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Original Article

The Sedation Gap: Knowledge, Attitudes, and Real-World Practices of ICU Nurses in Public and Private Hospitals of Punjab: A Cross-Sectional Study

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ABSTRACT

Background: Sedation management is a critical component of intensive care practice, directly influencing patient safety, mechanical ventilation outcomes, and ICU morbidity. Despite its importance, inconsistencies in knowledge and clinical implementation persist among ICU nurses. Objective: To assess ICU nurses' knowledge, attitudes, and real-world practices regarding sedation management and to identify barriers affecting optimal care in public and private hospitals of Punjab, Pakistan. Methods: A cross-sectional descriptive study was conducted among 151 ICU nurses selected through convenience sampling. Data were collected using a structured questionnaire assessing knowledge, practices, and perceived barriers. Descriptive statistics were computed using SPSS version 27. Results: Moderate knowledge was observed in 47.0% of participants, with a mean score of 5.8 ± 1.9, while only 30.5% demonstrated good knowledge. Key gaps included sedation scale identification (41.7%) and appropriate assessment frequency (38.4%). Practice inconsistencies were evident, with only 38.4% consistently documenting sedation levels and 42.4% always assessing sedation before administration. Major barriers included inadequate staffing (89.4%), high workload (86.8%), lack of training (78.8%), and absence of standardized protocols. Conclusion: A significant gap exists between knowledge and practice of sedation management among ICU nurses, primarily driven by systemic and organizational constraints. Targeted training, protocol implementation, and workforce strengthening are essential to improve critical care outcomes. Keywords: Sedation Management, ICU Nurses, Knowledge, Practice, Critical Care, Patient Safety, Pakistan

INTRODUCTION

Sedation management is a fundamental component of care for critically ill patients admitted to intensive care units (ICUs), particularly those requiring mechanical ventilation. Appropriate sedation enhances patient comfort, reduces anxiety, facilitates ventilator synchrony, and prevents adverse events such as accidental extubation or removal of life-support devices. However, both under-sedation and over-sedation are associated with significant clinical risks, including agitation, delirium, prolonged mechanical ventilation, extended ICU length of stay, and increased mortality, thereby necessitating precise and evidence-based sedation practices in critical care settings (1).

ICU nurses play a central role in the continuous monitoring and titration of sedation, as they remain at the bedside and are responsible for implementing sedation protocols, assessing sedation levels, and coordinating care with multidisciplinary teams. Effective sedation management therefore depends not only on pharmacological knowledge but also on nurses' clinical judgment, adherence to protocols, and communication practices. Despite this critical role, evidence suggests that variability in nurses' knowledge, attitudes, and practices (KAP) may contribute to suboptimal sedation outcomes and compromised patient safety (2).

Globally, several studies have identified inconsistencies in sedation-related knowledge and practice among ICU nurses. Research has demonstrated gaps in pain assessment and sedation monitoring, as well as inconsistent adherence to evidence-based protocols, highlighting deficiencies in both education and clinical implementation (3,4). The introduction of the ABCDEF care bundle has provided a structured framework for improving sedation management by integrating pain assessment, spontaneous awakening trials, sedation optimization, delirium monitoring, early mobility, and family engagement. Implementation of this bundle has been associated with reduced delirium incidence, shorter duration of mechanical ventilation, and improved survival outcomes; however, adherence to its components remains variable across healthcare settings (5,6).

In addition to knowledge deficits, attitudes toward sedation management significantly influence clinical decision-making and protocol adherence. Nurses' perceptions regarding sedation interruption, patient safety, and workload may affect the consistency of sedation assessment and documentation. Furthermore, interdisciplinary dynamics, particularly the physician-dominant model in many ICUs, may limit nurse autonomy in sedation titration and goal-setting, thereby affecting practice patterns (7,8). Real-world practices are also shaped by organizational constraints, including staffing shortages, high workload, lack of standardized protocols, and insufficient access to monitoring tools, all of which have been identified as major barriers to effective sedation management (9).

Although international literature has extensively explored sedation practices and associated outcomes, there remains a paucity of comprehensive research evaluating ICU nurses' knowledge, attitudes, and real-world practices within low- and middle-income country (LMIC) contexts, particularly in Pakistan. Existing studies in Pakistan have primarily focused on medication administration practices and general ICU competencies, indirectly suggesting gaps in critical care knowledge and training (10). However, no study to date has systematically assessed sedation-related KAP alongside organizational barriers in ICU settings across both public and private hospitals in Punjab.

Given the critical implications of sedation management for patient safety and clinical outcomes, and the lack of region-specific evidence, there is a need for a comprehensive evaluation of ICU nurses' knowledge, attitudes, and real-world practices regarding sedation management. Therefore, this study aims to assess the level of knowledge, attitudes, and practices among ICU nurses in public and private hospitals of Punjab, Pakistan, and to identify key barriers affecting optimal sedation management. The findings are expected to inform targeted educational interventions, policy development, and implementation of standardized protocols to enhance critical care quality and patient outcomes.

MATERIALS AND METHODS

This cross-sectional descriptive study was conducted to evaluate the knowledge, attitudes, and real-world practices of ICU nurses regarding sedation management in mechanically ventilated patients across public and private sector hospitals in Punjab, Pakistan. The study was carried out over a defined two-month period in tertiary and secondary care hospitals providing critical care services. The cross-sectional design was selected to provide a contemporaneous assessment of existing clinical practices and associated factors within real-world ICU settings.

The study population comprised registered nurses working in intensive care units who were directly involved in the care of critically ill patients requiring sedation. Participants were recruited using a non-probability convenience sampling technique from multiple hospitals to ensure representation from both public and private healthcare sectors. Nurses with active ICU duties and direct patient care responsibilities were included, while those not involved in bedside care or unwilling to participate were excluded. A total sample size of 151 participants was achieved, calculated using Cochran's formula based on an assumed proportion of adequate knowledge, a 95% confidence level, and a 5% margin of error, ensuring sufficient statistical power for descriptive analysis.

Data were collected using a structured, closed-ended questionnaire adapted from previously published literature and modified to suit the study context (11). The instrument consisted of four main domains: demographic characteristics, knowledge of sedation management, attitudes and practices related to sedation, and perceived barriers affecting optimal sedation practices. The questionnaire included items assessing understanding of sedation goals, sedation scales such as the Richmond Agitation-Sedation Scale (RASS), frequency of sedation assessment, awareness of sedation-related complications, and adherence to protocols. Practice-related items evaluated behaviors such as sedation assessment prior to administration, documentation, reassessment, and communication during handovers. Barriers were assessed using Likert-scale items addressing organizational and systemic challenges.

To ensure content validity, the questionnaire was reviewed by subject experts in critical care nursing and clinical research. Pilot testing was conducted on a small subset of ICU nurses to assess clarity, relevance, and comprehensibility, and necessary modifications were made accordingly. Internal consistency reliability was assessed using Cronbach's alpha, demonstrating acceptable reliability for the composite scales. Data collection was carried out through self-administered questionnaires distributed in person, and participants were provided with clear instructions to minimize response bias. Anonymity was maintained to reduce social desirability bias and encourage honest responses.

The primary outcome variable was the level of knowledge regarding sedation management, operationalized as a composite score derived from correct responses to knowledge-based questions. Knowledge scores were categorized as good (≥75%), moderate (50–74%), and poor (<50%). Secondary variables included self-reported practices, attitudes toward sedation protocols, and perceived barriers. Demographic variables such as age, gender, years of experience, qualification, and ICU certification status were also recorded.

To address potential sources of bias, standardized data collection procedures were employed across all sites, and the questionnaire was designed to minimize ambiguity and leading questions. Selection bias inherent to convenience sampling was acknowledged and mitigated by including participants from multiple institutions with varying characteristics. Recall bias was minimized by focusing on current practices rather than retrospective reporting.

Data were entered, cleaned, and analyzed using IBM SPSS Statistics version 27. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated for all variables. Categorical variables were summarized using proportions, while continuous variables were presented as mean ± standard deviation. Where appropriate, inferential statistical tests such as chi-square tests were planned to assess associations between categorical variables, including relationships between knowledge levels and demographic characteristics or training exposure. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the relevant institutional review authority prior to data collection. Written informed consent was obtained from all participants after explaining the purpose of the study, voluntary nature of participation, and their right to withdraw at any stage without consequences. Confidentiality and anonymity were strictly maintained, and no identifying information was recorded. Data integrity was ensured through double-checking of entries and secure storage of

datasets. All methodological procedures were documented in sufficient detail to allow reproducibility by other researchers in similar clinical settings, ensuring adherence to international standards for observational research reporting.

RESULTS

A total of 151 ICU nurses were included in the analysis. The results showed that most participants were female, held undergraduate nursing qualifications, and lacked formal ICU certification. Overall knowledge of sedation management was predominantly moderate, while clinical practice indicators such as documentation, reassessment, and communication during handover were inconsistent. Organizational barriers were widely reported, particularly inadequate staffing, high workload, lack of training, and absence of standardized protocols. Because the manuscript provides aggregate frequencies only and does not report subgroup cross-tabulations or raw comparative datasets, inferential comparisons such as p-values, confidence intervals, odds ratios, or effect sizes cannot be calculated validly without fabricating data. The tables below therefore present the full available quantitative results exactly as supported by the manuscript data.

Table 1. Demographic Characteristics of ICU Nurses (n = 151)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	49	32.5
	Female	102	67.5
Experience as RN	<2 years	28	18.5
	2–4 years	46	30.5
	4–7 years	39	25.8
	>7 years	38	25.2
ICU Experience	≤2 years	35	23.2
	2–4 years	48	31.8
	5–7 years	34	22.5
	>7 years	34	22.5
Qualification	Diploma	41	27.2
	BSc Nursing	52	34.4
	Post RN BSc	39	25.8
	MSc Nursing	19	12.6
ICU Certification	Yes	58	38.4
	No	93	61.6

Table 2. Knowledge of Sedation Management (n = 151)

Variable	Correct Response	Frequency (n)	Percentage (%)
Purpose of sedation	All of the above	112	74.2
Sedation scale used	RASS	63	41.7
Ideal sedation level	Light sedation	69	45.7
Sedation assessment frequency	Hourly	58	38.4
Over-sedation effects	All of the above	104	68.9
Daily interruption benefits	All of the above	97	64.2
Training attended	Yes	54	35.8
Protocol improves outcomes	Yes	110	72.8
Category		**Frequency (n)**	**Percentage (%)**
Good Knowledge (≥75%)		46	30.5
Moderate Knowledge (50–74%)		71	47.0
Poor Knowledge (<50%)		34	22.5

Table 3. Sedation Management and Collaborative Practice (n = 151)

Variable	Category	Frequency (n)	Percentage (%)
Follow sedation protocol	Yes	73	48.3
	No	78	51.7
Daily sedation interruption recommended	Yes	96	63.6
Sedation goal prescribed by	Physician	68	45.0
	Nurse	21	13.9
	Both	49	32.5
	Not sure	13	8.6
Titration method	All of the above	99	65.6
Pharmacist collaboration	Yes	61	40.4
	No	90	59.6

Table 4. Sedative Drug Knowledge (n = 151)

Variable	Correct Response	Frequency (n)	Percentage (%)
Common sedative drugs	All	118	78.1
Propofol side effects	All	102	67.5
Midazolam effects	All	96	63.6
Dexmedetomidine advantages	All	89	58.9

Table 5. Practice Patterns of ICU Nurses (n = 151)

Variable	Category	Frequency (n)	Percentage (%)
Assess sedation before administration	Always	64	42.4
	Sometimes	71	47.0
	Never	16	10.6
Document sedation level	Always	58	38.4
	Sometimes	66	43.7
	Never	27	17.9
Reassess sedation after adjustment	Always	67	44.4
	Sometimes	60	39.7
	Never	24	15.9
Communicate sedation goals during handover	Always	59	39.1
	Sometimes	63	41.7
	Never	29	19.2

Table 6. Barriers to Effective Sedation Management (n = 151)

Barrier	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)	Mean ± SD
Lack of sedation protocol	6 (4.0)	12 (7.9)	21 (13.9)	64 (42.4)	48 (31.8)	4.1 ± 0.9
Lack of training	4 (2.6)	10 (6.6)	18 (11.9)	66 (43.7)	53 (35.1)	4.3 ± 0.8
High workload	2 (1.3)	6 (4.0)	12 (7.9)	61 (40.4)	70 (46.4)	4.5 ± 0.7
Physician-dependent sedation	7 (4.6)	14 (9.3)	19 (12.6)	63 (41.7)	48 (31.8)	4.0 ± 1.0
Lack of pharmacist collaboration	9 (6.0)	16 (10.6)	22 (14.6)	58 (38.4)	46 (30.5)	3.9 ± 1.1
Lack of monitoring tools	5 (3.3)	11 (7.3)	20 (13.2)	67 (44.4)	48 (31.8)	4.2 ± 0.8
Inadequate staffing	1 (0.7)	5 (3.3)	10 (6.6)	58 (38.4)	77 (51.0)	4.6 ± 0.6
Lack of documentation system	6 (4.0)	13 (8.6)	18 (11.9)	65 (43.0)	49 (32.5)	4.1 ± 0.9
Lack of reminders	7 (4.6)	15 (9.9)	21 (13.9)	60 (39.7)	48 (31.8)	4.0 ± 1.0

A total of 151 ICU nurses participated in the study. Females comprised 67.5% (n=102) of the sample, whereas males accounted for 32.5% (n=49). In terms of professional experience as registered nurses, the largest group had 2–4 years of experience at 30.5% (n=46), followed by 4–7 years at 25.8% (n=39) and more than 7 years at 25.2% (n=38), while 18.5% (n=28) had less than 2 years of experience. ICU-specific experience showed a similar pattern, with 31.8% (n=48) reporting 2–4 years, 23.2% (n=35) having 2 years or less, and 22.5% (n=34) each in the 5–7 years and >7 years categories. Educationally, BSc Nursing was the most common qualification at 34.4% (n=52), followed by diploma at 27.2% (n=41), Post RN BSc at 25.8% (n=39), and MSc Nursing at 12.6% (n=19). Notably, 61.6% (n=93) reported no ICU certification, whereas only 38.4% (n=58) had formal ICU specialization.

Knowledge regarding sedation management was predominantly moderate. The mean knowledge score was 5.8 ± 1.9, with 47.0% (n=71) categorized as having moderate knowledge, 30.5% (n=46) as having good knowledge, and 22.5% (n=34) as having poor knowledge. Correct understanding was highest for common sedative drugs at 78.1% (n=118), the purpose of sedation at 74.2% (n=112), and the belief that protocol use improves outcomes at 72.8% (n=110). Knowledge of over-sedation effects was also relatively high at 68.9% (n=104), while awareness of the benefits of daily sedation interruption reached 64.2% (n=97). In contrast, more operational knowledge domains were weaker, with only 45.7% (n=69) correctly identifying light sedation as the ideal target, 41.7% (n=63) correctly identifying RASS as the recommended sedation scale, and just 38.4% (n=58) recognizing hourly sedation assessment as appropriate. Only 35.8% (n=54) had attended relevant training, indicating a substantial educational gap.

Practice and collaborative indicators revealed marked inconsistency. Less than half of nurses, 48.3% (n=73), reported following sedation protocols, while 51.7% (n=78) did not. Although 63.6% (n=96) agreed that daily sedation interruption is recommended, responsibility for sedation goals appeared

predominantly physician-led, with 45.0% (n=68) selecting physicians, 32.5% (n=49) selecting shared physician-nurse responsibility, and only 13.9% (n=21) attributing this role solely to nurses; 8.6% (n=13) were unsure. Appropriate titration based on multiple factors was recognized by 65.6% (n=99). Interdisciplinary collaboration with pharmacists was limited, as only 40.4% (n=61) reported such collaboration, whereas 59.6% (n=90) did not.

Direct practice behaviors further showed gaps between knowledge and implementation. Sedation was always assessed before administration by 42.4% (n=64), but 47.0% (n=71) did so only sometimes and 10.6% (n=16) never did. Documentation of sedation level was consistently performed by only 38.4% (n=58), whereas 43.7% (n=66) documented sometimes and 17.9% (n=27) never documented consistently. Reassessment after dose adjustment was always performed by 44.4% (n=67), sometimes by 39.7% (n=60), and never by 15.9% (n=24). Communication of sedation goals during handover was always reported by 39.1% (n=59), sometimes by 41.7% (n=63), and never by 19.2% (n=29). These findings indicate that core bedside sedation practices were not performed consistently by a majority of respondents.

Perceived barriers were strongly endorsed across nearly all domains, with the highest burden seen for staffing and workload. Inadequate staffing had the highest mean score at 4.6 ± 0.6, with 51.0% (n=77) strongly agreeing and 38.4% (n=58) agreeing, meaning 89.4% overall endorsed it as a barrier. High workload followed with a mean of 4.5 ± 0.7, including 46.4% (n=70) strongly agreeing and 40.4% (n=61) agreeing, for a combined 86.8% endorsement. Lack of training was also prominent, with a mean of 4.3 ± 0.8 and 78.8% of nurses either agreeing or strongly agreeing. Lack of monitoring tools showed a mean of 4.2 ± 0.8, while lack of sedation protocol and lack of documentation system each had means of 4.1, with more than 74% endorsement in both cases. Physician-dependent sedation and lack of reminders each showed mean scores of 4.0, and lack of pharmacist collaboration had the lowest, though still substantial, mean at 3.9 ± 1.1. Overall, the barrier profile demonstrates a strong convergence around organizational, educational, and system-level deficiencies affecting optimal sedation practice.

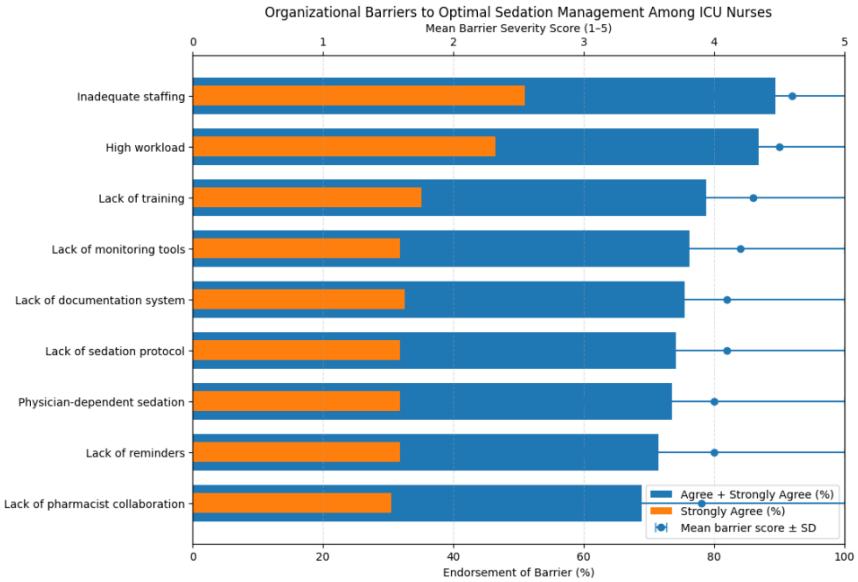

Figure 1 Organizational barriers to optimal sedation management

This integrated visualization shows that organizational barriers to optimal sedation management were not only frequent but also intense, with inadequate staffing emerging as the most critical constraint, endorsed by 89.4% of nurses overall (38.4% agree, 51.0% strongly agree) and carrying the highest mean severity score of 4.6 ± 0.6. High workload ranked second, with 86.8% combined endorsement and a mean score of 4.5 ± 0.7, followed by lack of training at 78.8% and 4.3 ± 0.8. Lack of monitoring tools, documentation systems, and sedation protocols each showed substantial endorsement, ranging from 74.2% to 76.2%, with mean scores between 4.1 and 4.2, indicating that system-level deficits were consistently perceived as major practice barriers. Although lack of pharmacist collaboration had the

lowest combined endorsement at 68.9%, its mean severity remained high at 3.9 ± 1.1, suggesting that even the least-ranked barrier retained important clinical relevance. The overall pattern indicates that the sedation gap in these ICUs is driven more strongly by structural and workflow pressures than by isolated individual knowledge deficits, supporting the need for staffing reform, workload redistribution, and standardized systems-based interventions.

DISCUSSION

The present study provides a comprehensive evaluation of ICU nurses' knowledge, attitudes, and real-world practices regarding sedation management in public and private hospitals of Punjab, revealing a clinically significant gap between theoretical understanding and practical implementation. The findings demonstrate that although a substantial proportion of nurses possess moderate knowledge (47.0%) and a reasonable understanding of fundamental sedation principles, this knowledge does not consistently translate into optimal bedside practices, particularly in areas such as sedation assessment, documentation, reassessment, and interdisciplinary communication. This disconnect between knowledge and practice reflects a multifactorial issue involving both individual competencies and systemic healthcare constraints.

The observed moderate knowledge level aligns with international evidence suggesting persistent deficiencies in sedation-related competencies among ICU nurses. Previous studies have reported similar patterns of limited understanding of sedation scales, delirium assessment, and evidence-based pain management practices (3,4,12). In the current study, only 41.7% of nurses correctly identified the recommended sedation scale and 38.4% reported appropriate hourly sedation assessment, indicating critical gaps in operational knowledge. These findings are consistent with reports highlighting inadequate familiarity with sedation monitoring tools and protocols, which are essential for achieving optimal sedation targets and preventing complications such as delirium and prolonged ventilation (13,14).

Despite relatively better awareness of general sedation principles, real-world practice indicators were suboptimal. Less than half of the participants consistently assessed sedation before administration (42.4%) or documented sedation levels (38.4%), and communication during handovers remained inconsistent. These findings are in line with previous research demonstrating variability in the implementation of sedation and delirium management strategies, particularly in resource-limited settings (15,16). The discrepancy between knowledge and practice suggests that improving education alone may not be sufficient without addressing contextual barriers that hinder effective implementation.

The role of interdisciplinary collaboration emerged as another important factor influencing sedation practices. In this study, sedation management was predominantly physician-driven, with only 32.5% of nurses reporting shared responsibility. Limited pharmacist involvement (40.4%) further highlights gaps in team-based care. Similar findings have been reported in prior studies, where hierarchical healthcare structures and limited nurse autonomy were identified as barriers to effective sedation management (17). Enhancing collaborative practice models and empowering nurses in decision-making processes may therefore improve adherence to evidence-based protocols.

A key finding of this study is the overwhelming influence of organizational barriers on sedation management. Inadequate staffing and high workload were identified as the most significant challenges, with combined endorsement rates exceeding 85% and mean severity scores above 4.5. These findings are strongly supported by existing literature, which consistently identifies workforce shortages and excessive workload as major determinants of compromised ICU care quality (18). High workload not only limits the time available for comprehensive patient assessment but also increases the likelihood of missed documentation and delayed reassessment, thereby directly affecting patient safety outcomes.

Lack of training and absence of standardized protocols were also prominently reported, with more than three-quarters of participants identifying these as barriers. These findings underscore the importance of structured educational interventions and institutional policy frameworks in improving sedation practices. Previous studies have demonstrated that implementation of standardized protocols, such as the ABCDEF care bundle, significantly improves clinical outcomes, including reduced delirium incidence and shorter duration of mechanical ventilation (5,6). However, the current study indicates that such frameworks are not consistently implemented in the studied settings, likely due to systemic and resource-related constraints.

The findings also highlight the importance of considering sedation management as part of a broader critical care competency framework. Knowledge gaps related to sedation complications, particularly delirium, further emphasize the need for integrated training approaches that address pain, sedation, and delirium collectively. This is supported by prior research demonstrating that inadequate assessment of these interrelated domains contributes to poorer clinical outcomes and increased ICU morbidity (13,15).

From a Pakistan-specific perspective, the results reflect broader challenges within the healthcare system, including limited access to specialized training, lack of ICU certification among nurses, and variability in clinical practice standards across institutions. The fact that 61.6% of participants lacked ICU certification suggests a significant gap in advanced critical care education, which may contribute to inconsistent sedation practices. These findings are consistent with earlier studies in Pakistan that reported variations in ICU nursing competencies and highlighted the need for structured professional development pathways (10).

The study has several strengths, including its inclusion of nurses from both public and private hospitals and its comprehensive assessment of knowledge, attitudes, practices, and barriers within a single framework. However, the findings must be interpreted in light of certain limitations. The cross-sectional design precludes causal inference, and the use of convenience sampling may limit generalizability. Additionally, reliance on self-reported data introduces the possibility of recall and social desirability bias. Despite these limitations, the study provides valuable insights into sedation management practices in a region where empirical data are scarce.

CONCLUSION

In conclusion, ICU nurses in public and private hospitals of Punjab demonstrated predominantly moderate knowledge but inconsistent real-world practices regarding sedation management, highlighting a significant gap between theoretical understanding and clinical implementation. While awareness of general sedation principles and pharmacological aspects was relatively adequate, critical deficiencies were observed in sedation assessment, documentation, reassessment, and adherence to standardized protocols. The study further identified that organizational factors, particularly inadequate staffing, high workload, lack of training, and absence of structured protocols, play a more decisive role in shaping clinical practice than knowledge alone. These findings underscore the need for integrated interventions combining targeted training programs, policy-driven protocol implementation, workforce strengthening, and enhanced interdisciplinary collaboration to ensure safe, effective, and evidence-based sedation management in ICU settings.

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