Research Article

Intensive Care Unit Nurses' Satisfaction and Perspectives on Continuous Enteral Feeding Pumps: A Cross-Sectional Study in an Indian Trauma Centre

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Abstract

Background: Trauma patients often experience significant nutrient deficits during critical care due to frequent interruptions in enteral nutrition. Continuous enteral feeding using automated pumps enhances delivery precision and reduces workload; however, its adoption in Indian intensive care units (ICUs) remains limited due to infrastructural and training constraints. Nurses' satisfaction and perspectives are crucial for the successful implementation of such technology in resource-limited settings. The study aims to assess ICU nurses' satisfaction and perspectives on continuous enteral feeding pumps and to identify perceived challenges and recommendations for clinical integration in an Indian tertiary trauma center.

Materials and Methods: A cross-sectional descriptive study was conducted among 154 ICU nurses at a tertiary trauma care center between April and September 2022. Data were collected using a validated Nurses' Satisfaction Questionnaire with Feeding Pumps. Descriptive statistics were applied using Statistical Package for the Social Sciences version 20.

Results: Among 154 respondents (mean clinical experience: 6 years), 85.07% agreed that continuous enteral feeding enhanced nutrient delivery, and 91.56% reported reduced administration time. Overall satisfaction with pump-assisted feeding was high, 4.47 ± 0.75, with strong confidence in accuracy, 4.57 ± 0.61. However, alarm fatigue and misconnection risks were identified as operational concerns. Two-thirds, 64.94% of nurses recommended routine pump use for all critically ill patients, while 35.06% supported selective application based on tolerance and clinical stability.

Conclusion: ICU nurses perceived continuous enteral feeding pumps as beneficial, efficient, and reliable, though operational issues require attention. Targeted training, technical support, and infrastructure strengthening are essential for widespread adoption in Indian ICUs.

Keywords: Continuous enteral feeding, feeding pump, intensive care unit nurses, nursing satisfaction, nutritional adequacy

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Introduction

Trauma patients have high nutritional requirements due to the hypermetabolic and catabolic response to injury. However, cumulative nutrient deficits are commonly observed in Intensive Care Unit (ICU) settings, particularly during the initial phase post-injury, due to repeated surgical interventions, prolonged critical care stay, and gastrointestinal (GI) intolerance to enteral nutrition.[1] Optimal nutrition support has

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been shown to improve clinical outcomes, including reduced complications, shorter ICU stays, and enhanced recovery in critically ill patients.[2-4]

Enteral feeding can be administered through two primary methods: Bolus and continuous. Bolus feeding involves intermittent administration of larger volumes, typically via gravity, while continuous enteral feeding through electric pumps provides a regulated and sustained nutrient flow.[5] In ICU settings, feeds are often paused for imaging, procedures, or repositioning.[6] Continuous Enteral Feeding via pumps allows for precise tracking and automatic resumption, minimizing the risk of underfeeding. In contrast, bolus feeds, once interrupted or delayed, are often not compensated for later, contributing to cumulative caloric deficits. Present clinical guidelines recommend continuous feeding for patients at risk of GI intolerance, aspiration, or those requiring mechanical ventilation, as it supports improved nutritional adequacy, glycemic control, and feeding tolerance, though clear superiority of one method over the other is not demonstrated.[2,3]

However, in low- and middle-income country (LMIC) ICU settings, such as India, bolus feeding remains common.[3,7] This persistent reliance is largely attributable to limited pump availability, financial constraints, infrastructure deficiencies, and inadequate training, all of which have impeded the adoption of Continuous Enteral Feeding in public healthcare settings.[3,8]

During periods of extreme clinical demand, such as the COVID-19 pandemic, nurse shortages highlighted the potential of continuous feeding pumps.[9] The use of these pumps gained renewed attention due to their ability to streamline feeding workflows, reduce nursing workload, and deliver nutrition more efficiently.[9-11] The perspectives of nursing staff are recognized as pivotal to the successful implementation of enteral feeding practices and have been studied extensively, the use of Continuous Enteral Feeding Pumps remains underexplored within Indian ICU settings.[8,12-14] Nurses' satisfaction, perceived benefits, and challenges play a direct role in adherence to nasogastric feeding protocols and ultimately affect patient outcomes.[7,12,13] Therefore, the present study aimed to assess ICU nurses' satisfaction and perspectives on the use of continuous enteral feeding pumps and to identify perceived challenges and areas for improvement in a tertiary trauma care setting in India.

Materials and Methods

Study design and setting

A cross-sectional descriptive study was conducted to assess nurses' satisfaction with continuous enteral feeding practices among critically ill patients in a tertiary care trauma center in India.

Sampling and participants

The study included ICU nurses with a minimum of 6 months' experience using enteral feeding pumps and were enrolled using purposive sampling. A total of 154 nurses completed the questionnaire between April 2022 and September 2022, following approval from the Institutional Ethics Committee.

Tool for data collection

Data were collected using the Nurses' Satisfaction Questionnaire with Feeding Pumps (NSQ with FP), a tool developed and validated by clinical experts. The questionnaire has been attached in Appendix 1. The instrument comprised three sections:

- Section 1: Four items evaluating perceptions of feeding adequacy, including achievement of target volume, nutrient delivery, and common feed-associated complications. Responses were recorded on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree)
- Section 2: Three items assessing overall satisfaction, rated on a 5-point Likert scale (1 = Least Satisfied, 5 = Most Satisfied)
- Section 3: One multiple-choice item on nurses' recommendations for incorporating Continuous Enteral Feeding Pumps into routine care.

The reliability of the tool was tested using Cronbach's alpha ($\alpha = 0.67$), which was acceptable for exploratory research involving short instruments.[15]

Data collection procedure

Before data collection, nurses were sensitized to the project, and a structured group demonstration was conducted to familiarize them with study objectives and the questionnaire. Completed questionnaires were anonymized and compiled for analysis.

Data analysis

Data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences version 20. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to summarize the responses.

Results

A total of 154 ICU nurses participated in the study, with an average clinical experience of approximately 6 years. Most respondents preferred Continuous Enteral Feeding Pumps over bolus methods, citing greater ease of administration and improved nutrient delivery.

Survey analysis revealed strong support for Continuous Enteral Feeding Pumps among ICU nurses. Figure 1 illustrates ICU nurses' agreement regarding the perceived benefit of continuous enteral feeding compared to bolus feeding. About 73.38% of nurses strongly agreed that Continuous Enteral Feeding is easier to administer, and 85.07% nurses agreed or strongly agreed that it enhances the delivery of prescribed nutrition. More than half, 51.30% nurses strongly agreed that it improves nutrient (carbohydrate, protein, fat) delivery. Similarly, 91.56% nurses agreed or strongly agreed that continuous feeding

reduces the time required for feed administration, with 58.44% nurses strongly agreeing with this benefit.

Regarding GI issues, such as diarrhea, abdominal distension, and increased Ryle's tube aspirate, 75.98% nurses reported that these complications were less frequently observed during Continuous Enteral Feeding. While 44.81% nurses strongly agreed that GI complications appeared to decrease with Continuous Enteral Feeding, 16.88% nurses were neutral, and 7.15% nurses strongly disagreed and disagreed, indicating variability in perception.

Figure 2 shows nurses' satisfaction and experience with Continuous Enteral Feeding Pumps, nurses reported high levels of confidence in pump functionality. The mean satisfaction score for the overall experience of using continuous feeding pumps was 4.47 ± 0.75, and the perceived accuracy of feed delivery scored even higher at 4.57 ± 0.61. A total of 93.51% nurses were satisfied with the Continuous Enteral Feeding Pumps' ability to deliver targeted feed volumes consistently, including 63.64% nurses most satisfied and 29.87% nurses very satisfied.

Despite positive perceptions, operational issues were noted: Error profile (false alarms, misconnection, and feed discoloration) were noted by 53.89% nurses rated their satisfaction as least satisfied, neutral, or satisfied; only 14.29% nurses were most satisfied, and 31.82% nurses were very satisfied with the error profile. Alarm-related performance received the lowest rating, 3.25 ± 1.20, indicating moderate dissatisfaction and possible alarm fatigue. Frequent false alarms were described as disruptive to workflow, requiring repeated troubleshooting and sometimes delaying patient care. The risk of misconnection or incorrect tubing placement added to nurses' concerns about safety and device handling in a high-acuity ICU environment. In addition, some nurses considered continuous enteral feeding pumps to be an extra

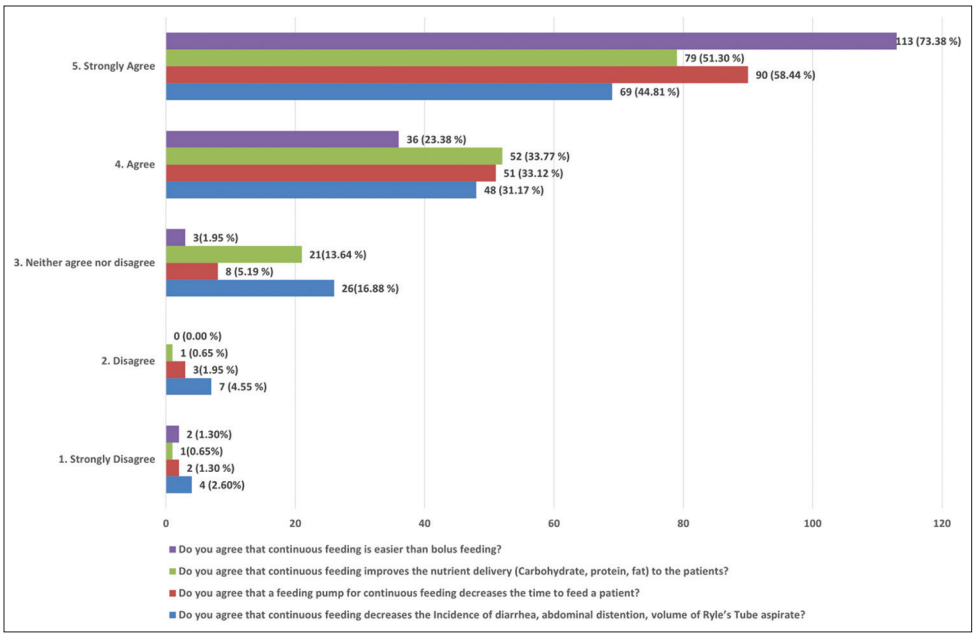

Figure 1: Intensive care unit nurses' agreement on the clinical benefits of continuous enteral feeding compared to bolus feeding

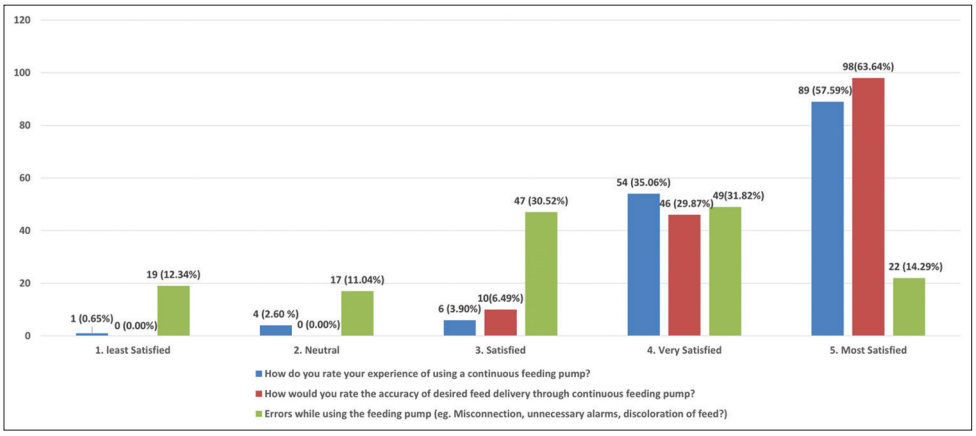

Figure 2: Nurses' satisfaction and experience with continuous feeding pumps for enteral feed delivery

workload, given the additional effort required to manage and monitor an electronic device at the patient's bedside.

Figure 3 presents nurses' recommendations for clinical integration of Continuous Enteral Feeding Pumps. Approximately two-thirds, 64.94% of nurses recommended their use for all critically ill patients, while 35.06% nurses favored selective use, particularly for those who do not tolerate bolus feeding. Notably, none of the nurses considered feeding pumps unnecessary in the ICU practice. These results indicate universal support for the integration of Continuous Enteral Feeding Pumps into ICU nutrition protocols.

Discussion

Continuous enteral feeding using automated pumps has become a standard practice in many high-income countries (HICs) due to its precision, consistency, and ability to enhance nutritional adequacy in critically ill patients.[16] However, in India and other LMICs, the use of such technology remains limited.[3,16] The present cross-sectional study provides novel insight into ICU nurses' satisfaction and perspectives regarding continuous enteral feeding pumps in a tertiary care trauma center, adding to the limited regional evidence base.[8] The findings revealed a strong preference for continuous enteral feeding pumps assisted feeding over traditional bolus methods, reflecting nurses' recognition of its efficiency, accuracy, and potential to enhance patient nutritional adequacy. Similar results have been reported internationally, where nurses associate continuous feeding with improved nutritional delivery, reduced manual workload, and enhanced workflow consistency.[4,8,17]

Given the heavy workload faced by nurses in Indian ICUs, this study sought to evaluate whether the use of continuous enteral feeding pumps could help alleviate this burden. Nurses cited improved nutrient delivery, reduced preparation and administration time, and streamlined workflows as key advantages of the electronic continuous enteral feeding pumps, findings consistent with previous literature.[18,19] These benefits also translate into less manual charting, fewer interruptions for feed administration, and reduced frequency of bedside interventions, collectively easing nursing workload. In high-acuity ICU settings, especially during staffing shortages or increased patient loads, this efficiency gain becomes critically important. Continuous enteral feeding pumps lessen nurses' workload, helping them prioritize other essential ICU duties more efficiently and thereby improve overall unit productivity and quality care.[20]

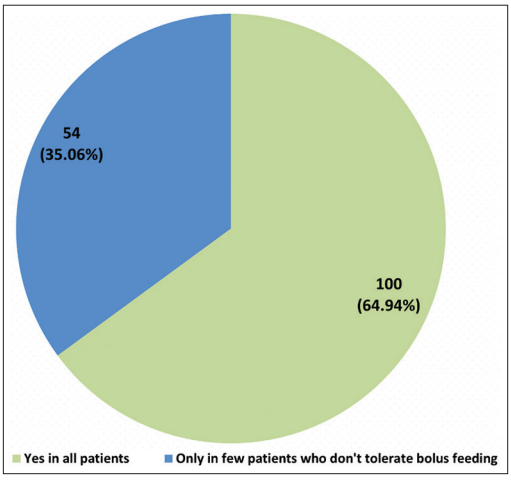

Figure 3: Presents nurses' recommendations for clinical integration of continuous enteral feeding pumps

Previous studies from HICs have similarly reported that nurses perceive continuous feeding as improving nutritional adequacy and job satisfaction, owing to its consistency and reduced need for repeated manual intervention.[9,14,18] However, comparable studies from LMICs are missing. Earlier research also highlights that automated and standardized feeding systems can minimize human error and help ensure patients receive nutrition tailored to their individual needs.[17,19] When nurses trust the equipment they are using, they are more likely to adhere to feeding protocols, ultimately increasing the likelihood of achieving nutritional targets and improving patient outcomes.[12-14]

Despite the overall positive perception, operational challenges were also identified. Commonly reported issues included false alarms, misconnection risks, and feed discoloration. Alarm fatigue emerged as a prominent concern, primarily due to frequent false or non-critical alerts.[19,20,21] Nurses reported that such alarms disrupted workflow, increased stress levels, and contributed to desensitization, potentially delaying responses to clinically significant events. These findings are supported by previous studies, which identify alarm mismanagement and desensitization as contributing factors to underfeeding and inefficiencies in ICU care delivery.[12-14] In response to excessive alarms, nurses often adopt informal coping strategies, such as muting non-urgent alerts or delegating alarm management tasks. While these adaptations may provide temporary relief, they carry inherent risks for both patient safety and care quality.[20,21]

Importantly, this study revealed a nuanced perspective on the use of a feeding pump to minimize nutrient deficit in critically ill patients. While 65% of nurses supported routine use for all critically ill patients, 35% advocated for selective implementation. Their decisions were influenced by factors, such as GI tolerance, hemodynamic instability, postoperative status, and short anticipated ICU stay. Feasibility in LMIC contexts, such as India is further shaped by equipment availability, cost, maintenance support, and staffing levels, underscoring the need for adaptable, resource-aware protocols.[3,7,22]

Limitations

This was a single-center study conducted in a tertiary care trauma center in India, representing the perspective of ICU nurses from a LMIC. While similar studies have been conducted in HICs, comparable data from LMICs are limited.[12,13] The findings may not be generalizable to other intensive care settings, particularly rural, private, or non-academic institutions.

Second, the use of a selective (non-random) sampling method may have introduced selection bias; for example, nurses who were more experienced or engaged may have been more likely to participate. All responses were self-reported, which raises the possibility of response bias, including social desirability effects or recall inaccuracies.

Further multi-center studies are recommended to validate these findings and enhance their generalizability.

Conclusions

This study demonstrates that ICU nurses perceive continuous enteral feeding via pump as both clinically beneficial and operationally efficient. High satisfaction scores, coupled with strong agreement on accurate nutrient delivery, time efficiency, and reduced GI complications, highlight the advantages of integrating feeding pumps into routine ICU practice.

At the same time, the study highlights operational challenges, such as alarm fatigue, misconnection risks, and pump maintenance issues. These findings point to the need for targeted staff training, regular technical support, and infrastructure planning tailored to the demands of critical care environments. Importantly, nurses expressed a thoughtful, patient-centered perspective, advocating for the selective use of feeding pumps based on clinical judgment and individual patient needs, rather than a uniform approach.

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Conflict of Interest

None declared.

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