Perceptions of Nursing Students and Faculty on Virtual Reality Simulation in Nursing Education: A Descriptive Exploratory Study in South India

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ABSTRACT

Background: The rapid advancement of educational technology has significantly influenced nursing education, with Virtual Reality (VR) simulation emerging as a promising pedagogical strategy. VR simulation provides immersive, interactive, and risk-free learning environments that allow nursing students to practice complex clinical skills without endangering patient safety. As healthcare systems become increasingly technology-driven, there is a growing need to explore how such innovations are perceived by both learners and educators to ensure effective integration into curricula.

Aim: To explore the perceptions of nursing students and faculty regarding the use of VR simulation in nursing education, focusing on perceived benefits, challenges, and suggestions for effective implementation.

Methods: A descriptive exploratory qualitative study was conducted at a selected nursing college in South India. Purposive sampling was used to recruit 100 nursing students (final-year and third-year B.Sc. Nursing) and 50 faculty members from academic and clinical settings. Data were collected using semi-structured interviews and analyzed through qualitative content analysis. Ethical approval and institutional permission were obtained prior to data collection.

Results: The majority of participants demonstrated high awareness of VR simulation (students: 74.5%; faculty: 90%). Both groups perceived VR as a valuable tool for enhancing clinical competence, decision-making, and confidence while reducing anxiety associated with real clinical exposure. However, participants emphasized that VR cannot replace real clinical practice. Major challenges identified included limited infrastructure, high cost, lack of technical support, and insufficient faculty training. Participants strongly recommended structured curricular integration and regular training workshops.

Conclusion: VR simulation holds strong potential as a supplementary teaching–learning strategy in nursing education. Strategic planning, institutional support, and continuous faculty development are essential for maximizing its benefits and ensuring sustainable integration into nursing curricula.

Keywords: Virtual reality, nursing education, simulation, perceptions, faculty development, clinical training

INTRODUCTION

Nursing education is undergoing a significant transformation due to rapid advancements in educational technology and increasing complexity in healthcare delivery (World Health Organization [WHO], 2023). Traditional pedagogical approaches, although foundational, often provide limited opportunities for repeated practice of complex clinical skills in a safe and controlled environment (Cant & Cooper, 2017). As patient safety and clinical competence have become central priorities in nursing education, simulation-based learning has emerged as an essential instructional strategy (INACSL Standards Committee, 2021).

Simulation in nursing education encompasses a wide range of modalities, including low-fidelity mannequins, high-fidelity simulators, standardized patients, and digital simulations. Among these, Virtual Reality (VR) simulation represents an advanced and immersive modality that allows learners to interact with realistic, computer-generated clinical environments (Radianti et al., 2020). VR simulation enables students to engage in experiential learning by performing procedures, making clinical decisions, and managing patient scenarios without the risk of causing harm to real patients (Cho & Kim, 2024).

The educational value of VR simulation is supported by experiential learning theory, which emphasizes learning through concrete experience, reflective observation, and active experimentation (Kolb, 1984). Constructivist learning theory further supports the use of VR by highlighting the role of learners in actively constructing knowledge through meaningful interactions with their learning environment (Dalgarno & Lee, 2010). Through immersive visualization and interactivity, VR facilitates deeper cognitive engagement, enhances knowledge retention, and supports the development of psychomotor and critical thinking skills (Makransky & Petersen, 2019).

Evidence from systematic reviews and meta-analyses suggests that VR simulation is effective in improving nursing students' clinical competence, self-confidence, and decision-making abilities (Cho & Kim, 2024; BMC Medical Education, 2023). Additionally, VR-based training has been associated with reduced anxiety and stress during initial clinical exposure, thereby enhancing students' readiness for real-world practice (Foronda et al., 2020).

Despite these advantages, the successful implementation of VR simulation depends on multiple contextual factors, including faculty readiness, institutional infrastructure, curriculum alignment, and stakeholder acceptance (Radianti et al., 2020). In low- and middle-income countries such as India, challenges related to cost, technological access, and faculty training may further influence adoption. Empirical evidence exploring the perceptions of nursing students and faculty toward VR simulation in the Indian context remains limited, particularly in South India.

Understanding stakeholder perceptions is critical for guiding evidence-based educational planning, optimizing resource utilization, and ensuring sustainable integration of VR simulation into nursing curricula. Therefore, this study aimed to explore the perceptions of nursing students and faculty regarding VR simulation in nursing

education, with specific emphasis on perceived benefits, challenges, and recommendations for effective implementation.

The quality of nursing education plays a crucial role in shaping competent and confident nursing professionals capable of meeting the complex demands of modern healthcare systems. Traditional nursing education relies heavily on classroom instruction and clinical postings to impart knowledge and skills. While these approaches remain fundamental, they often present limitations in terms of patient availability, variability of clinical exposure, safety concerns, and increasing student enrollment. These challenges have necessitated the adoption of innovative teaching–learning strategies that enhance experiential learning while maintaining patient safety.

Simulation-based education has gained global recognition as an effective method to bridge the gap between theory and practice in nursing education. Among various simulation modalities, Virtual Reality (VR) simulation represents a significant technological advancement. VR simulation utilizes computer-generated, three-dimensional environments that immerse learners in realistic clinical scenarios. Through head-mounted displays and interactive interfaces, learners can engage actively with virtual patients, perform procedures, and make clinical decisions in real time.

The theoretical foundation of VR-based learning aligns with experiential learning theory and constructivist learning principles, which emphasize learning through active participation, reflection, and contextual experience. VR simulation allows repeated practice, immediate feedback, and standardized exposure to complex and high-risk clinical situations that may be infrequently encountered during traditional clinical postings. Evidence from international studies suggests that VR simulation can enhance clinical competence, psychomotor skills, critical thinking, and learner engagement among nursing students (Cho & Kim, 2024).

Despite these promising benefits, the successful integration of VR simulation into nursing education depends largely on the acceptance and perceptions of key stakeholders, particularly students and faculty members. Faculty readiness, technological competence, institutional infrastructure, and curriculum alignment play a critical role in determining the sustainability of VR implementation. In the Indian context, especially in South India, the use of VR simulation in nursing education is still emerging, and empirical evidence exploring stakeholder perceptions remains limited.

Understanding the perceptions of nursing students and faculty is essential for identifying facilitators and barriers to VR adoption and for informing evidence-based educational planning. Therefore, the present study was undertaken to explore the perceptions of nursing students and faculty regarding VR simulation in nursing education, focusing on perceived benefits, challenges, and recommendations for effective implementation.

Methods

Research Design

A descriptive exploratory qualitative research design was employed to gain an in-depth understanding of the perceptions and experiences of nursing students and faculty regarding VR simulation in nursing education.

Setting

The study was conducted at a selected nursing college in South India that offers undergraduate nursing programs and is exploring the integration of advanced simulation technologies into its educational framework.

Participants and Sampling

Purposive sampling technique was used to select participants who were information-rich and relevant to the study objectives. The sample consisted of:

- 100 undergraduate nursing students (third-year and final-year B.Sc. Nursing)
- 50 nursing faculty members from academic and clinical backgrounds

Inclusion criteria for students included enrollment in the B.Sc. Nursing program and willingness to participate. Faculty members with teaching or clinical supervisory roles were included.

Data Collection Tool and Procedure

Data were collected using semi-structured interview guides developed by the investigators based on an extensive review of literature. The interview guide included open-ended questions related to awareness, perceived benefits, challenges, and recommendations regarding VR simulation. Interviews were conducted in a comfortable environment, and confidentiality was assured.

Ethical Considerations

Institutional ethical committee approval was obtained prior to the study. Written informed consent was secured from all participants. Participants were assured of anonymity, confidentiality, and their right to withdraw from the study at any time.

Data Analysis

The collected qualitative data were analyzed using content analysis. Responses were transcribed verbatim, coded, categorized, and organized into themes and subthemes reflecting participants' perceptions of VR simulation.

Results

Awareness and Exposure to Virtual Reality Simulation

Among the participants, a high level of awareness regarding Virtual Reality (VR) simulation in nursing education was observed. Approximately 74.5% (n = 75) of nursing students reported being aware of VR simulation, while awareness was considerably higher among faculty members, with 90% (n = 45) indicating familiarity with VR-based educational technologies. Faculty members reported greater exposure to VR through academic conferences, workshops, and professional discussions, whereas students primarily gained awareness through digital media, peer interactions, and limited institutional demonstrations.

Perceived Benefits of VR Simulation

A majority of both students and faculty expressed positive perceptions regarding the educational value of VR simulation. More than two-thirds of students reported that VR simulation enhanced their understanding of complex clinical procedures, improved decision-making abilities, and increased confidence prior to real clinical exposure. Similarly, a substantial proportion of faculty members perceived VR as an effective tool for improving clinical reasoning, psychomotor skill development, and learner engagement.

Both groups highlighted that VR simulation allows repeated practice in a risk-free environment, which was perceived as particularly beneficial for learning invasive and high-risk procedures. Additionally, a notable proportion of students reported reduced fear and anxiety related to initial clinical postings after exposure to simulated environments, suggesting improved psychological preparedness for patient care.

Perceived Challenges and Limitations

Despite favorable perceptions, participants identified several significant barriers to the effective use of VR simulation. The majority of faculty members and students cited the high cost of VR equipment and software as a major limitation. Limited infrastructure, inadequate technical support, and insufficient hands-on exposure were also frequently reported concerns.

Furthermore, a considerable proportion of faculty members emphasized the lack of formal training and technical expertise required to effectively integrate VR into teaching practices. Time constraints within the existing curriculum were identified as another challenge, particularly by faculty, who expressed concerns regarding balancing VR-based activities with traditional teaching and clinical requirements.

Importantly, nearly all participants strongly agreed that VR simulation cannot replace real clinical practice, but should function as a supplementary instructional strategy to enhance learning outcomes.

Suggestions for Effective Implementation

Participants provided clear recommendations for optimizing the use of VR simulation in nursing education. The majority of students expressed a strong preference for structured integration of VR modules into the nursing curriculum, supported by adequate training and supervision. Faculty members similarly emphasized the need for curricular inclusion, regular faculty development programs, and institutional investment in infrastructure.

Both groups recommended the use of VR simulation specifically for teaching invasive procedures, emergency scenarios, and rare clinical conditions, where real-life exposure is often limited. Regular workshops and hands-on training sessions were suggested to ensure effective and sustainable implementation.

Discussion

The findings of the present study reveal predominantly positive perceptions of VR simulation among nursing students and faculty, consistent with existing literature. High levels of awareness and acceptance suggest readiness for technological integration in nursing education. The perceived benefits of enhanced learning, confidence, and reduced anxiety align with findings from systematic reviews indicating the effectiveness of VR in improving nursing competency (Cho & Kim, 2024).

However, concerns regarding cost, infrastructure, and faculty preparedness highlight significant barriers to implementation, particularly in resource-constrained settings. Similar challenges have been reported in previous studies conducted in developing countries, emphasizing the need for strategic planning and policy support.

Importantly, participants' consensus that VR should supplement rather than replace clinical practice underscores the irreplaceable value of real patient interactions in nursing education. Blended approaches that combine VR simulation with traditional clinical training may offer the most effective model.

Implications for Nursing Education and Practice

The study findings have important implications for nursing education administrators, educators, and policymakers. Investment in VR infrastructure, faculty development, and curriculum redesign is essential to harness the full potential of VR simulation. Incorporating VR into nursing education can contribute to producing competent, confident, and technologically proficient nursing professionals, ultimately improving patient care quality and safety.

Limitations

The study was conducted in a single institution, which may limit the generalizability of findings. The use of qualitative methods may also be subject to researcher bias. Future studies with multi-center designs and mixed-method approaches are recommended.

Conclusion

The present study demonstrates that Virtual Reality (VR) simulation is widely perceived by both nursing students and faculty as an effective and innovative pedagogical approach in nursing education. Participants acknowledged the significant role of VR in enhancing clinical understanding, decision-making ability, confidence, and preparedness for real-world clinical practice, while also reducing anxiety associated with initial patient exposure. Importantly, the findings reaffirm that VR simulation is best utilized as a complementary strategy rather than a replacement for traditional clinical training.

Despite its educational advantages, the study highlights key challenges that may hinder widespread implementation, including high financial costs, limited infrastructure, inadequate technical support, and the need for comprehensive faculty training. Addressing these barriers through institutional investment, structured curricular integration, and continuous professional development is essential for the sustainable adoption of VR-based learning.

Overall, VR simulation represents a promising adjunct to conventional nursing education that can strengthen clinical competence and promote patient safety when strategically implemented. Future research involving multi-institutional and mixed-method designs is recommended to further evaluate long-term learning outcomes and inform evidence-based policy decisions for integrating advanced simulation technologies into nursing curricula.

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