmacological interventions may offer some relief, non-pharmacological strategies are increasingly recognized as essential for preventing and managing burnout without the risk of medication-related side effects.

Aims & Objective: This meta-analysis aims to evaluate the effectiveness of various non-pharmacological interventions, such as art therapy, guided meditation, mindfulness-based stress reduction, cognitive-behavioral therapy (CBT), and peer support programs, in reducing the symptoms of burnout syndrome among ICU nurses.

Materials and Methods: A systematic literature search was conducted across multiple databases (PubMed, CINAHL, PsycINFO, and Cochrane Library) for randomized controlled trials (RCTs) and quasi-experimental studies evaluating non-pharmacological interventions for burnout in ICU nurses. Studies published between 2010 and 2024 were included. The primary outcome measure was the reduction in burnout symptoms as assessed by validated scales such as the Maslach Burnout Inventory (MBI). Data extraction and quality assessment were performed independently by two reviewers, and statistical analyses were conducted using a random-effects model to calculate pooled effect sizes.

Results: A total of 18 studies involving 2,346 ICU nurses were included in the meta-analysis. The pooled effect size indicated that non-pharmacological interventions significantly reduced emotional exhaustion (Hedges' $g = 0.67$, 95% CI [0.45, 0.89], $p < 0.01$) and depersonalization (Hedges' $g = 0.59$, 95% CI [0.38, 0.81], $p < 0.01$) while improving personal accomplishment (Hedges' $g = 0.53$, 95% CI [0.30, 0.76], $p < 0.01$). Among the interventions, mindfulness-based stress reduction and CBT showed the highest efficacy, followed by art therapy and guided meditation. Peer support programs also demonstrated moderate effectiveness but were less studied.

Conclusion: The findings suggest that non-pharmacological interventions, particularly mindfulness and cognitive-behavioral therapies, are effective in reducing burnout symptoms among ICU nurses. These interventions offer a sustainable, low-risk alternative to pharmacological approaches, contributing to better mental health outcomes and improved nurse retention in high-stress environments. Future research should focus on larger, multi-center trials and explore the long-term impacts of these interventions.

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1. Introduction

ICU nurses are highly susceptible to burnout syndrome due to their high-stakes work, life-threatening patient conditions, demanding workloads, and emotionally taxing situations. This condition, characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment, impairs mental health and patient care quality.[1–3]

1.1. Burnout in ICU nurses

ICU nurses face high burnout rates due to exposure to critically ill patients, complex decision-making responsibilities, and emotional pressure. This can lead to medical errors, reduced patient satisfaction, increased turnover, and long-term health issues like anxiety, depression, and chronic fatigue.[1,4–7]

1.2. Need for non-pharmacological interventions

Non-pharmacological interventions like mindfulness-based stress reduction, cognitive-behavioral therapy, guided meditation, art therapy, and peer support programs are increasingly recognized as effective alternatives for managing burnout, empowering nurses to manage stress through personal development and coping mechanisms.[8–10]

1.3. Types of non-pharmacological interventions

1. Mindfulness-Based Stress Reduction (MBSR): MBSR, a practice involving meditation and yoga, aids in stress management, particularly beneficial in ICU nurses, reducing emotional exhaustion and promoting emotional regulation.[11]
2. Cognitive-Behavioral Therapy (CBT): CBT helps nurses reduce stress-related cognitive distortions by altering negative thought patterns and behaviors, teaching coping strategies, and decreasing depersonalization, thereby enhancing personal accomplishment among healthcare workers.[12,13]
3. Art Therapy: Art therapy provides a creative outlet for nurses to express emotions, potentially reducing burnout symptoms and aiding those experiencing high emotional exhaustion.[14]
4. Guided Meditation: Guided meditation aids nurses in relaxation, mental clarity, and detachment from daily stressors, reducing emotional exhaustion and depersonalization.[15]
5. Peer Support Programs: Peer support interventions, which involve group discussions and mentorship, have been found to moderately improve nurses' personal accomplishment and job satisfaction, though their effectiveness is less studied.[16]

* *Corresponding author*.
E-mail address: csangati456@gmail.com (C. R. Sangati).

1.4. Impact of non-pharmacological interventions on burnout

Studies show mindfulness-based interventions, cognitive-behavioral therapy (CBT), art therapy, and guided meditation significantly reduce burnout symptoms. Peer support programs are promising, but further research is needed to determine their long-term effectiveness. Implementing these interventions in ICU settings could improve nurse well-being and patient care.[17–19]

1.5. Rationale for the study

The meta-analysis evaluates non-pharmacological interventions' effectiveness on ICU nurses' burnout syndrome symptoms, providing evidence-based recommendations for the healthcare industry. This study aims to improve nurse retention, job satisfaction, and patient outcomes.[20]

2. Materials and Methods

This meta-analysis aims to evaluate non-pharmacological interventions' effectiveness on burnout syndrome among ICU nurses through a systematic, transparent, and reproducible approach.

2.1. Study design

This meta-analysis follows the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to maintain the quality and reliability of the findings. Both randomized controlled trials (RCTs) and quasi-experimental studies evaluating non-pharmacological interventions for ICU nurses' burnout syndrome were included in this review. The primary outcome is a reduction in burnout symptoms, specifically emotional exhaustion, depersonalization, and personal accomplishment, assessed through validated scales.

2.2. Inclusion criteria

1. Population**:** Studies involving ICU nurses experiencing burnout or stress symptoms.
2. Interventions: Non-pharmacological interventions aimed at reducing burnout, such as mindfulness-based stress reduction (MBSR), cognitive-behavioral therapy (CBT), art therapy, guided meditation, and peer support programs.
3. Comparators: Studies comparing these interventions with a control group, which could include no intervention, usual care, or waitlist controls.
4. Outcomes**:** The primary outcome of interest was the reduction of burnout symptoms as measured by validated tools such as the Maslach Burnout Inventory (MBI)**,** Copenhagen Burnout Inventory (CBI)**,** or other equivalent scales.

5. Study Design**:** RCTs and quasi-experimental studies published between 2010 and 2024.
6. Language**:** Only studies published in English were included to ensure quality and consistency in interpretation.

2.3. Exclusion criteria

1. Studies not specifically involving ICU nurses.
2. Studies focusing on pharmacological interventions.
3. Studies that did not report burnout outcomes using validated scales.
4. Reviews, editorials, commentaries, and case reports were excluded.

2.4. Search strategy

Comprehensive search was conducted across the following electronic databases:

1. PubMed
2. CINAHL (Cumulative Index to Nursing and Allied Health Literature)
3. PsycINFO
4. Cochrane Library

The search spanned from January 2010 to October 2024 and was structured to capture all relevant studies on non-pharmacological interventions for burnout among ICU nurses. The following keywords and Medical Subject Headings (MeSH) terms were used:

1. "Burnout syndrome"
2. "ICU nurses" OR "critical care nurses"
3. "Non-pharmacological interventions"
4. "Mindfulness-based stress reduction"
5. "Cognitive-behavioral therapy"
6. "Art therapy"
7. "Guided meditation"
8. "Peer support programs"

Boolean operators (AND, OR) were applied to refine the search. Manual searches of references from relevant articles were also conducted to identify additional studies.

2.5. Study selection

The selection process followed a two-stage approach:

1. Screening Titles and Abstracts**:** Two independent reviewers screened the titles and abstracts for relevance to the research question. Duplicates and irrelevant studies were removed at this stage.
2. Full-text Review**:** Full-text articles of potentially eligible studies were retrieved and assessed by both reviewers. Any disagreements were resolved through discussion or by consulting a third reviewer if necessary.

A PRISMA flow diagram was created to detail the study selection process, including the number of studies screened, assessed for eligibility, and finally included in the meta-analysis.

2.6. Data extraction

Two independent reviewers performed data extraction using a predefined data collection form to ensure consistency and reduce bias. The following information was extracted from each study:

1. Study characteristics**:** Author(s), year of publication, country, study design, sample size, and duration of the intervention.
2. Participant characteristics**:** Age, gender, work experience, and baseline burnout scores.
3. Intervention characteristics: Type of non-pharmacological intervention, duration, frequency, and intensity.
4. Outcome measures**:** Pre- and post-intervention burnout scores (emotional exhaustion, depersonalization, and personal accomplishment).
5. Comparison group**:** Description of the control or comparison group.

Any discrepancies in data extraction were resolved through consensus between the two reviewers.

3. Risk of bias and quality assessment

The risk of bias in individual studies was assessed using the Cochrane Collaboration's Risk of Bias Tool for randomized controlled trials, and the ROBINS-I (Risk of Bias in Non-Randomized Studies - of Interventions) tool for quasi-experimental studies. The following domains were evaluated:

1. Selection bias**:** Random sequence generation and allocation concealment.
2. Performance bias**:** Blinding of participants and personnel.
3. Detection bias**:** Blinding of outcome assessors.
4. Attrition bias**:** Incomplete outcome data.
5. Reporting bias**:** Selective reporting of outcomes.

Studies were rated as low**,** high, or unclear risk of bias based on these domains. Additionally, GRADE (Grading of Recommendations Assessment, Development and Evaluation) was used to assess the overall quality of the evidence.

3.1. Data synthesis and statistical analysis

A meta-analysis was conducted using Review Manager (RevMan) software. The primary outcome—reduction in burnout symptoms—was synthesized using the random-effects model to account for heterogeneity across studies.

1. Effect Size Calculation**:** Pooled effect sizes were calculated using Hedges' g**,** with 95% confidence intervals (CIs) to quantify the impact of non-pharmacological interventions on burnout.
2. Heterogeneity**:** Statistical heterogeneity was assessed using the I^2 statistic**,** with values of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively.
3. Subgroup Analyses**:** Subgroup analyses were performed to explore the impact of different types of interventions (e.g., mindfulness-based stress reduction, CBT) on burnout outcomes. Additionally, sensitivity analyses were conducted to assess the robustness of the findings by excluding studies with high risk of bias.

3.2. Publication bias

Potential publication bias was evaluated using funnel plots and Egger's test for asymmetry. A visual inspection of funnel plots was used to detect any imbalance in the reported studies, while Egger's test provided a statistical measure of potential bias in the study results.

3.3. Ethical considerations

As this meta-analysis used secondary data from published studies, ethical approval was not required. However, all included studies adhered to ethical guidelines, as reported in their original publications.

3.4. Limitation

The following potential limitations were acknowledged in this study:

1. Variability in the quality and design of included studies (RCTs vs. quasi-experimental).
2. Possible underreporting of non-pharmacological interventions with negative or null results.
3. Variations in the implementation of interventions, which may contribute to heterogeneity in the findings.

4. Results

This section presents the findings from the meta-analysis of 18 studies, which evaluated the effectiveness of non-pharmacological interventions on burnout syndrome among ICU nurses. The primary outcomes analyzed include reductions in emotional exhaustion, depersonalization, and improvements in personal accomplishment, all measured using validated tools like the Maslach Burnout Inventory (MBI).

4.1. Study selection and characteristics

The meta-analysis included 18 studies conducted between 2010 and 2024, with a total of 2,346 ICU nurses. These studies assessed a variety of non-pharmacological interventions, including:

1. Mindfulness-Based Stress Reduction (MBSR) (7 studies)
2. Cognitive-Behavioral Therapy (CBT) (5 studies)
3. Art Therapy (3 studies)
4. Guided Meditation (2 studies)
5. Peer Support Programs (1 study)

All studies reported burnout outcomes using the Maslach Burnout Inventory (MBI)**,** except for two that used the Copenhagen Burnout Inventory (CBI)**.** The average study duration ranged from 4 weeks to 6 months, with follow-ups conducted at the end of the intervention.

4.2. Meta-analysis of intervention effects

4.2.1. Emotional Exhaustion (Table 1)

Emotional exhaustion, the most prominent dimension of burnout, was assessed in all 18 studies.

1. Effect Size**:** The pooled effect size for emotional exhaustion was Hedges' $g = 0.67$ (95% CI [0.45, 0.89], $p < 0.01$), indicating a moderate to strong reduction in emotional exhaustion.
2. Heterogeneity**:** $I^2 = 65\%$**,** suggesting moderate heterogeneity among the studies.

4.3. Depersonalization

Depersonalization was evaluated in 16 of the included studies. The analysis showed a significant reduction in depersonalization scores among ICU nurses following the interventions.

1. Effect Size**:** Hedges' $g = 0.59$ (95% CI [0.38, 0.81], $p < 0.01$), reflecting a moderate reduction in depersonalization.
2. Heterogeneity**:** $I^2 = 58\%$**,** indicating moderate heterogeneity. (Table 2)

4.4. Personal Accomplishment

Personal accomplishment, a measure of an individual's sense of achievement at work, was assessed in 15 studies. The interventions demonstrated a positive impact, increasing nurses' feelings of personal accomplishment.

1. Effect Size**:** Hedges' $g = 0.53$ (95% CI [0.30, 0.76], $p < 0.01$), indicating a moderate improvement in personal accomplishment.
2. Heterogeneity**:** $I^2 = 50\%$, showing moderate heterogeneity. (Table 3)

Table 1: Forest plot for emotional exhaustion

Intervention Type	Number of Studies (n)	Pooled Effect Size (Hedges' g)	95% CI	p-value
Mindfulness-Based Stress Reduction (MBSR)	7	0.75	[0.55, 0.95]	< 0.01
Cognitive-Behavioral Therapy (CBT)	5	0.63	[0.38, 0.88]	< 0.01
Art Therapy	3	0.55	[0.30, 0.80]	< 0.01
Guided Meditation	2	0.40	[0.20, 0.60]	0.02
Peer Support Programs	1	0.32	[0.15, 0.49]	0.04

(Forest plot illustrates the effect sizes of the interventions on emotional exhaustion, showing a pooled reduction across all studies.)

Table 2: Forest plot for depersonalization

Intervention Type	Number of Studies (n)	Pooled Effect Size (Hedges' g)	95% CI	p-value
Mindfulness-Based Stress Reduction (MBSR)	6	0.67	[0.45, 0.89]	< 0.01
Cognitive-Behavioral Therapy (CBT)	5	0.60	[0.38, 0.82]	< 0.01
Art Therapy	3	0.48	[0.25, 0.71]	< 0.01
Guided Meditation	2	0.42	[0.18, 0.66]	0.03

(Forest plot shows the effect sizes of interventions on depersonalization, with significant reductions in depersonalization across all interventions.)

Table 3: Forest plot for personal accomplishment

Intervention Type	Number of Studies (n)	Pooled Effect Size (Hedges' g)	95% CI	p-value
Mindfulness-Based Stress Reduction (MBSR)	5	0.60	[0.35, 0.85]	< 0.01
Cognitive-Behavioral Therapy (CBT)	4	0.55	[0.32, 0.78]	< 0.01
Art Therapy	3	0.45	[0.20, 0.70]	< 0.01
Guided Meditation	2	0.38	[0.15, 0.61]	0.04

(Forest plot indicates significant improvements in personal accomplishment across the included studies.)

4.5. Subgroup analysis

Subgroup analysis was conducted to assess whether the type of intervention influenced the outcomes. The analysis revealed that Mindfulness-Based Stress Reduction (MBSR) and Cognitive-Behavioral Therapy (CBT) had the greatest impact on reducing emotional exhaustion and depersonalization and improving personal accomplishment. (Table 4)

4.6. Publication bias

A funnel plot was generated to assess publication bias. Visual inspection of the funnel plot suggested symmetry, indicating that there was no significant publication bias. Additionally, Egger's test was conducted to statistically confirm the absence of bias ($p = 0.12$).

4.7. Sensitivity analysis

To test the robustness of the findings, a sensitivity analysis was performed by excluding studies with a high risk of bias. The results remained consistent, indicating that the findings of the meta-analysis are stable and reliable.(Table 5)

Graph 1: Forest Plot for Emotional Exhaustion (This forest plot shows the effect of different interventions on emotional exhaustion in ICU nurses across the studies.)

Graph 2: Forest Plot for Depersonalization (This forest plot illustrates the pooled effect sizes of interventions on depersonalization.)

Graph 3: Forest Plot for Personal Accomplishment (The forest plot shows improvements in personal accomplishment across various non-pharmacological interventions.)

The results of this meta-analysis indicate that non-pharmacological interventions, particularly Mindfulness-Based Stress Reduction (MBSR) and Cognitive-Behavioral Therapy (CBT), are effective in reducing burnout symptoms among ICU nurses. These interventions demonstrate a moderate-to-strong effect in reducing emotional exhaustion, depersonalization, and enhancing personal accomplishment. Art therapy and guided meditation also showed effectiveness but to a slightly lesser degree. Peer

Table 4: Subgroup analysis

Intervention	Effect on Emotional Exhaustion (Hedges' g)	Effect on Depersonalization (Hedges' g)	Effect on Personal Accomplishment (Hedges' g)
MBSR	0.75	0.67	0.60
CBT	0.63	0.60	0.55
Art Therapy	0.55	0.48	0.45
Guided Meditation	0.40	0.42	0.38

Table 5:

Outcome	Pooled Effect Size (Hedges' g)	95% Confidence Interval (CI)	p-value	Heterogeneity (I^2)
Emotional Exhaustion	0.67	[0.45, 0.89]	< 0.01	65%
Depersonalization	0.59	[0.38, 0.81]	< 0.01	58%
Personal Accomplishment	0.53	[0.30, 0.76]	< 0.01	50%

support programs were less studied

5. Discussion

The findings from this meta-analysis suggest that non-pharmacological interventions significantly reduce burnout symptoms, particularly emotional exhaustion and depersonalization, while enhancing personal accomplishment among ICU nurses. Interventions like Mindfulness-Based Stress Reduction (MBSR) and Cognitive-Behavioral Therapy (CBT) demonstrated the highest efficacy, supporting previous research that emphasizes their role in stress management and emotional regulation. The effectiveness of art therapy and guided meditation highlights the value of creative and reflective approaches to reducing mental fatigue and fostering self-awareness.

One notable outcome of this meta-analysis is the moderate heterogeneity observed across the included studies, which could be attributed to variations in intervention duration, study settings, and sample sizes. Despite this, the consistent positive outcomes across diverse studies reinforce the robustness of the results. The moderate effect sizes, particularly for emotional exhaustion (Hedges' g = 0.67), suggest that these interventions provide substantial relief for ICU nurses who face high levels of stress in critical care environments.

The implications of these findings are crucial for healthcare organizations seeking sustainable, cost-effective solutions for burnout. Unlike pharmacological approaches, these interventions carry no medication-related risks, making them suitable for long-term application. Future research should explore the long-term effects of these interventions and assess the scalability of programs like peer support, which, though less studied, show potential for mitigating burnout in collaborative environments. Multi-center trials could also provide more generalizable results.

6. Conclusion

This meta-analysis demonstrates that non-pharmacological interventions are effective in reducing burnout syndrome among ICU nurses. The findings highlight that interventions such as Mindfulness-Based Stress Reduction (MBSR), Cognitive-Behavioral Therapy (CBT), art therapy, and guided meditation provide substantial benefits by decreasing emotional exhaustion and depersonalization while improving personal accomplishment. Among these, MBSR and CBT emerged as the most effective, indicating their potential as primary strategies for preventing and managing burnout in high-stress environments like the ICU. Burnout is a critical issue for ICU nurses, given the emotional and physical demands of their work. The consequences of burnout extend beyond the individual nurse to affect patient care, organizational efficiency, and nurse retention. This analysis underscores the importance of non-pharmacological approaches, which offer a sustainable and low-risk alternative to pharmacological treatments, free from side effects or dependency risks. The interventions not only address the immediate symptoms of burnout but also contribute to overall mental well-being, providing ICU nurses with tools to manage stress and prevent burnout recurrence over time. However, this meta-analysis also points to areas requiring further investigation. For instance, the moderate heterogeneity among studies indicates that variations in intervention duration, intensity, and follow-up periods may affect the outcomes. Additionally, the role of peer support programs, though showing promise, remains underexplored, necessitating more rigorous research. Future studies should focus on larger, multi-center trials and long-term follow-up to assess the enduring impact of these interventions. In conclusion, non-pharmacological interventions are a valuable component of burnout prevention strategies for ICU nurses. Their adoption could significantly enhance the well-being of nursing professionals, improve patient care quality, and contribute

to healthier work environments.

7. Source of Funding

None.

8. Conflict of Interest

None.

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Author's biography

Chetan Ramesh Sangati, Assistant Professor

Bhairgouda Patil, Senior Tutor

Sanjay Alagundi, Senior Tutor

Veerupayya Pujar, Assistant Lecturer

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