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Endotracheal Suctioning in ICU Patients: A Narrative Review of Pain, Physiological Responses, and Quran-Based Spiritual Interventions

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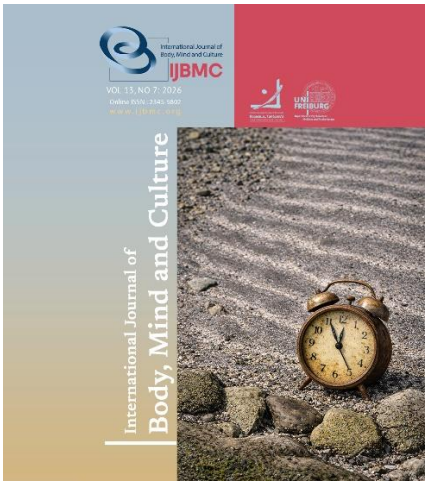

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ABSTRACT

Objective: Endotracheal suctioning is a critical procedure for mechanically ventilated patients; however, it is frequently associated with significant pain and physiological instability.

Methods and Materials: This review aims to synthesize existing evidence regarding the impact of endotracheal suctioning on pain intensity and hemodynamic parameters in adult ICU patients, and to explore the potential role of Quran-based spiritual interventions in alleviating these responses. A narrative review was conducted using a comprehensive search strategy. Electronic databases including PubMed, Scopus, ScienceDirect, and Google Scholar were searched for quantitative studies published between 2020 and 2025.

Findings: Seventeen studies met the inclusion criteria. The review indicates that endotracheal suctioning consistently triggers immediate increases in pain scores and hemodynamic fluctuations (e.g., increased heart rate and blood pressure). Regarding the intervention, studies utilizing Quran recitation demonstrated potential benefits in modulating pain perception and promoting hemodynamic stability compared to control groups. However, the reviewed evidence is heterogeneous, varying significantly in study design and sample size.

Conclusion: Quran-based spiritual interventions appear to be a promising, safe, and culturally congruent adjunctive strategy for managing procedural pain in ICU settings. Further robust clinical trials are recommended to confirm these effects before routine implementation.

Keywords: Endotracheal Suctioning, Mechanical Ventilation, Procedural Pain, Hemodynamic Responses, Quran Recitation.

Introduction

Tracheal intubation with mechanical ventilation (MV) is a cornerstone procedure in intensive care units (ICU) designed to support the respiratory system in critically ill patients (Dsouza et al., 2021). While patients unable to clear pulmonary secretions require endotracheal suctioning to maintain airway patency, clinical practice guidelines by the Care (2010) emphasize that this procedure should be performed only when clinically indicated to prevent complications. The burden of critical care is significant; according to the Medicine et al. (2000), more than five million patients are admitted annually to ICUs in the United States alone, presenting a major challenge for healthcare systems.

Despite its necessity, endotracheal suctioning is frequently cited as a source of significant discomfort. Research indicates that pain intensity can increase by approximately 50% during and after suctioning procedures in mechanically ventilated patients, regardless of whether open or closed suction techniques are utilized (Khayer et al., 2020). Furthermore, the procedure triggers physiological fluctuations, including elevations in hemodynamic parameters, which can destabilize the patient's condition (Bozkurt, 2024). These adverse effects underscore the need for effective pain management strategies, as uncontrolled pain can lead to complications that negatively affect patient outcomes (Wøien, 2020).

Majeed et al. (2023) identified in adequate pain assessment and management as a primary barrier to quality care in critical settings. The anticipation and experience of pain create a psychological burden for patients, necessitating effective interventions (Hamidi et al., 2024). Therefore, pain management is an essential part of nursing (AL-Shammary & Sadeq, 2024). Neglecting pain management can lead to a cascade of physiological and behavioral changes; specifically, the overproduction of stress hormones can compromise hemodynamic stability (Pota et al., 2022). Additionally, uncontrolled pain may suppress the immune system, delay wound recovery, and precipitate behavioral symptoms such as agitation, anxiety, and delirium (Gunther et al., 2025; Zebian et al., 2024). Conversely, prompt and effective nursing interventions are associated with improved pain management outcomes (Albadry & Hassen, 2024). While factors such as the level of consciousness (LOC) and medication regimens influence pain assessment (Ghufran Emad Bachi & Sadeq AL-Fayyadh 2022), there is a growing recognition of the need for holistic care approaches. Integrating spiritual care into non-pharmacological treatment plans has emerged as a strategy to enhance patient comfort and psycho-spiritual well-being (Austin et al., 2025; Puchalski et al., 2020). Effective application of spiritual practices has been shown to reduce stress levels in critically ill patients (Moulaei et al., 2023). Moreover, experimental studies suggest that auditory and spiritual interventions such as Quran recitation can reduce anxiety, thereby indirectly modulating pain perception and physiological responses during painful procedures (Al‐Jubouri et al., 2021).

Evidence also suggests potential benefits regarding the improvement of LOC and oxygen saturation (SPO_2) (Klimasiński, 2021; Rababa & Al-Sabbah, 2023). Furthermore, such interventions may play a role in shortening ICU length of stay and decreasing the reliance on analgesics and sedatives. However, the current evidence regarding the specific physiological effects of Quran recitation during suctioning remains fragmented. To date, few reviews have specifically synthesized these findings distinct from general spiritual care, highlighting a gap that this review aims to fill (Rababa & Al-Sabbah, 2023). Therefore, this review aims to synthesize findings from previous studies regarding pain intensity and physiological responses induced by endotracheal suctioning in intensive care units, and to explore the role of spiritual care specifically Quran recitation in alleviating pain and modulating hemodynamic responses. Accordingly, this review addresses the following research question: How does endotracheal suctioning impact pain intensity and hemodynamic parameters in ICU patients, and what is the potential role of spiritual care in alleviating these responses and promoting physiological stability?

Theoretical Framework

This review is grounded in the Biopsychosocial-Spiritual Model, which asserts that patient care must address physical, psychological, social, and spiritual needs holistically (Al-Khaqani & Al-Fayyadh, 2024). Spiritual balance, characterized by a sense of meaning and connection through religious practices, is a fundamental component of this holistic approach (Al‐Fayyadh et al., 2022).

Application of the framework

In this review, the model serves as a conceptual lens to interpret the complex interaction between the procedure and the intervention: Represents the physiological stress and nociceptive pain caused by endotracheal suctioning. Encompasses the anxiety and distress associated with mechanical ventilation and painful procedures (Melzack & Wall, 1965).

The Spiritual Domain: Represents the intervention (Quran-based spiritual care). The framework posits that by addressing the spiritual domain through Quran recitation, the patient's psychological anxiety may be reduced, which in turn modulates the biological stress response (hemodynamic stability). This conceptual structure guides the discussion of findings in this narrative review.

Methods and Materials

Study Design

This study was conducted as a narrative review to synthesize existing evidence regarding the physiological impact of endotracheal suctioning and the efficacy of Quran-based spiritual interventions. A narrative approach was selected to allow for the inclusion and analysis of heterogeneous study designs (ranging from randomized controlled trials to case reports) that would preclude a strict meta-analysis or systematic review structure

Search Strategy

A comprehensive literature search was conducted between November 20, 2025, and January 30, 2026. The primary electronic databases searched were: PubMed, Scopus, and ScienceDirect. Google Scholar was utilized as a supplementary source to ensure broad coverage. To ensure reproducibility, specific Boolean search strings were developed combining keywords for the procedure, the outcome, and the intervention. The primary search syntax used was: ("Endotracheal suctioning" OR "Tracheal suctioning" OR "Airway suctioning") AND ("Pain" OR "Hemodynamic parameters" OR "Vital signs" OR "Physiological responses") AND ("Quran recitation" OR "Spiritual care" OR "Auditory intervention"). In addition to electronic searching, a manual screening of the reference lists of eligible articles was performed to identify further relevant studies.

Eligibility Criteria

The selection process was guided by defined criteria to distinguish between the procedural context and the therapeutic intervention.

Inclusion Criteria

Adult patients (≥18 years) admitted to ICU under MV; Studies investigating the physiological burden (pain, hemodynamic instability) of endotracheal suctioning; Studies evaluating Quran recitation or related spiritual care interventions; Quantitative designs, including Randomized Controlled Trials (RCTs), quasi-experimental studies, and clinical case reports/series; Full-text articles available in the English language; Studies published between 2020-2025.

Exclusion Criteria

Studies were excluded if they were qualitative research, editorials, conference abstracts, conducted on pediatric or neonatal populations, or published prior to 2020.

Data Extraction and Synthesis

The primary researcher screened the titles and abstracts of retrieved articles to identify relevant studies. Full-text articles meeting the inclusion criteria were then reviewed. Data were extracted using a structured format comprising the following specific details: authors, year, and country of origin; study design; sample size; data collection tools (e.g., pain scales like CPOT, hemodynamic monitoring); key empirical findings.

To address the distinct conceptual focuses of the review, the extracted data were organized into two separate domains: Studies describing the physiological burden and pain associated with endotracheal suctioning (Table 1). Studies evaluating the efficacy of Quran-based spiritual interventions (Table 2). Due to the heterogeneity of the included studies, a narrative thematic synthesis was employed. Findings were categorized based on the primary outcomes (e.g., pain intensity, hemodynamic parameters, and oxygen saturation) to provide a structured overview, while acknowledging the variation in study designs (ranging from RCTs to case reports).

Ethical consideration

Although this study is a narrative review of published literature and does not involve direct interaction with human participants, ethical approval was obtained as part of the formal administrative governance

requirements for the Master's thesis. The protocol was approved by the Research Ethical Approval Committee at the University of Baghdad, College of Nursing (Reference No. 27, dated November 19, 2025).

Findings and Results

To address the research question regarding the impact of Islamic spiritual care on endotracheal suctioning-induced pain and physiological stress, a comprehensive synthesis was conducted. Initially, the search strategy yielded 54 potential records. After a rigorous screening process based on the inclusion and exclusion criteria, 17 studies were finally selected for this review. These studies were categorized into two distinct domains: (1) the physiological impact of endotracheal suctioning, and (2) the efficacy of Quran-based spiritual interventions.

Theme 1: Physiological Impact of Endotracheal Suctioning (Table 1)

Table 1 summarized findings from the 10 studies focusing on the procedural burden of suctioning. The majority of these studies utilized observational cross-sectional designs, with sample sizes ranging from 31 to 176 patients. geographically, the studies were predominantly conducted in Turkey, with others from Iran, Iraq, Egypt, and Spain.

Pain Response. The review identified consistent evidence that endotracheal suctioning acts as a highly noxious stimulus. Across studies using standardized tools, most frequently the Behavioral Pain Scale (BPS) and the Critical-Care Pain Observation Tool (CPOT). Patients exhibited significant elevations in pain scores immediately during and up to 10 minutes post-procedure. Pain levels typically returned to baseline within 30 minutes.

Hemodynamic Instability. In parallel with pain, the studies documented marked physiological fluctuations. Key findings included significant increases in Heart Rate (HR), Mean Arterial Pressure (MAP), and Respiratory Rate (RR), alongside a transient decrease in Oxygen Saturation (SpO2) during the procedure. These physiological surges were positively correlated with lower sedation levels (assessed via RASS or RSS) and higher consciousness level (GCS) (Table 1).

Table 1

Summary of studies examining the physiological impact of endotracheal suctioning

No.	Authors, Year, Country	Sample size	Main Focus	Measurement Tool	Study Design	Key Findings
1.	Khayer et al., 2020, Iran.	75 patients	Impact of open vs. closed suctioning on pain	RASS, CPOT.	Randomized Controlled Trial (RCT).	Pain scores were significantly higher in the open suctioning group compared to the closed group during and 10 minutes post-procedure ($p<0.05$). No significant difference was observed after 30 minutes.
2.	Menekli et al., 2021, Turkey.	100 patients	Pain levels and hemodynamic alterations during suctioning	BPS, RSS, GCS, Hemodynamic monitoring.	Cross-sectional study.	Pain intensity increased significantly during suctioning. A positive correlation was observed between pain severity and consciousness levels (GCS), while a negative correlation was found with sedation levels (RSS).
3.	Bachi & AL-Fayyadh, 2022b, Iraq.	135 patients	Pain severity during nursing procedure (suctioning).	BPS	Descriptive Cross-sectional study	Pain intensity increased to sever levels during endotracheal suctioning, compared to mild levels recorded at baseline and 20 minutes post-procedure.
4.	Kurt & Zaybak, 2022, Turkey.	165 patients	Pain levels during nursing interventions (suctioning).	BPS, RSS	Descriptive cross-sectional study.	Suctioning (tracheal, oral, and nasal) caused a significant increase in pain intensity and elevated systolic/diastolic blood pressure compared to baseline levels.
5.	Kara & Bolukbas, 2022, Turkey.	62 patients	Pain intensity during endotracheal and oral care.	CPOT, RSS, GCS.	Descriptive cross-sectional study.	Mean pain score were significantly higher during endotracheal suctioning and oral care procedure compared to baseline levels.
6.	Kostekli et al., 2022, Turkey.	74 patients.	Comparison of deep vs. superficial suctioning on pain and hemodynamics.	BPS, hemodynamic checklist.	Randomized Controlled Trial (RCT).	Pain scores peaked at 1-minute post-suctioning and returned to baseline within 30 minutes. No significant difference was observed between deep and superficial suctioning techniques.
7.	Surme et al., 2023, Turkey.	176 patients	Pain behaviors and physiological alterations during suctioning	BPS, RSS, physiological monitoring.	Descriptive observational study.	Suctioning caused significant increased in BPS scores, MAP, and HR, with a simultaneous decrease in oxygen saturation. A significant negative correlation was observed between O_2 saturation and pain scores.

8.	Bozkurt & Eroglu, 2024, Turkey.	66 patients	Pain intensity and hemodynamic changes during suctioning.	BPS, hemodynamic checklist	A descriptive-observational study	Vital signs and BPS scores increased significantly during suctioning, while oxygen saturation decreased. Pain levels returned to baseline within 5-15 minutes post-procedure.
9.	De-Aberasturi et al., 2024, Spain.	31 patients	Pain assessment using pupillometry and behavioral scales.	BPS, RASS, PDR, ESCID.	Descriptive cross-sectional study	Behavioral pain scores remained low overall. However, pupillary dilation reflex successfully detected nociceptive responses even in patients exhibiting low behavioral pain scores.
10.	Shehab et al., 2025, Egypt.	72 patients	Physiological and behavioral impact of suctioning.	BPS, Hemodynamic monitoring.	Descriptive observational study.	Suctioning caused a significant transient increase in pain intensity and hemodynamic parameters. Pain levels significantly improved and returned to baseline within minutes after the procedure.

BPS = Behavior Pain Scale, CPOT = Critical Care Pain Observation Tool, GCS = Glasgow Coma Scale, RSS = Ramsay Sedation Scale, RASS = Richmond Agitation Sedation Scale, PDR = Pupillary Dilation Reflex, MAP = Mean Arterial Pressure, HR = Heart Rate, O2 = Oxygen.

Theme 2: Efficacy of Quran-Based Spiritual Interventions (Table 2)

Table two details the seven studies investigating the therapeutic role of Quran recitation. The evidence base is heterogeneous, necessitating a distinction between controlled trials and exploratory case reports.

Controlled Trials & Comparative Studies. The review included five comparative studies (RCTs, quasi-experimental, and case-control design conducted in Indonesia, Pakistan, and Jordan). These studies generally reported that patients receiving Quran recitation intervention showed statistically significant reductions in pain intensity (lower CPOT or pain scale scores) and improved hemodynamic stability (lower HR and MAP) compared to control groups receiving routine care alone.

Case Reports. Two single-case studies provided preliminary descriptive evidence. While these reports suggested that Quran recitation might facilitate physiological relaxation and improve comfort in individual cases, the findings are exploratory and cannot be generalized with the same strength as the controlled trials. Despite the variation in study designs, the thematic synthesis suggests a potential benefit of auditory spiritual care in modulating the stress response to suctioning.

Table 2

Summary of studies examining the efficacy of Quran-Based Spiritual Interventions on Physiological Parameters and pain.

NO.	Authors, Year, Country	Sample Size	Intervention Type	Measurement Tool	Study Design	Key Findings
			Controlled Clinical Trials & Comparative Studies			
1.	Purnawan et al., 2021a, Indonesia.	86 patients	Dreamer Spiritual Therapy (DST).	CPOT, ELISA.	Randomized Controlled Trial (RCT).	The spiritual intervention significantly reduced stress levels (cortisol) and pain intensity compared to control group.
2.	Purnawan et al., 2021b, Indonesia.	40 patients	Listening to Murattal (Quran recitation).	CPOT	Quasi-experimental study.	Pain scores decreased in both groups. However, no statistically significant difference was found between the intervention and control groups regarding the extent of pain reduction.
3.	Rustam et al., 2021, Indonesia.	56 patients	Daily Islamic rituals and comfort care nursing.	Comfort questionnaire (CQMVP), PRS	Randomized Controlled Trial (RCT).	No significant difference was found at baseline. Post-intervention, the group receiving Islamic comfort care showed a significant increase in comfort levels compared to the control group.
4.	Rababa et al., 2025, Jordan.	32 patients	Listening to Quran recitation during pain-inducing procedures.	BPS, RSS.	Experimental pilot study.	Significant differences were found in BPS scores and heart rate measures between the intervention and control groups after controlling for sedation levels, favoring the intervention group.
5.	Pervaiz R et al., 2024, Pakistan.	100 patients	Listening to Surah Al-Rehman recitation	Numerical pain scale (NPS).	Prospective case control study	The intervention group reported a significant reduction in pain intensity and a shorter duration of hospital and ICU stay compared to the control group.
			Case Reports/ Case Series			

6.	Rachmah et al., 2023, Indonesia.	1 participant	Islamic spiritual therapy (Dhikr and Audio).	CPOT, hemodynamic parameters.	Clinical Case Study.	The application of Dhikr therapy resulted in a descriptive reduction in pain behaviors and improved physiological stability (HR, BP) during the observation period.
7.	Alfiani et al., 2024, Indonesia.	One patient	Listening to Murattal Al-Quran combined with pharmacological treatment (Citicoline).	Hemodynamic parameters (MAP, BP, HR, SpO_2) and GCS.	A single-case descriptive study.	The combined intervention was associated with descriptive improvements in hemodynamic stability (reductions in BP, HR, and RR) and an observed increase in consciousness level.

ELISA = Enzyme-Linked Immunosorbent Assay, CRS = Comfort Rating Scale, NPS = Numeric pain scale

Discussion and Conclusion

The primary aim of this review was to evaluate the efficacy of Islamic spiritual care interventions, specifically Quran recitation in alleviating pain intensity and stabilizing hemodynamic parameters during endotracheal suctioning in ICU patients. guided by Biopsychosocial and Spiritual Model, this discussion interprets the synthesized evidence, linking the physiological stress of suctioning with the potential mitigating effects of spiritual care.

1. Physiological Burden of Suctioning (The Biological Aspect)

Consistent with the first set of included studies (Table 1), the evidence strongly indicates that ETS acts as a potent nociceptive stimulus. The reviewed literature (e.g., Bozkurt, 2024; Shehab, 2025; Sürme et al., 2023) demonstrates that suctioning is associated with acute elevations in heart rate (HR), blood pressure (BP), and mean arterial pressure (MAP), alongside desaturation. These physiological fluctuations are clinically interpreted as a sympathetic nervous system (SNS) response to invasive airway stimulation (Ghufran Emad Bachi & S AL-Fayyadh, 2022).

2. Efficacy of Spiritual Interventions (The Intervention Evidence)

The synthesis of spiritual care interventions (Table 2) reveals promising, though heterogeneous, evidence. Controlled clinical trials generally reported that patients listening to Quran recitation experienced significantly lower pain scores and improved hemodynamic stability compared to control groups (Pervaiz et al., 2024; Rababa et al., 2025; Rustam et al., 2021). For instance, Purnawan, Hidayat, et al., (2021) provided biochemical support for this effect, noting a significant reduction in salivary cortisol levels. However, findings were not entirely uniform; Purnawan, Setiyarini, et al. (2021) found that while pain scores decreased in the intervention group, the difference was not statistically significant compared to the control group. This discrepancy highlights the need for cautious interpretation and suggests that efficacy may depend on implementation variables such as duration and patient baseline characteristics. Additionally, case reports (Khotimah & Prajayanti, 2025; Rachmah et al., 2022) offer preliminary descriptive support for the calming effect of spiritual therapy, though these findings are exploratory.

3. Theoretical Mechanisms (Biopsychosocial and Spiritual Model)

The observed effects can be interpreted through the Biopsychosocial and Spiritual Model adopted as the theoretical framework for this review. Theoretically, pain during suctioning is not merely a biological reflex but a multidimensional experience influenced by psychological and spiritual states. The findings suggest that Quran recitation acts as a spiritual anchor that modulates the psychological response (anxiety and fear), thereby influencing the biological stress response.

By fostering a state of spiritual comfort, the intervention is hypothesized to shift the autonomic balance from sympathetic dominance ("fight or flight") toward parasympathetic activation (relaxation). This alignment with the theoretical framework suggests that addressing the "spiritual pain" or distress through culturally congruent care may help block the stress cascade, potentially triggering natural pain-modulating pathways (such as endogenous opioid release) and leading to the observed stabilization in hemodynamic parameters (Rababa et al., 2025; Rustam et al., 2021). Consequently, based on the Biopsychosocial and Spiritual Model, this review posits that limiting pain management solely to pharmacological methods addresses only the biological dimension of the patient. The synthesized evidence supports the researcher's perspective that integrating spiritual care is not merely a cultural accommodation, but a therapeutic necessity to

achieve holistic homeostasis in mechanically ventilated patients.

Limitations

Despite the scientific value of this review, several methodological limitations must be acknowledged. First, the research relied primarily on databases such as Google Scholar, a platform that may lack some of the advanced filtering features found in specialized medical databases, potentially affecting the accuracy of reproducible research. Second, the review was limited to studies published in English and available through open access, which opens the door to selection and language bias that could exclude important research published in other languages or that was paid for. Third, the review included a mix of research designs, including individual case reports and clinical trials, which increases the variability in the quality of the ranked evidence. We also note that we did not conduct a formal risk of bias assessment or an evaluation of the quality of the included studies, which necessitates caution when interpreting the strength of the conclusions. In addition, precise details regarding the mechanism for removing duplicate references to ensure consistent filtering were not provided. Finally, there is a possibility of publication bias. (Publication Bias), since studies that show positive results for spiritual interventions are often more likely to be published than others, which should be taken into account when generalizing the results.

Conclusion

In conclusion, this review establishes consistent evidence that endotracheal suctioning triggers significant acute pain and hemodynamic fluctuations in ICU patients. Regarding spiritual interventions, preliminary evidence suggests that Quran recitation appears promising as a culturally congruent, adjunctive intervention in predominantly Muslim ICU populations, potentially aiding in pain modulation and vital sign stabilization. However, given the heterogeneous nature of the current evidence base which includes case reports and small sample sizes claims of high efficacy remain premature. Therefore, rather than recommending immediate routine integration, this study suggests that spiritual care be considered a supportive option based on individual patient preference and cultural context. Ultimately, higher-quality clinical trials are essential to substantiate these preliminary findings before broader implementation in daily nursing protocols can be definitively recommended.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Declaration of Helsinki, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contribute to this study.

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