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Advancing Sustainable Development Goals Through Nursing: Innovations, Impact, and the Road Ahead

Jaita Mondal

Principal cum Dean, Sri Sri College of Nursing, Sri Sri University, Odisha, India

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Abstract

Nursing is increasingly recognized as a transformative force in advancing the Sustainable Development Goals (SDGs). This article analyzes nursing's direct and indirect contributions to the SDGs highlighting the multidimensional role of nurses in health promotion, education, gender equity, environmental stewardship, economic growth, and social justice. Nurses play a pivotal role in achieving SDG 3 through preventive care, chronic disease management, emergency response, and mental health promotion, while also significantly contributing to SDGs related to education, clean water and sanitation, decent work, reduced inequalities, climate action, and strong institutions. Bibliometric evidence underscores that nursing research is heavily concentrated on health-related goals, with notable gaps in areas such as poverty reduction and zero hunger. The article further explores nursing leadership in innovation, sustainability, ethical governance, and partnerships, emphasizing the need for stronger research integration, policy engagement, and interdisciplinary collaboration. Strengthening nursing education, leadership, and research capacity is essential to maximize its impact on the 2030 Agenda. The analysis concludes that nursing is not merely a supporting discipline in global development but a central catalyst for achieving a healthier, more equitable, and sustainable future from very ancient period.

Keywords: Nursing, Sustainable Development Goals, Health Equity, Climate Action, Global Health

Introduction

Sustainable Development provides a comprehensive framework for addressing global challenges related to health, equity, education, environment, and economic growth. Among all health professions, nursing occupies a unique and strategic position due to its workforce size, community proximity, and holistic philosophy of care. Nurses function as the connection of individuals, families, communities, and health systems, making them indispensable to the realization of multiple SDGs. This article critically analyzes nursing's contribution from the era of Florence Nightingale to the SDGs focusing on both direct and indirect impacts across social, economic, and environmental dimensions. The article also analyses the impact of nursing on the SDGs in India and Other Low- and Middle-income countries (LMICs) of the Global South.

Nursing and Direct Contributions to the SDGs

SDG 3: Good Health and Well-being

Nursing's most visible and documented contribution lies in SDG 3. Nurses serve as frontline providers of preventive care through immunization programs, early disease detection, health education initiatives and direct care to patients. In chronic

Corresponding author : Jaita Mondal ,Principal cum Dean, Sri Sri College of Nursing, Sri Sri University, Odisha, India

Email: jaitamondal.g@srisriuniversity.edu.in

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disease management, nurses ensure continuity of care, adherence to treatment, and patient self-management, thereby reducing complications and hospitalizations. Their role in emergency and disaster response has been critical during pandemics, natural disasters, and humanitarian crises. Mental health promotion through community-based interventions further strengthens population resilience. Bibliometric evidence indicates that SDG 3 is the most frequently represented goal in nursing research, reflecting the profession's centrality to universal health coverage and health equity.[1,2,4,6]

SDG 4: Quality Education

Nursing contributes to quality education through competency-based training, lifelong learning, ethical leadership development, and the integration of technology such as simulation-based education. In India alone, over two million nurses and midwives contribute to formal and informal education, including school health programs, nutrition education, maternal and child health counseling, and adolescent health initiatives. By educating patients and communities, nurses extend the reach of health literacy beyond institutional settings, reinforcing SDG 4 at the grassroots level.[1,3]

SDG 5: Gender Equality

Globally, approximately 90% of the nursing workforce comprises women, positioning nursing as a powerful driver of gender equality. Nurses increasingly occupy leadership roles as managers, educators, researchers, and policy advisors, challenging traditional gender hierarchies in healthcare governance. Advocacy for income parity, safe work environments, and professional recognition aligns nursing practice with SDG 5 by promoting women's empowerment, decision-making authority, and workplace dignity.[1,12]

SDG 6: Clean Water and Sanitation

Nurses play a vital role in promoting water, sanitation, and hygiene (WASH) practices through infection prevention, maternal and child health services, and community education. They are primary implementers of hand hygiene, safe water use, sterilization, and biomedical waste management. Evidence from healthcare and community settings demonstrates that nursing-led WASH interventions significantly reduce water-borne diseases and improve public health outcomes. It reminds us about the Environmental Thery derived by Florence Nightingale in 1860.[5,11]

SDG 8: Decent Work and Economic Growth

The nursing sector generates substantial employment opportunities and supports workforce mobility across regions. Continuous skill development enhances professional competency and productivity while advocating for ethical and humane working conditions. By maintaining population health and huge employment nurses support national economic growth and workforce stability.[1]

SDG 9: Industry, Innovation, and Infrastructure

Nursing-led and nursing-supported innovations such as telemedicine, digital health tools, simulation-based learning, and community health technologies strengthen healthcare infrastructure and expand access to underserved populations. Interdisciplinary collaboration and research partnerships further position nursing as a contributor to resilient and inclusive health systems.[3,6]

SDG 10: Reduced Inequalities and SDG 11: Sustainable Cities

Nurse-led initiatives prioritize vulnerable and marginalized populations, addressing disparities in access, quality, and health outcomes. Community outreach programs in both urban and rural settings reinforce inclusive and robust health infrastructure, contributing to sustainable cities and communities.[12]

SDG 12: Responsible Consumption and Production

Healthcare generates significant biomedical waste, posing environmental risks. Nurses lead safe biomedical waste management practices, including

segregation, handling, and disposal. Through staff and community training, nurses minimize environmental pollution while maintaining safety standards, demonstrating responsible resource use.[11,15]

SDG 13: Climate Action

Nurses increasingly address climate-related health risks by promoting waste reduction, lowering healthcare carbon footprints, and implementing climate-resilient care strategies. Community education on heatstroke prevention, vector-borne disease control, and disaster preparedness highlights nursing's proactive role in climate adaptation and mitigation.[9,10]

SDG 7, 14, and 15: Energy and Ecosystem Protection

Nursing contributions extend to promoting clean energy use, energy-efficient hospital practices, and community awareness of clean household fuels. Nurses also advocate against improper waste disposal into water bodies, protecting aquatic ecosystems, and ensure safe disposal of hazardous materials to prevent soil contamination and protect biodiversity.[8,15,16]

Indirect Contributions and Research Gaps

SDG 1: No Poverty and SDG 2: Zero Hunger

Nursing indirectly contributes to poverty reduction by preventing disease-related financial burden through health education and early intervention. However, bibliometric studies reveal a striking gap in nursing research addressing SDG 1 and SDG 2, despite nurses' involvement in nutrition counselling, growth monitoring, and maternal health services. This gap is particularly evident in the Indian context, highlighting the urgent need for empirical studies linking nursing practice and policy to poverty alleviation and food security.[4,6,7,12]

SDG 16: Peace, Justice, and Strong Institutions

Ethical nursing practice, patient rights advocacy, transparent documentation, and trust-building are foundational to strong healthcare institutions. Nurses uphold justice, accountability, and human rights in daily practice, reinforcing public confidence in health systems.[13,14]

SDG 17: Partnerships for the Goals

Nursing thrives on collaboration with healthcare institutions, government bodies, global agencies, NGOs, and communities. Such partnerships enable integrated care delivery, policy implementation, and sustainable development initiatives at local, national, and global levels.[1,13,14]

Nursing and Its Impact on the SDGs in India and Other Low- and Middle-income countries (LMICs) of the Global South

In India and other LMICs of the Global South, nurses form the backbone of the health system and are central to achieve SDG 3. As discussed above they are working at the frontline of primary healthcare, nurses deliver maternal and child health services, disease prevention, and management of communicable and noncommunicable diseases. Their role in health promotion, early detection, and continuity of care directly supports universal health coverage.[17]

Beyond direct healthcare delivery, nursing contributes to several interlinked SDGs by addressing social determinants of health. In India, nurses lead community education on nutrition, adolescent health, sanitation, and hygiene, advancing SDG 2, SDG 4, SDG 5, and SDG 6. As trusted professionals within communities, nurses empower women, support vulnerable populations, and reduce health inequities, particularly among marginalized and tribal groups. These efforts highlight nursing as a key driver of comprehensive and equitable development in LMIC contexts.[1]

Nursing also influences broader development goals such as SDG, SDG 10, SDG 13, and SDG 17. A strong nursing workforce improves population health, reduces healthcare costs, and enhances economic productivity. In climate-vulnerable areas, nurses are essential in disaster preparedness and emergency response. Strengthening nursing education, leadership, and policy involvement is therefore a cost-effective and sustainable strategy accelerating SDG progress across the Global South.[18]

The Road Ahead

To maximize nursing's contribution to the 2030 Agenda, there is a need to scale evidence-based practices, strengthen interdisciplinary partnerships, advance leadership models, and invest in research and innovation. Empowering nurses in policy and decision-making roles will ensure that their frontline insights shape sustainable health strategies. Strengthening nursing education and research capacity, particularly in underrepresented SDGs, is essential for achieving a fairer and healthier future.[1,3,6]

Conclusion

Nursing is not merely a component of global development but a catalyst for transformative change across the SDGs from 18th century. Its holistic, people-centered approach positions nurses as key agents in advancing health equity, sustainability, and social justice. Strengthening the nursing profession is therefore indispensable to achieving the goals of the 2030 Agenda.

Ethical Clearance- as it is review article hence not required.

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Bridging the Care Gap: A Nursing Perspective on Integrating Voice-Enabled Virtual Nurse Assistant to Enhance Patient Self-Efficacy and Mitigate Workforce Strain

[1]Komakula NKS Santhoshi, [2]Avanthi Devi P, [3]Veena V G, [4]Vikas M Miskin

[1-4]Nursing Tutor / Clinical Instructor, College of Nursing, All India Institute of Medical Sciences (AIIMS), Mangalagiri, Andhra Pradesh, India

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Abstract

Rapid digital transformation across industries has accelerated the adoption of advanced technologies to reduce manual workload, enhance efficiency, and optimize operational costs. Healthcare is undergoing a similar transformation, with artificial intelligence (AI) emerging as a key enabler of innovative care delivery modelsa. Among these, Voice-Enabled Virtual Nursing Assistants (VNAs) represent a promising solution to address increasing care demands, workforce shortages, and rising healthcare costs.

Virtual Nursing Assistants offer 24/7 availability, enabling continuous patient engagement beyond the limitations of human staffing. They assist patients by responding to health-related queries, providing medication reminders, monitoring symptoms, supporting chronic disease management, and offering emotional and mental health support. Evidence suggests that VNAs improve accuracy, timeliness, and accessibility of care compared to traditional methods.

From a healthcare provider perspective, VNAs streamline documentation, support preliminary assessment and triage, enhance real-time monitoring, and optimize workflow efficiency. In critical care settings, the integration of virtual nursing roles has been identified as a viable approach to mitigating projected nursing workforce gaps while maintaining care quality. Additionally, VNAs demonstrate potential in education and staff development through virtual teaching platforms and cognitive learning enhancement.Future advancements are expected to expand VNA capabilities through wearable integration, electronic health record synchronization, advanced personalization, and diagnostic support. Despite challenges related to data security, ethics, cost, usability, and regulatory frameworks, Virtual Nursing Assistants represent a transformative digital health innovation with significant potential to improve patient outcomes, empowers especially elderly patients and reducesnurse's workload, and strengthen healthcare systems.

Keywords: Virtual Nursing Assistant, Artificial Intelligence in Healthcare, Digital Health Transformation, Voice-Enabled Technology, Patient-Centered Care, Nursing Workforce, Healthcare Automation, Geriatric Care.

Corresponding Author: Komakula NKS Santhoshi, Nursing Tutor / Clinical Instructor, College of Nursing, All India Institute of Medical Sciences (AIIMS), Mangalagiri, Andhra Pradesh, India

E-mail: santhuswarupa@gmail.com

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Introduction

Almost every industry sector is undergoing digital transformation. To reduce manual workload and slash operational costs, organizations rely on new-age technologies. Most organizations are moving towards hyper-automation, where the human touch is minimal. One industry sector undergoing significant digital transformation is healthcare. AI tools for digital transformation in healthcare are no longer a far-fetched idea. eHealth and mHealth lifestyle tools such as AI-powered chatbots have emerged, promising affordable, scalable interventions to empower patients and to reduce workload over health care providers.[1]The use of artificial intelligence in healthcare has immense potential. Healthcare providers are constantly striving to improve patient care and streamline their operations. A virtual nursing assistant is not a human; it is a device or robotic system designed to assist individuals with healthcare-related needs[2]. Voice-Enabled Virtual nursing assistants can bring a paradigm shift to patient care and at the same time Virtual Nursing Assistant improve overall operational efficiency and reduce costs for both healthcare facilities and patients.Implementing a virtual nursing role in the intensive care unit offers a viable approach to addressing projected gaps in nursing workforce capacity and quality.[3]

Need for Virtual Nurse Assistance

A healthcare provider cannot be available for a single patient around the clock, but a Voice-Enabled virtual nursing assistant can provide 24/7 support to every patient. For instance, an AI-enabled interface or virtual nurse assistant can manage multiple patient profiles simultaneously, ensuring continuous attention and care for each patient. This constant availability enhances patient monitoring, addresses queries promptly, and ensures timely medication reminders, significantly improving overall patient care and allowing human nurses to focus on more complex tasks. Patients can ask their health-related queries, and the assistant provides appropriate answers. Experimental results show that compared to traditional methods, the proposed method is more accurate and faster, allowing patients to get service anywhere and anytime.[4] A scoping review indicated that AI technologies perform multiple roles in the care of older adults and have a promising impact on elderly healthcare. These technologies show considerable potential in addressing the unmet care needs of older adults and enhancing the quality of geriatric care.[5]

Review of Literature

Some of the projects were carried out to create a voice-based smart Virtual Nursing Assistant that makes use of cutting-edge machine learning, speech recognition, and other technologies[6] Towards building a Virtual Nursing Assistant health coach an automated coaching systems have been developed with the aim of improving health coaching accessibility for millions of people who could benefit from them.[7] Chatbot software is also in trail, that can chat with people using artificial intelligence. This software is used to execute tasks such as rapidly responding to users, informing them, helping to purchase products and providing better service to customers.[8] A recent pilot project demonstrates the feasibility of deploying a consumer-grade voice assistant device in COVID-19 patient rooms, with the Echo Show device proving to be engaging and effective.[9]Among the three domains of learning outcomes—skills-based, cognitive, and affective—virtual teaching are particularly effective in enhancing cognitive outcomes, including the acquisition of theoretical knowledge.

Methodology

When an individual interacts with a Virtual Nurse Assistant (VNA) for healthcare-related information or concerns, the system captures the user's input through voice-enabled interfaces. The spoken input is processed using automatic speech recognition (ASR) technology to convert speech into text. This text is then analysed, interpreted, and semantically processed using natural language processing (NLP) techniques. The interpreted query is verified against structured and unstructured data available in the system database, including clinical

guidelines, patient records, and health knowledge repositories. Based on this analysis, machine learning algorithms generate an appropriate and context-specific response[8]. The system adapts responses by learning from user interactions, feedback, and historical data to improve accuracy over time. The validated response is then converted back into speech using text-to-speech (TTS) synthesis and delivered to the patient as a voice output. This end-to-end process enables real-time, interactive, and personalized healthcare communication, allowing patients to receive timely guidance, education, and support without direct human intervention while maintaining continuity of care.[1]

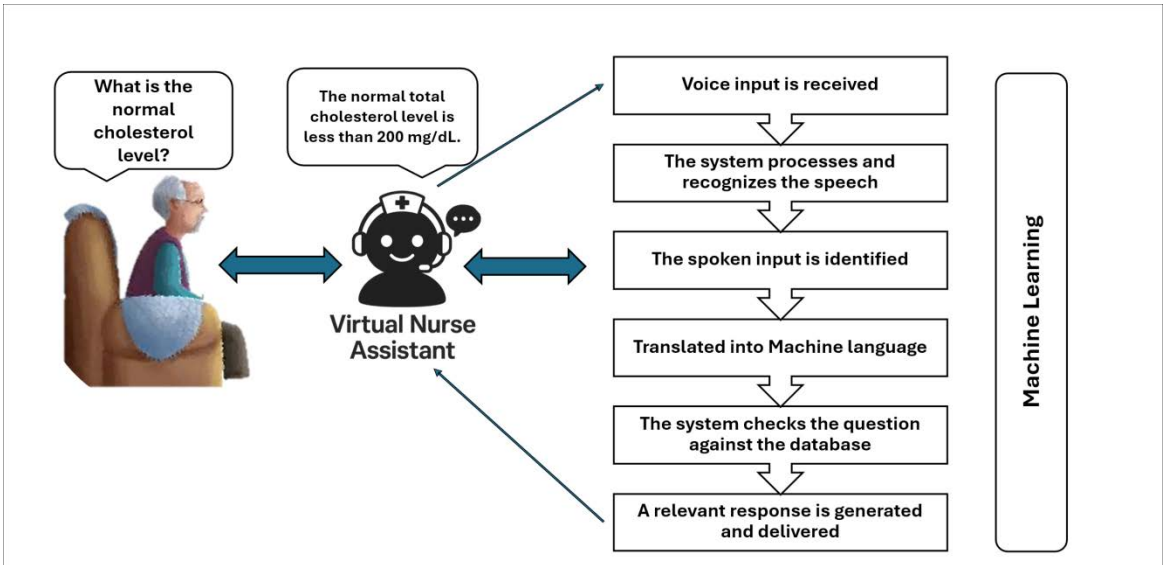


Figure 1: Communication through virtual nurse assistant (created by the author)

Benefits of Virtual Nurse assistant

The Virtual Nurse Assistant provides a wide range of benefits to both individuals and healthcare providers, from delivering personalized care to enhancing the efficiency of healthcare services.

Benefits to Individuals / Patients:

AI-powered Virtual Nursing Assistant offers personalized experiences to individuals. It helps them to identify their illness based on the symptoms, monitor their health status, schedule doctor appointments, and do more[4]. Here are some of the most valuable ways virtual nurse assistants provide support:

- **Health Guidance**
  - Analyse patient-reported symptoms to suggest possible causes and provide initial advice.
  - Recommend appropriate next steps, such as home care or medical consultation.
  - Suggest the relevant medical specialty based on symptoms.
  - Provide tailored health information on conditions like hypertension or diabetes, including side effects and when to seek medical attention.
- **Doctor Appointment and Support**
  - Simplify scheduling for doctor visits, tests, or follow-ups, including teleconsultations.
  - Send appointment reminders.
  - Answer queries regarding OPD timings, doctor availability, or specialist consultations.
- **Lab and Diagnostic Support**
  - Schedule lab tests and send timely reminders.

- Offer preparation instructions for investigations (e.g., fasting for cholesterol test).
- Explain lab results and normal value ranges to improve patient understanding.

- **Medication Management**
  - Send alerts or alarms to remind patients to take medications as prescribed.
  - Notify patients about medication refills or purchases.
  - Provide drug administration instructions (e.g., when and how to take tablets).
- **Dietary Counselling**
  - Offer personalized dietary recommendations based on health conditions.
  - Advise on foods to include or avoid for better health outcomes.
- **Chronic Condition Monitoring**
  - Regularly track vitals, symptoms, and lifestyle data in chronic conditions like diabetes or hypertension.
  - Share progress updates with healthcare providers.
  - Provide recovery tips and post-treatment monitoring for early detection of complications.
- **Emotional and Mental Health Support**
  - Detect stress, anxiety, or depression through verbal cues.
  - Provide emotional support, especially to elderly or isolated individuals.
  - Offer coping strategies and connect users with mental health professionals if necessary.
- **Insurance Reminders**
  - Inform patients about available insurance plans.
  - Send timely reminders for premium payments and policy renewals.
- **Emergency Support**
  - Respond to emergencies (e.g., chest pain or choking) by guiding immediate steps and calling ambulance services.
  - Provide instructions such as CPR guidance or first-aid tips until help arrives.

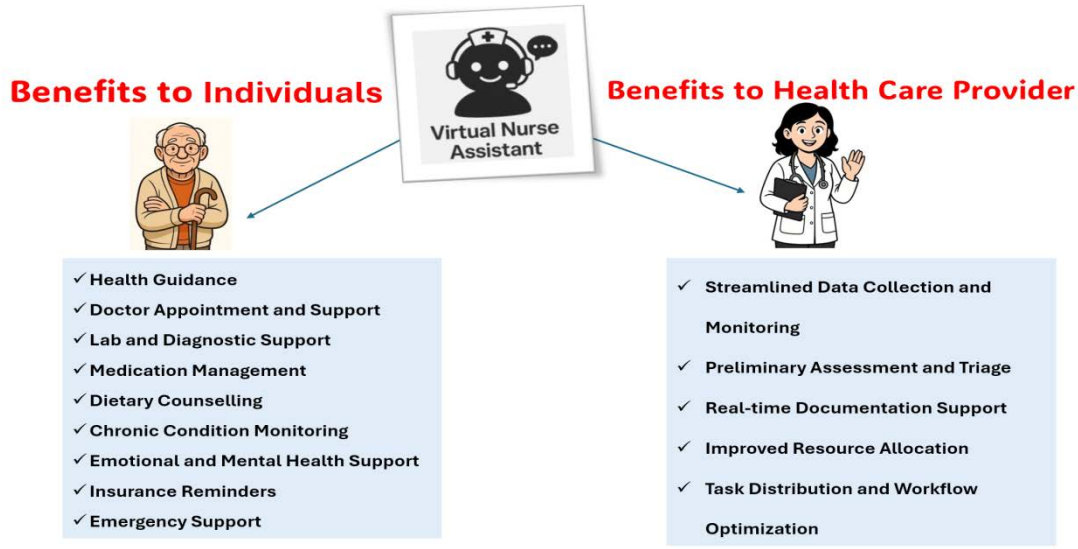


Figure 2: Benefits of Virtual Nurse assistant to Individuals and Health care Providers (created by the author)

Benefits to Healthcare Providers:

Virtual Nursing Assistants (VNAs) will support healthcare delivery by improving patient care and optimizing clinical workflows. One of the study stated that The Virtual Nursing Grand Rounds is a real-time, synchronous, computer-assisted interactive platform that supports continuous evidence-based staff development and provides expert consultative services to nursing professionals[10].Advanced technology enables the virtual nurse to oversee and coordinate patient care by engaging with patients through six core roles: patient education; staff mentoring and education; real-time quality and patient safety surveillance; participation in physician rounding; admission processes;[11]

- **Streamlined Data Collection and Monitoring**
  - VNAs efficiently gather and organize patient information, simplifying documentation and clinical consultations.
  - They enable continuous tracking of patient health metrics, trends, and improvements, providing timely alerts and insights to support informed clinical decisions.
  - Regular updates on patient progress help healthcare providers make better treatment adjustments.
- **Preliminary Assessment and Triage**
  - VNAs collect basic health histories and perform initial assessments, supporting faster diagnosis and effective treatment planning.
  - They help prioritize care by identifying urgent cases based on reported symptoms, ensuring prompt medical attention.
- **Real-time Documentation Support**
  - VNAs assist in transcribing notes during or after patient visits, allowing healthcare providers to focus more on patient interaction and care quality.
- **Improved Resource Allocation**
  - VNAs analyse collected data to predict patient needs and suggest optimal resource distribution across departments.
  - This supports better planning and preparedness, especially during peak service demand.
- **Task Distribution and Workflow Optimization**
  - VNAs help maintain an equitable distribution of tasks between nursing staff and digital assistants.
  - By handling routine and preliminary duties, they allow nurses and doctors to concentrate on complex, high-priority clinical care.

Case Studies of Voice-Enabled Virtual Nurse Assistants

Several studies have highlighted the effectiveness of Virtual Nursing Assistants in improving patient care and reducing nurses' workload. AI-driven voice agents used for monitoring daily vitals and providing medication reminders among elderly patients enhanced self-care behaviors and minimized routine nursing telephone triage[12]. At the Mayo Clinic, voice-activated systems supported patients recovering from orthopedic surgery by improving self-efficacy and reducing non-clinical inquiries to nursing staff[13]. Similarly, Cedars-Sinai Medical Centre demonstrated that in-room voice assistants handling non-medical requests saved nurses considerable time per shift[14]. Proof-of-concept studies on conversational AI for nutritional and psychological counselling in diabetic patients showed improved self-management and reduced administrative burden[15]. Additionally, voice-enabled health screening systems in low-connectivity areas enabled a single nurse to monitor larger patient populations by intervening only when critical alerts were generated[16]. Collectively, these findings emphasize the role of VNAs in enhancing efficiency, patient empowerment, and workforce optimization.

Future Prospects of Virtual Healthcare Assistants

The capabilities of VHAs are expected to expand significantly in the coming years. By 2030 advancements in AI and data analytics will enable VHAs to undertake more complex tasks, such as:

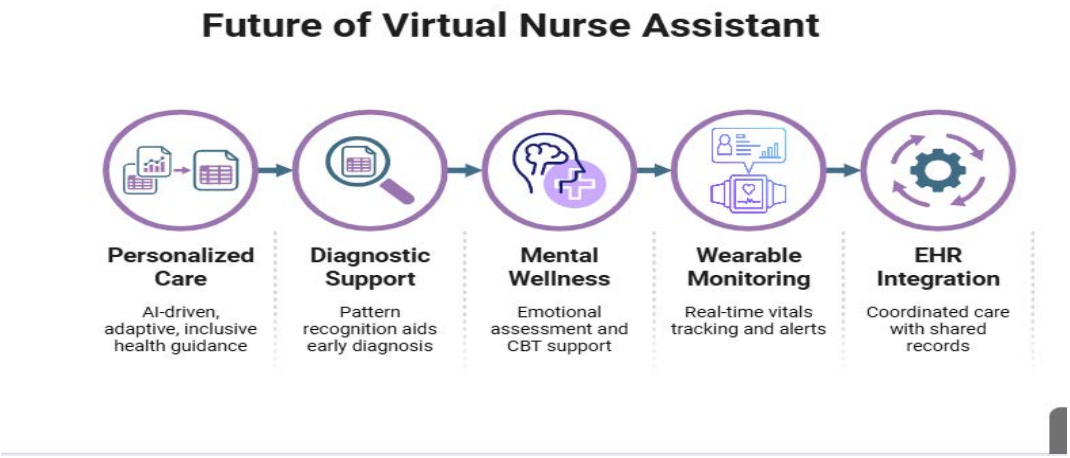


Figure 3: Future of Virtual Nurse assistant to Individuals and Health care Providers (created by the author)

- **Enhanced Personalization through AI and Patient Data**

  Virtual Nursing Assistants use artificial intelligence to deliver personalized care by analysing patients' medical history, lifestyle patterns, and ongoing feedback. They adapt health advice while considering cultural and socioeconomic factors, promoting inclusive and patient-centered healthcare1.

- **Smart Support for Diagnosis Using Symptom Patterns**

  By recognizing patterns in symptoms and health data, VNAs assist in early disease detection and recommend appropriate diagnostic tests or referrals, thereby accelerating clinical decision-making and care delivery7.

- **Virtual Mental Health Aid for Emotional Well-being**

  VNAs support emotional well-being by assessing stress and mood, offering cognitive behavioural therapy (CBT)-based modules, providing empathetic responses, and facilitating referrals to mental health professionals when required6.

- **Wearable Device Integration for Real-Time Monitoring**

  Integration with wearable devices enables VNAs to continuously track vital signs, detect physiological abnormalities, and deliver timely health guidance based on real-time patient data.

- **EHR Integration for Seamless Care**

  Synchronization with electronic health records (EHRs) allows VNAs to support coordinated and continuous care, enhance communication among healthcare providers, and reduce duplication of investigations[16].

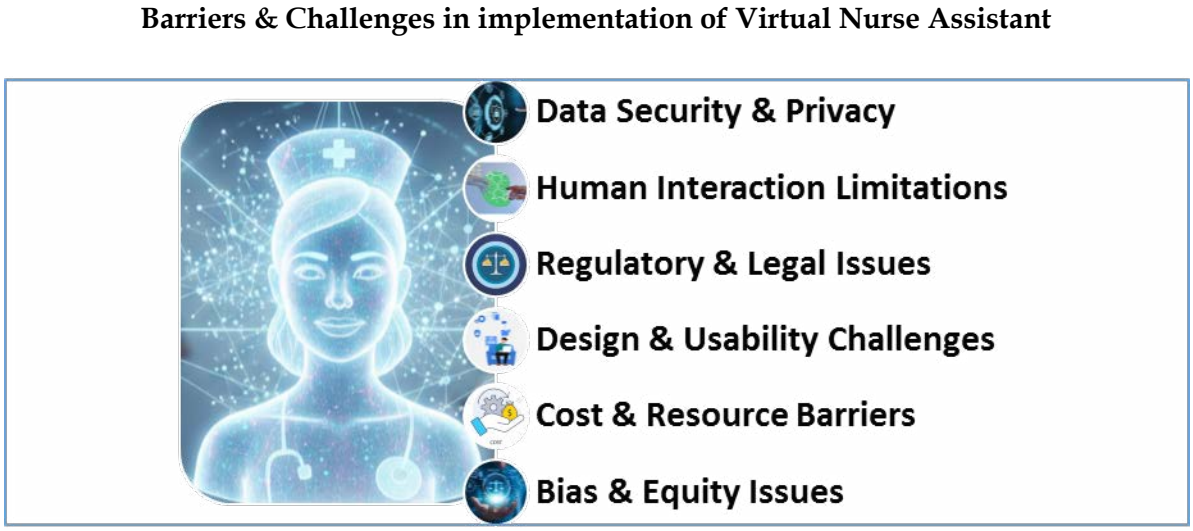


Figure 4: Barriers and Challenges of Virtual Nurse assistant (created by the author)

Protecting patient information is essential to prevent security breaches and maintain public trust, making strong yet user-friendly cybersecurity systems a necessity[17]. Virtual Nursing Assistants (VNAs) also face limitations in understanding human emotions and handling complex conversations, which can affect the quality of care[18]. In the absence of clear regulatory guidelines, the safe and legal use of VNAs remains uncertain. Poorly designed or difficult-to-use systems may discourage adoption and reduce user satisfaction. Although VNAs can be cost-effective in the long term, the high initial expenses for implementation and staff training act as a major barrier for many institutions. Gaining public confidence further requires VNAs to adhere to ethical principles such as transparency and accountability[19]. Additionally, if training data is biased or lacks adequate representation, VNAs may contribute to unequal and unjust healthcare outcomes.

The Application of Virtual Nursing Assistants in India

India currently supports a population of approximately 1.47 billion, with a life expectancy at birth of 67.3 years according to the World Health Organization (WHO)[20]. This massive demographic scale presents significant challenges for health service delivery. Although there are approximately 3.3 to 3.6 million registered nursing personnel in the country, the nurse-to-population ratio remains a critical concern. Currently, India maintains approximately 1.96 nurses per 1,000 people—with some reports suggesting even lower functional ratios of 1:476—falling well below the WHO recommended standard of 3 per 1,000[21]. This shortage is compounded by a severe geographic imbalance. Most nursing professionals are concentrated in urban centres, leaving rural and remote areas underserved. This disparity is driven by inadequate compensation, lack of professional recognition, and significant out-migration of skilled nurses[22]. In the wake of the COVID-19 pandemic, which served as a leading cause of mortality in recent years, the need for innovative supportive tools to bridge these gaps has become urgent.

In resource-constrained settings like India, VNAs can serve as valuable force-multipliers. When integrated with existing infrastructure and adapted to local cultural contexts, VNAs can enhance accessibility and continuity of care[15]. By deploying VNAs with specialized knowledge, the healthcare system can achieve a "cascade of benefits". Automating routine tasks such as appointment reminders and health education through Virtual Nursing Assistants significantly reduces the

administrative workload of human nurses, allowing them to focus more on direct patient care. VNAs also provide structured post-discharge support by ensuring regular follow-up and monitoring, which helps prevent unnecessary readmissions and promotes continuity of care. Additionally, by delivering health education in local dialects, VNAs enhance health literacy, improve patient understanding, and encourage better adherence to treatment and lifestyle recommendations.

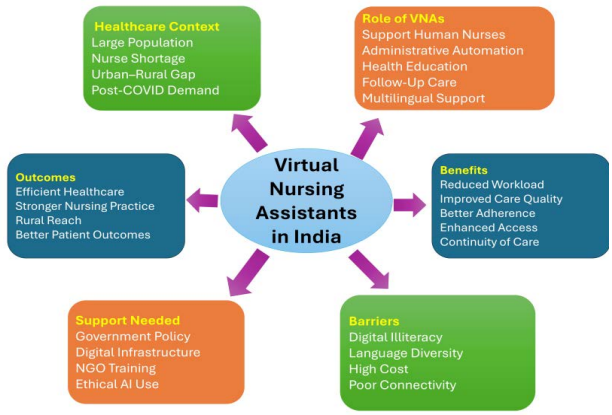


Figure 5: The Application of Virtual Nursing Assistants in India (created by the author)

Limitations and Barriers to Implementation in India

1. **The Digital Divide and Literacy:** The elderly population in India faces significant barriers to digital health. Approximately 85% of India's elderly are digitally illiterate, with only one-fifth to one-fourth utilizing internet-connected devices[23]. Barriers include the high cost of hardware, expensive data services, and a fundamental fear of technology. Furthermore, a persistent rural-urban divide exists; only 24% of rural households have internet access compared to 66% in urban areas
2. **Linguistic and Semantic Complexity:** India's linguistic landscape is incredibly diverse, encompassing over 19,500 mother tongues and 121 major languages[24]. While the Constitution recognizes 22 official languages, the development of VNAs is hindered by the need to understand local slangs, medical jargons, and regional nuances. Training AI to accurately interpret these variations is a financially demanding and technically tedious endeavour.
3. **Financial Implication:** In Tier-1 cities such as Delhi, Mumbai, and Bengaluru, the initial cost of setting up a single-room AI-powered Virtual Nursing Assistant (VNA) unit ranges from approximately ₹80,000 to ₹1,20,000, including the first year of software support. Such high upfront investment represents a substantial out-of-pocket expenditure for the general population and poses a significant financial barrier to adoption. This cost-related challenge has important implications for equitable access to digital health technologies, particularly in low- and middle-income settings, and remains one of the major obstacles to widespread implementation of VNAs[18]

VNAs are not a substitute for human nurses but act as a complementary system to strengthen nursing practice of India. Effective implementation of Virtual Nursing Assistants requires strong institutional support, including government investment in digital infrastructure and the development of clear policy frameworks to ensure ethical and responsible use of artificial intelligence. Community-level training initiatives, particularly through NGOs, can play a vital role in improving digital literacy among the elderly and other vulnerable groups, enabling them to use VNA services confidently.

Summary

Most individuals lack the medical expertise required to accurately assess or understand the seriousness of their symptoms. In this context, natural language processing plays a vital role in healthcare. AI-driven chatbots gather patient health information and use it to deliver relevant, understandable insights about physical conditions, while also guiding patients on appropriate next steps. AI-powered virtual assistant provides personalized support to patients by helping them identify possible illnesses based on symptoms, monitor their health status,

schedule doctor appointments, and perform various other healthcare-related tasks

Conclusion

A virtual nurse assistant is a digital health tool designed to support patients and healthcare providers by using artificial intelligence (AI) and machine learning (ML) technologies. The Virtual Nurse assistant services empower patients to manage their health effectively, improve treatment adherence, and access timely care, all while offering personalized and compassionate support. Nurse leaders and professional associations cite the value of virtual nursing; however, model adoption appears lower than projected need and perceived impact. Some of the study findings suggest that Virtual Nursing Assistant`s may be useful for older adults as they age in place and offer reassurance for support persons.Voice based Virtual nurse assistants represent a significant advancement in digital health, leveraging technology to enhance patient care, improve outcomes, and streamline healthcare delivery.Virtual Nursing Assistant offer an innovative way to deliver personalized, engaging, and easily accessible health programs at scale and at a low cost. The design elements of these assistants such as their visual appearance and language style play a crucial role in shaping user experience and determining how effectively users engage with them**.** Although immersive virtual reality holds promise as an educational strategy in nursing education, few studies have explored its application**.**Virtual reality is presented as a potential educational approach in nursing education, with an immersive learning experience currently being developed for nurses. However, research is required to provide multilingual support to ensure clear communication for diverse users.Furthermore, strategic deployment of VNAs should focus on health education and follow-up care, allowing human nurses to concentrate on high-acuity and complex clinical tasks, thereby improving overall healthcare efficiency and quality. With strategic planning, VNAs have the potential to play a transformative role in the future of Indian healthcare delivery.

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A Review of Barriers, Facilitators, and Contextual Factors for the Integration of Artificial Intelligence in Nursing Education

[1]Madhuri Meshram, [2]Sathish Rajamani

[1]Associate Professor – School of Nursing – DRIEMS University, Cuttack. Odisha, [2]Professor – School of Nursing – DRIEMS University, Cuttack. Odisha

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Abstract

Background: Artificial intelligence (AI) is becoming more common in healthcare and health professions education, but it is still not consistently used in nursing programs because of a number of contextual factors. To help with effective implementation and curriculum development, it's important to know what makes it easier or harder for nursing schools to use AI.

Methods: A scoping review was performed utilising the Peters et al. framework to delineate the current evidence regarding AI integration in nursing and allied health professions education. A systematic search of Google Scholar, PubMed, and Semantic Scholar yielded 1,245 records; subsequent screening and full-text evaluation resulted in 42 studies that satisfied the inclusion criteria. Data from empirical studies, case reports, policy papers, and discussion articles were extracted and thematically synthesised to identify principal barriers, facilitators, and contextual influences.

Results: Major problems included a lack of technological infrastructure, problems with interoperability, and a lack of technical support. There were also gaps in knowledge and skills among teachers and students. Concerns about ethics and privacy, a reluctance to change, a lack of resources, and unclear policies and regulations made it even harder for AI to be adopted. Facilitators included active participation from stakeholders, thorough training focused on AI, a supportive infrastructure, clear policy frameworks, proven benefits for learning and clinical decision-making, and collaboration between different fields. Regional, cultural, and contextual disparities significantly impacted the degree and character of AI integration, with affluent environments typically more equipped to adopt AI-enhanced education.

Conclusion: The integration of AI into nursing education is influenced by a complex interplay of technological, educational, ethical, policy, and contextual factors. To make AI adoption in nursing curricula more meaningful, it is important to deal with known barriers and strengthen facilitators using strategies that are sensitive to the context and have many different parts. The review provides a foundation for creating standardised AI curricula, funding infrastructure, and guiding future implementation research and policy in nursing education.

Key Words: Artificial Intelligence, Nursing Care, Nurses, Barriers, Facilitators and Integration

Background of the Study

Artificial intelligence (AI) is becoming increasingly embedded in healthcare. While AI is now used in the field, its role in clinical practice and in educating health professionals remains a topic of debate.[(1)]The integration of artificial intelligence (AI) into healthcare has emerged as a transformative

Email: shivaresearch051283@gmail.com

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force, with the potential to significantly enhance medical diagnosis, treatment, and overall healthcare delivery.[2]Advancements in accessible storage, faster networks, and more powerful computing have enabled the integration of AI into numerous healthcare services. AI has now reached a level of maturity that allows its application in image analysis, predicting disease patterns, and triage across a range of medical fields, such as radiology, gynecology, neurology, cardiology, pathology, and robotic surgery.[3]AI is becoming a growing trend in healthcare, driven by increased access to medical data and algorithm development. Healthcare AI integration has a unique potential to enhance healthcare services.[4,5]

John McCarthy came up with the idea for artificial intelligence (AI) at the Dartmouth conference in New Hampshire in 1956. It refers to a new field of science that studies and creates theories and methods. Artificial intelligence (AI) is a type of computer technology that can imitate how people act and do things that people can't do.[6] In recent years, AI has been used more and more in medicine, thanks to advances in data analysis, image recognition, and other technologies. This is especially true for processing medical images and making intelligent clinical decisions. AI opens up new ways to find diseases early, diagnose them correctly, and treat and manage them in a way that works best for each person.[7,8]

Advances in machine learning, especially deep learning, along with GPU and public database development, have enabled big data usage and sparked worldwide interest in AI technology.[9] Recently, artificial intelligence (AI) has gained prominence in diabetes research and clinical practice owing to its capacity to effectively and precisely manage and analyse extensive clinical and behavioural data.[10–12]Artificial intelligence methodologies, encompassing machine learning (ML) and deep learning (DL), are employed to develop predictive models that facilitate clinical decision-making, enhance the forecasting of complication risks, and customise treatment strategies.[13,14] AI applications in diabetes treatment encompass early diagnosis, automated insulin dose control, and the identification of important glycaemic abnormalities, thereby establishing a novel paradigm in precision medicine for diabetes. Nonetheless, the obstacles and facilitators identified by healthcare professionals in the efficient incorporation of these AI-based technologies into standard clinical practice remain predominantly uninvestigated.[13,15]

AI-powered predictive analytics enables proactive healthcare management. For example, AI can analyse continuous glucose monitoring data to predict and prevent diabetic crises or interpret electrocardiogram (ECG) signals from ubiquitous devices to detect arrhythmias prior to their onset.[16] As the first people to see patients in different healthcare settings, clinicians are very important in making decisions and are the main gatekeepers for the use and integration of AI solutions. Their perspectives on the barriers and enablers to AI acceptance and deployment are expected to influence the degree and manner in which AI tools are embraced and integrated into clinical practice in a variety of situations. Furthermore, the regional context of clinicians' practice, including policy frameworks and cultural differences, influences AI adoption.[17]

AI algorithms have been actively incorporated into various domains, including the identification of biomarkers, the selection and initial screening of appropriate populations, the repurposing of therapeutic pharmaceuticals, and the detection of adverse events (AEs). These purposes include finding new drugs, clinical studies before a medicine is sold, and keeping an eye on safety once a drug is sold.[18]

Randomized controlled trials have provided evidence supporting the safety and efficacy of AI-assisted decision-making software in a range of therapeutic fields. In terms of disease detection, these tools have enabled the early identification of patients with low ejection fraction, enhanced the detection rates of actionable lung nodules, and increased the identification of polyps that are often overlooked.[19,20] Recent research has shown that computer-aided detection (CAD) systems powered by artificial intelligence have the ability to improve

the accuracy of chest radiographs used to test for lung cancer.[21]

In the context of breast imaging, artificial intelligence offers advantages as well as difficulties. In particular, the challenges and facilitators related to the incorporation of AI systems into clinical breast imaging settings have not been fully described. The obstacles to AI application in breast cancer imaging have been somewhat examined in earlier scoping reviews, but they have not provided a thorough study of these obstacles.[22,23]

Despite the many advantages, emergency care facilities have been slow to adopt Clinical Decision Support Systems (CDSSs), even those built on artificial intelligence. Common complaints about their ineffectiveness and low adoption rate include problems with usability, a lack of interaction with other medical systems, a lack of time, and alert fatigue.[24,25]

The extensive body of academic literature reveals a complex array of ideas regarding the implementation of AI in healthcare.[26–28] However, most of our comprehension of these complex barriers and facilitators is derived from anecdotal accounts and narrative reflections, frequently devoid of a solid basis in empirical facts or strong theoretical frameworks.[29–31] Thus, the process of attaining successful AI implementation in healthcare remains enigmatic. We lack a detailed map of the numerous parameters that affect the incorporation of AI into therapeutic settings. This study utilises implementation science to identify the facilitators and constraints by analysing existing implementation narratives.

Research Question Based on the PICO Population/ Participants, Concept and Context (PCC) as outlined by Peters et al. [32]

What are the obstacles and enablers to the integration of artificial intelligence among nursing educators and students within the realm of nursing education, concentrating on the notion of AI adoption and implementation?

Objective of the Study

This study seeks to identify and synthesize the primary barriers and facilitators to the integration of artificial intelligence (AI) in nursing education. It further examines the impact of regional, cultural, and contextual factors on AI implementation and offers evidence-based recommendations for overcoming obstacles and leveraging facilitators to enhance the adoption of AI in nursing education.

Methods

Design

To pinpoint the main obstacles and enablers for incorporating artificial intelligence (AI) into nursing education, a scoping review method was chosen. This approach, as opposed to a systematic review, highlights the exploratory and conceptually unclear nature of the field. The scoping review follows the framework proposed by Peters et al.[32] and involves these steps: (1) Setting the objective and formulating the research question, (2) Defining criteria for selecting pertinent sources, (3) Planning the strategy for searching, selecting, extracting, and presenting evidence, (4) Finding relevant sources, (5) Applying inclusion and exclusion criteria to select eligible sources, (6) Gathering pertinent data from the chosen sources, (7) Analyzing the extracted data in accordance with the research objective, (8) Organizing and reporting the results, and (9) Summarizing the findings, drawing conclusions, and discussing their implications.

Results Study

Selection and Characteristics

The search strategy found a total of 1,245 records on Google Scholar, PubMed, and Semantic Scholar. After getting rid of duplicates and looking at the titles and abstracts, 78 full-text articles were checked to see if they were eligible. After applying the inclusion and exclusion criteria, 42 studies were incorporated into the review.

These studies included empirical research articles, case reports, policy papers, and discussion

papers that concentrated on the integration of AI in health professions education, especially in nursing education. The studies were conducted in North America, Europe, Asia, and Australia, which shows that they took place in different cultural and regional settings.

Obstacles to the Integration of AI in Health Professions Education The literature revealed several significant barriers:

1. **Technological Problems:** AI adoption was slowed down by poor infrastructure, AI systems that couldn't work with existing educational platforms, and not enough technical support.
2. **Knowledge and Skill Gaps:** Teachers and students often didn't know enough about AI concepts and uses, which led to resistance or misuse.
3. **Ethical and privacy concerns:** Stakeholders were worried about data security, patient privacy, and the moral use of AI-generated information.
4. **Resistance to Change:** Cultural and institutional inertia, doubts about AI's dependability, and worries about losing jobs made people hesitant to use AI tools.
5. **Resource Constraints:** Lack of money and training materials made it hard to use AI technologies in the classroom.
6. **Uncertainty about policies and rules:** Unclear rules about how AI can be used in schools and hospitals made it hard for people to use it widely.

Things that help AI become a part of health professions education

The literature also found things that help AI integration work well:

1. **Stakeholder Engagement:** Getting teachers, students, doctors, and policymakers involved in the development and use of AI helps it be accepted and useful.
2. **Comprehensive Training Programs:** Teaching people the basics of AI, how to use it, and the ethical issues that come with it gives them the skills they need to use it safely and effectively.
3. **Supportive Infrastructure:** Investments in compatible technology platforms, reliable internet access, and technical help make integration go more smoothly.4
4. **Clear Policy Frameworks:** Creating rules and standards for how AI can be used in schools and hospitals makes things less confusing and more trustworthy.
5. **Proven advantages:** Proof that AI improves learning outcomes, clinical decision-making, and patient care encourages use.
6. **Working together across fields:** Collaborations between computer scientists, teachers, and healthcare workers improve the design and use of AI tools.

Effects of Contextual, Cultural, and Regional Factors The acceptance of AI was greatly impacted by regional differences in educational resources, cultural views, and technological advances. Due to improved finance and infrastructure, high-income nations, for instance, showed stronger integration of AI, while low- and middle-income regions encountered more significant obstacles. Acceptance levels were influenced by cultural elements such as professional norms and technological trust. Wide variations in policy contexts also have an impact on the extent and speed of implementation.

Discussion

This scoping review emphasises the intricate interaction of technological, educational, ethical, cultural, and policy-related aspects affecting AI incorporation in nursing education. Although AI possesses transformative potential for improving education and clinical readiness, surmounting obstacles necessitates comprehensive approach. Highlighting stakeholder engagement, customised training, strong infrastructure, and transparent governance can expedite AI

deployment. Implementation strategies should be guided by regional and cultural nuances to guarantee contextual relevance and equity. The results correspond with the extensive literature on healthcare AI application, highlighting the necessity for empirical, theory-based research to enhance comprehension of facilitators and barriers. This review synthesises existing research and establishes a basis for focused interventions and policy formulation in nursing education. Constraints The review is constrained by possible publication bias and the heterogeneity of the included research, which differed in design, focus, and quality. The swift advancement of AI technologies may surpass the existing literature. Moreover, the emphasis on nursing education may restrict applicability to other healthcare professions.

Conclusions

The effective incorporation of AI in nursing education requires the resolution of technological, educational, ethical, and contextual challenges, alongside the utilisation of facilitators like stakeholder engagement and supportive policies. Strategies that are customised to regional and cultural contexts are crucial. Future research must focus on the empirical assessment of implementation interventions and the development of strong theoretical models to provide guidance.This scoping review has certain problems, such as possible publication bias because it doesn't include unpublished studies, grey literature that wasn't found in the databases investigated, and publications in languages other than English. These things could make the evidence less complete. The differences in design, focus, context, and quality of the studies that were included make it hard to compare them and stop us from formally judging their effectiveness or causality. Also, because AI in education is changing so quickly, the results could go out of date very quickly, especially when it comes to newer tools. Finally, the main focus on nursing and health professions education may make it hard to use the results in other educational or clinical contexts, especially in places with few resources.

Ai Adoption in Health Professions Education.

Recommendations

Create standardised AI curricula that include technical skills, ethics, and real-world uses.

Put money into infrastructure and technical support that is specific to schools.

Encourage people from different fields to work together to make AI tools that put the user first.

Set clear rules and policies for how AI can be used in education and practice.

Encourage all stakeholders to get involved to make the project more acceptable and useful.

Do long-term studies to see how integrating AI affects educational and clinical outcomes.

Source of Funding: Self

Conflict of Interest: No

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Global Quality Assurance in Nursing Education: ACEN Standards and International Accreditation

[1]Nell Ard, [2]Keri Nunn-Ellison

[1]PhD, RN, CNE, ANEF – Chief Accreditation Officer for the Accreditation Commission for Education in Nursing (ACEN), [2]EdD MSNEd, RN, CNE – Senior Director - ACEN

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Abstract

Accreditation plays a critical role in ensuring the quality, credibility, and continuous improvement of nursing education programs worldwide. This article examines the role of accreditation in nursing education, with an emphasis on quality assurance, public trust, and the promotion of ongoing program evaluation and enhancement. Particular attention is given to the benefits of international nursing accreditation for students, faculty, institutions, employers, and communities of interest, including improved educational quality, enhanced global recognition, and increased mobility of graduates. The article also addresses challenges associated with international accreditation, such as time, financial costs, and the sustained commitment required to maintain compliance with accreditation standards. Additionally, the work highlights international accreditation efforts led by the Accreditation Commission for Education in Nursing (ACEN), outlining its global reach, comprehensive Standards and Criteria, and support for programs seeking this recognition. The article also provides an overview of the *ACEN Standards and Criteria* as applied in international contexts, illustrating how global quality benchmarks are implemented while respecting local regulatory and cultural frameworks.By applying consistent, globally relevant standards while allowing programs to reflect local regulatory and cultural contexts, international accreditation supports excellence in nursing education and contributes to the preparation of competent, ethical, and practice-ready nurses worldwide.

Key Words: Accreditation, Quality, Standards

Introduction

Nursing education quality is critical in preparing competent professionals who are capable of meeting the increasingly complex healthcare needs of individuals, families, and communities worldwide. As healthcare systems evolve and expectations for safe, ethical, and patient-centered care continue to grow, ensuring the quality and consistency of nursing education has become a global priority. Accreditation is a peer-review, self-regulatory process by which non-governmental associations recognize educational institutions or programs that have been found to meet or exceed standards and criteria for educational quality.[1]Therefore, accreditation serves as a key mechanism for evaluating and validating nursing education program quality, providing assurance that established standards of excellence are being met and maintained.

Corresponding Author: Nell Ard, PhD, RN, CNE, ANEF, 3390 Peachtree Road, NE #1400 Atlanta, GA 30326;

E-mail: nard@acenursing.org

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In nursing education, accreditation functions as an external, peer-reviewed process that assesses program quality elements such as administration, faculty qualifications, student support, curriculum design, and measurable outcomes. Beyond quality assurance, accreditation encourages programs to engage in continuous improvement, supports workforce readiness, and enhances public trust. Internationally, accreditation has gained increased importance as nursing education and practice become more globally interconnected, with students, educators, and nurses seeking educational and professional opportunities across national borders.

This article explores the role of accreditation in nursing education, highlighting its significance in program development, quality assurance, and public confidence. It further examines the benefits and challenges associated with international nursing accreditation and describes global accreditation efforts led by the Accreditation Commission for Education in Nursing (ACEN). In addition to examining the role, benefits, and challenges of international nursing accreditation, this article outlines the *ACEN Standards and Criteria*[2]as quality indicators and describes how these standards are applied across diverse global educational settings.By outlining the *ACEN Standards and Criteria*[2] and their application across diverse educational contexts, this article underscores the importance of accreditation in advancing high-quality nursing education, expanding educational opportunities for students, and strengthening the global nursing workforce.

The Role of Accreditation in Nursing Education

Accreditation has several primary roles related to nursing education. The first role is to provide quality assurance. [3,4, 5, 6, 7] Nursing accreditation promotes high-quality nursing education regardless of where the program is located. Programs are expected to meet a set of standards specific to administration and resources, faculty, students, curriculum, and student outcomes. In essence, accreditation is a third-party "stamp of approval" indicating that the nursing program meets the benchmarks that have been set related to educational quality.

The second role of nursing accreditation is serving as an incentive for continuous improvement for nursing programs. Attaining and maintaining accreditation requires the program faculty to reflect, self-evaluate, and adapt based on best practices and evolving education and healthcare needs. [3,4, 5, 6, 7] In essence, accreditation is a voluntary but vital process that assists in upholding the integrity and quality of nursing education while ultimately safeguarding patient safety and advancing the nursing profession.

Another role of nursing accreditation is related to public trust. Nursing accreditation can provide credibility and legitimacy for a program. The accreditation assures employers and the public that graduates are completing a rigorous high quality nursing education program. Graduates coming from an accredited nursing program are being prepared for the diverse nursing roles needed to provide patient-centered care and ethical practice, as well as being ready for effective leadership in contemporary healthcare environments.

Benefits of International Nursing Accreditation:

Attaining international accreditation benefits nursing programs, students, and faculty. The first program benefit is that the accreditation process drives continuous quality improvement in nursing education. [3,4, 5, 6, 7] The program undergoes a rigorous self-evaluation and peer review process, leading to enhancements in curriculum relevance, teaching methodologies, and student support services. International accreditation demonstrates the extent to which the program meets educational quality standards specific to nursing education. The process heightens the faculty member's and administrator's awareness and responsiveness to areas needing further development as part of maintaining accreditation, which fosters ongoing self-examination, reevaluation, and focus on the future for continuous program improvement. Further, international nursing accreditation provides recognition as a quality nursing education program, which can assist in student recruitment as well as expanding the program's global outreach.

International accreditation has several benefits for the students. The first benefit is that international accreditation can assist the students with education decision-making. Students and their parents seek out quality nursing programs and a program with international accreditation reflects the quality of the education provided. Students benefit from attending a nursing education program that meets international accreditation standards of educational quality. Finally, graduating from an internationally accredited nursing program can also assist with transfer of credits and/or acceptance into the next level of nursing education within the country as well as in other countries.

International accreditation also provides valuable benefits for the faculty and the communities of interest. Having international accreditation increases the faculty's awareness of areas needing development and fosters a proactive approach to addressing those needs. [3,4, 5, 6, 7] Furthermore, accreditation offers opportunities for professional development and validation for the quality of educational practices.[5] Finally, international accreditation serves as an indicator of program excellence and can assist employers in seeking out graduates from these programs since the quality of education demonstrated through accreditation helps to ensure the program is producing competent practitioners.

Accredited nursing programs typically have better program outcomes related to program completion, licensure pass rates[8], and job placement rates. The ACEN publishes information regarding data collected annually from its programs in the *Report to Constituents.*[9]

Table 1. Benefits and Challenges Related to International Accreditation

Benefits	Challenges
Drives continuous quality improvement	Time commitment of faculty and administration for the accreditation journey
Heightens the awareness of areas needing further development	
Provides recognition as a quality nursing program	
Assist students/parents with education decision-making; assist in student recruitment	Financial costs of accreditation
May assist with transfer of credits or admission to the next level of education	
Provides Professional Development Opportunities	Maintaining accreditation over time
Assists employers in hiring graduates from a quality program	

Challenges in Accreditation

While there are clear benefits to having international accreditation, there are also challenges, including costs and maintenance.[5,6]There are two challenges related to the cost of achieving and maintaining international accreditation: time and finances. There is a time commitment by the faculty and administration for the accreditation journey including writing a Self-Study Report, identifying evidence, and preparing for site visits. Additionally, the financial costs of the accreditation process include fees and the potential need to invest in infrastructure, faculty development, student support, and/or administrative support.

Another challenge is maintaining international accreditation. The program and faculty will need to

continue to maintain compliance with the Standards and Criteria in between accreditation visits.The process is not a "one and done" encounter; the process requires commitment to the ongoing self-evaluation, collection of data, and making changes for quality improvements when and if needed.

ACEN International Accreditation Efforts

The ACEN is a U.S.-based nursing accreditation agency that is recognized by the Department of Education in the United States as well as the Council for Higher Education Accreditation (CHEA). The CHEA recognition includes accreditation of international nursing programs.

The ACEN mission is to support the interests of nursing education, nursing practice, and the public by the functions of accreditation, and the purpose of the ACEN is to provide specialized accreditation for all levels of nursing education programs located in the United States, U.S. Territories, and internationally.

The ACEN began accrediting programs internationally in 2000.The ACEN accredits nursing programs at all levels of nursing (e.g., practical, diploma, associate, baccalaureate, master's, and clinical doctorate). Currently the ACEN has 26 accredited international nursing programs in 10 countries, an additional 20 programs in candidacy that will add an additional five countries, and six programs that have started the candidacy process.

ACEN Position Statement on Accreditation of International Nursing Education Programs[10]

The ACEN is committed to quality in all types of nursing education programs and encourages self-evaluation, peer review, and the promotion of educational equity, access, and mobility through the functions of accreditation. Recognizing that accreditation is one way of enhancing the quality of nursing education and is a way to facilitate the nursing profession being the best and strongest it can be worldwide, the ACEN welcomes nursing programs outside the United States and U.S. Territories to pursue international nursing accreditation.

The ACEN asserts that accreditation is a voluntary, self-regulatory process by which non-governmental entities recognize educational institutions or programs that have been found to meet or exceed standards and criteria for educational quality. The ACEN acknowledges that nursing education programs located outside of the United States and its Territories can benefit from adherence to best practices and generally accepted guidelines for nursing education incorporated in the ACEN Standards and Criteria. To fulfill its mission to support the interests of nursing education, nursing practice, and the public, the ACEN seeks to broaden the impact of accreditation to encompass nursing education programs across the globe.

Therefore, in a spirit of cooperation, openness, and mutual respect consistent with its organizational values, the ACEN extends accreditation and related services to international nursing education programs.

Recognizing the need for global standards, the Accreditation Commission for Education in Nursing (ACEN) has developed Standards and Criteria that are appropriate for use internationally. Regardless of whether the nursing program is in the United States, a U.S. Territory, or located outside of the United States or whether the institution is public, private, religious, or hospital-based, all programs should be designed and implemented to ensure that the hallmarks of quality nursing education are achieved and maintained. The *ACEN Standards and Criteria*[2]broadly reflect these elements of quality education to provide a framework and support for nursing education worldwide. There are five ACEN Standards, and each Standard has several Criteria. Each ACEN accreditation Standard is one element of quality nursing education, and the Criteria are the subcomponents that ensure that the Standard is achieved. The ACEN also provides a Glossary of terms to ensure that all programs have the same definition of various components imbedded within the Standards and Criteria or ACEN materials.[1] A high-level overview of each standard will be provided, as well as some examples regarding how they are applied in an international context.

Table 2. ACEN Standards[2]

Standard 1: Administrative Capacity and Resources The mission and/or philosophy of the nursing program reflects the governing organization's mission, goals, and/or values. The governing organization and nursing program have administrative capacity and resources that support effective delivery of the program and facilitate the achievement of the end-of-program student learning outcomes and program outcomes for each nursing program type, and additionally for graduate programs the role-specific nursing competencies.
Standard 2: Faculty Faculty are educationally and experientially qualified for their assigned roles and responsibilities, maintain expertise, and are regularly evaluated to support the achievement of the end-of-program student learning outcomes and program outcomes for each nursing program type, and additionally for graduate programs the role-specific nursing competencies. Full- and part-time faculty include those individuals teaching and/or evaluating students in didactic, clinical, and/or laboratory settings.
Standard 3: Students Student policies and services support the achievement of the end-of-program student learning outcomes and program outcomes for each nursing program type, and additionally for graduate programs the role-specific nursing competencies.
Standard 4: Curriculum The curriculum supports the achievement of the end-of-program student learning outcomes for each nursing program type, and additionally for graduate programs, the role-specific nursing competencies; and is consistent with safe practice in contemporary healthcare environments.
Standard 5: Outcomes Nursing program assessment demonstrates the extent of student learning at or near the end of the program as well as program outcome achievement using a systematic plan for evaluation (SPE). The faculty create and implement a written SPE* for each nursing program type to determine the extent of the achievement of each end-of-program student learning outcome and program outcome, and additionally for graduate programs the role-specific nursing competencies, to inform program decision-making to maintain or improve student and program performance.

Standard 1 Administrative Capacity and Resources[1, 2, 3]requires that the program identify the foundational structures necessary to support high-quality nursing education regardless of geographic location. This standard emphasizes the alignment of the nursing program's mission and philosophy with that of the governing institution, underscoring the importance of meaningful faculty, student, and stakeholder participation in governance and program decision-making. However, the Criterion related to the mission and philosophy is written broadly, so nursing programs world-wide are able to provide evidence of this alignment with the institution.By requiring adequate fiscal and physical resources, Standard 1 reinforces that sustainable administrative infrastructure is essential for the effective delivery, evaluation, and continuous improvement of nursing education regardless of the country where the program is offered.

Standard 2 Faculty[1, 2, 3] focuses on the qualifications, roles, and ongoing development of individuals responsible for teaching and evaluating nursing students across didactic, laboratory, and clinical learning environments. This standard recognizes faculty as being central to educational quality and requires that academic preparation, licensure, and professional experience align with institutional expectations and national regulatory requirements where the program is located. Emphasis is placed on structured orientation, continuous professional development, and performance evaluation to support effective teaching. However, the expectations for faculty orientation, ongoing professional development, and evaluation do not mandate U.S.-specific processes, but instead emphasize systematic support and accountability for teaching effectiveness.The inclusion of expectations related to preceptor use further reflects the importance of clear role delineation, preparation, and oversight in practice-based learning environments, ensuring that instructional quality is maintained across diverse educational experiences.

Standard 3 Students[1, 2, 3] addresses the policies, resources, and institutional practices necessary to promote student success within nursing education programs. This standard emphasizes the importance of publicly accessible, current, and consistently implemented policies related to admission, progression, graduation, and grievance processes. It further underscores the role of faculty in selecting and evaluating learning (library) and technology resources that support student learning, as well as the responsibility of programs to orient students to those resources. By acknowledging country-specific approaches to educational funding and student financial responsibilities, Standard 3 allows programs to demonstrate compliance while reflecting local regulatory and cultural contexts.

Standard 4 Curriculum[1,2,3,4] centers on the faculty's intentional design, implementation, and ongoing evaluation of the nursing curriculum to ensure achievement of student learning outcomes. Faculty are expected to develop curricula grounded in professional nursing standards, contemporary practice concepts, and have clearly articulated end-of-program student learning outcomes that guide course sequencing and instructional strategies. This standard emphasizes alignment among learning activities, teaching methodologies, as well as formative and summative evaluation methods to support student progression towards achievement of the end-of-program student learning outcomes. Clinical learning experiences are required as a core component of nursing education, while flexibility is provided for the use of simulation and skills laboratories in accordance with educational best practices and the program's resources. For graduate programs, the integration and assessment of role-specific nursing competencies further demonstrate how curricula are tailored to advanced nursing practice expectations for the specialty area.The Criteria in Standard 4 assist the program in ensuring that its curriculum is consistent with contemporary nursing practice and standards within the country and geographic region where the program is located.

Standard 5 Outcomes[1,2, 3, 4] focuses on the systematic assessment of student learning and program effectiveness through the collection and analysis of aggregate and disaggregate data. Central to this standard is the development and implementation of a systematic plan of evaluation that guides ongoing self-assessment and evidence-based decision-making. Programs are expected to evaluate outcomes related to student learning achievement, program completion, licensure performance where applicable, and employment. For graduate-level programs, assessment of role-specific nursing competencies provides additional evidence of educational effectiveness. By requiring programs to use outcomes data to inform planning and improvement, Standard 5 reinforces accreditation as a continuous quality improvement process rather than a periodic compliance exercise.

While the Standards and Criteria are the same for all nursing programs, each program "tells its story" regarding how it demonstrates compliance with the Standard and its Criteria.This enables all programs to maintain national requirements specific to each country while demonstrating compliance with a set of global nursing accreditation standards reflecting quality nursing education.

Beyond the publication of these international quality nursing education standards, the ACEN encourages all nursing education programs to consider pursuing accreditation. To support these efforts, the ACEN provides education that is easily accessible online through ACEN Academy eCourses. Program faculty considering pursing ACEN accreditation are encouraged to review these offerings. Further, the ACEN provides in-person conferences and workshops to assist currently accredited programs or those seeking ACEN accreditation. Finally, every program seeking ACEN accreditation, regardless of location, is assigned a Candidacy mentor to assist in the process.

Conclusions

Accreditation is a vital mechanism for identifying and upholding the quality and integrity of nursing education internationally. Through clearly defined standards related to administration, faculty, students, curriculum, and outcomes, accreditation provides assurance to students, employers, and the public that nursing programs meet established benchmarks for excellence. International accreditation further extends these benefits by promoting global consistency in nursing education while respecting country-specific requirements and contexts. Although the accreditation process presents challenges, including faculty time, cost, and the need for continuous compliance, its value lies in fostering a culture of reflection, accountability, and ongoing improvement. The efforts of organizations such as the Accreditation Commission for Education in Nursing demonstrate how global accreditation standards can support high-quality nursing education across diverse settings. Ultimately, accreditation strengthens the nursing profession by preparing competent graduates, advancing educational quality, and contributing to improved patient care and safety worldwide.

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Original Article

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Nurses' Knowledge and Practices Regarding Prevention of Cesarean Section Wound Infection: An Intervention Program

Amira Refaat Said

Associate Professor of Obstetrics & Gynecological Nursing, Farasan University Collage, Jazan University- KSA

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Abstract

Aim: Study the effect of educational program on nurses' knowledge and practices regarding prevention of caesarean section wound infection.

Setting: The study was conducted in Obstetrics and Gynecology Department at Farasan General Hospital.

Design: A Quasi-experimental study (pre and post-test) was utilized.

Sampling: Convenient sample included 50 nurses.

Tools: Two tools were used Self-administered questionnaire and Observational checklist.

Results: Majority of studied nurses had poor total knowledge score regarding prevention of caesarean section wound infection pre intervention. While most of the nurses studied had good total knowledge score regarding prevention of caesarean section wound infection post intervention. More than majority of nurses studied had unsatisfactory total practice pre intervention toward prevention of caesarean section wound infection, meanwhile majority of studied nurses had high satisfactory total practices post intervention. ***Conclusion***: the intervention program had positive effect on nurses' knowledge and practices regarding prevention of caesarean section wound infection after application of program zcompared to before application.

Recommendations: Updating knowledge and practices of nurses through continuous in-service educational programs emphasizing the importance of the evidence-based nursing practices of prevention of caesarean section wound infection.

Keywords: Educational program, nurses' knowledge and practices, caesarean section wound infection.

Introduction

The caesarean section is one of the most common obstetrical surgical procedures. The international healthcare community has considered an appropriate proportion for CS to be between 10–15% of all deliveries[1]. Globally, the prevalence of CS is approximately 18.6%, ranging from 6 to

Corresponding Author: Amira Refaat Said, Associate Professor of Obstetrics & Gynecological Nursing, Farasan University Collage, Jazan University- KSA

E-mail: Amira.refaat 21@yahoo.com

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27.2%. Caesarean section is considered the most important risk factor for postpartum maternal infection [2]. Post wound infection is one of the most common postoperative complications after cesarean section in both developed and developing countries. Surgical site infection surveillance system is a must to implement before, during and after cesarean section to get a controlled, accurate and standardized magnitude. Especially the abdominal wound complicating cesarean section should be decreased through strict preventative strategies.[3] The successful application of infection control measures, cesarean section wound infection prevention measures, and well-structured continuing education programs are considered as a substantial element that would improve nurses' knowledge.[4]

Nurses should collaborate with other health team members to control and prevent cesarean section wound infection occurrence. Nurses play a key role in wound management, and their theoretical understanding of basic wound management is expected to influence the quality of wound therapy fundamentally. Education of health care professionals can improve their knowledge level, thus promoting infection prevention guidelines implementation which directly contributes to health care associated infections reduction.[5]

Significance of the Study

Caesarean wound infections have major consequences such as limiting the potential benefits of surgical interventions and increasing the economic burden on hospitals. Adding to the functional disability and emotional stress of the woman.[6]. Post cesarean section (CS) infection is a momentous problem that affects 4.5% in Kingdom Saudia Arabia, and infection at the incisional site which occurs in around 6.6%–9% of post cesarean deliveries.[8]

Aim of the Study

The aim of this research is to study the effect of intervention programme on nurses' knowledge and practices regarding prevention of caesarean section wound infection.

Research Hypotheses

Nurses' knowledge and practices regarding prevention of caesarean section wound infection will be improved after application of educational program compared to pre application.

Subjects and Method

A Quasi-experimental study (pre- and post-test) was followed. The study was conducted in Obstetrics and Gynecological Department at Farasan General Hospital. Convenient sample type**.** The total number includes (50) nurses.

Tools of Data Collection

Tool (I): Self-administered questionnaire. It includes demographic characteristics of nurses studied. Knowledge assessment sheet adapted from.[7,10,11,12]

Tool (II): Observational check list: it includes general nurses 'practices about prevention of caesarean section wound infection. General practices regarding environmental cleaning.

Ethical Consideration

- An official permission was granted from Committee for Research Ethics - Jazan University with reference number (REC-46/06/1319), date of decision 29 December 2024. The aim of the study was to explain to each nurse before applying the tools. An oral consent was obtained from each nurse to participate in the study, and each nurse can freely withdraw at any time. The data was collected and treated confidentially.

Validity and Reliability

The tools were thoroughly reviewed by three experts, two in Obstetrics & Woman's health nursing and one obstetrician for content validation. Reliability of the tools was performed to confirm their consistency by Cronbach's Alpha coefficient test which revealed that each of the two tools consisted of relatively homogenous items, which it was 0.83.

Pilot study: It was carried out on 10% of total sample (5 nurses) to evaluate reliability of study sample and clarity of the study tool.

Field Work

- Data was collected from the beginning of September 2023 until the end of May 2024, covering nine months. The study was carried out for three days weekly from 9 Am to 12 Pm at Obstetrics and Gynecological Department at Farasan General Hospital. Data was collected through distribution of self – administered questionnaire. The average time required for completion of the questionnaire was about 20 to 30 minutes with each nurse. Then the researcher used the observational checklists to assess nurses' practice regarding prevention of caesarean section wound infection and general practices regarding environmental cleaning and skin of surgical site preparation procedure. Nurses were divided into (10) groups according to working circumstances and nurses' physical and mental readiness. Each group included (5) nurses. The overall sessions were 4 sessions for each group; the duration of each session ranged from 30-45 minutes. At the beginning of the first session the researcher gave the nurses the instructional guideline and introduced an orientation of the instructional guideline. Then the researcher provided nurses with general knowledge about prevention of caesarean section wound infection. Then the researcher explained the knowledge about preoperative, intraoperative and postoperative measures to prevent caesarean section wound infection. The researcher demonstrates practical part of guideline covering contain procedure e.g. (skin of surgical site preparation and vaginal preparation). The last session, re-demonstration of the practical part. At the end of the session the researcher gave nurses the opportunity to ask questions and provided period of discussion. **Finally,** the researcher evaluates effect of the educational program (post-test) by using the same format of tools which were used before the implementation of the educational program (pre-test).

Statistical Design

After data collection, each sheet was scored, and data were organized, categorized, results were presented in tables and were analyzed by using the statistical package for social sciences (SPSS) program, version (2024). Numerical qualitative data were expressed as frequencies and percentages. As well, means, standard deviation (SD), Chi-square and probability of errors (*p*-value) test were used to examine the relation between qualitative variables.

Results

Table 1. Distribution of demographic characteristics of the nurses studied (n=50).

Personnel Characteristics	Frequency	%
Age in years		
20-<30	32	64.0
30-<40	5	10.0
≥40	13	26.0
Mean ±SD	31.98±8.74	

Continue....

Educational level		
Secondary nursing education	12	24.0
Technical nursing education	28	56.0
Bachelor's degree of Nursing	10	20.0
Years of experience		
< 5 years	30	60.0
5-10 years	2	4.0
≥10 years	18	36.0
Mean ±SD	6.68±4.53	
Previous attendance of training programs		
Yes	9	18.0
No	41	82.0

Table (1): clarifies that about two third (64.0%) of the studied nurses were in the age group of 20-30 years with a mean age of 31.98±8.74 years and more than half (56.0%) of the studied nurses were technical nursing education. Moreover, more than half (60.0%) of studied nurse had < 5 years of experience with mean 6.68±4.53 years. Regarding previous training programs, more than three quarters (82.0%) of the nurses studied didn't attend any training programs about cesarean section wound infection.

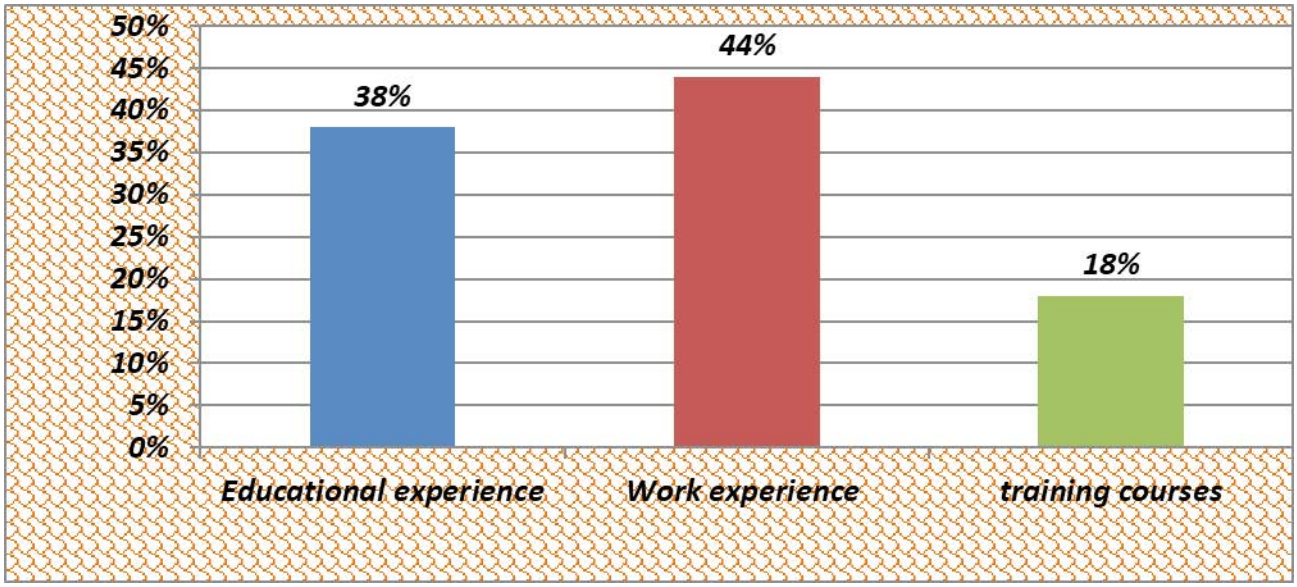


Figure 1: nurse's sources of knowledge regarding prevention of cesarean section wound infection

Figure (1) shows that most of the nurses (44%) had sources of knowledge regarding caesarean section wound infection from work experience, (38%) of them had sources of knowledge regarding caesarean section wound infection from educational experience, while (18%) of them had knowledge from training courses.

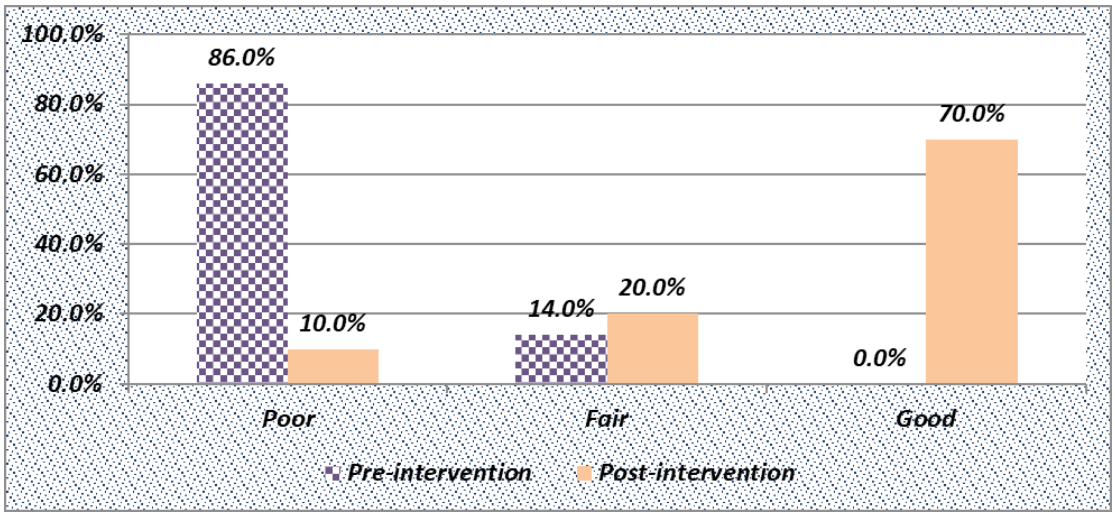


Figure 2: percentage distribution of total knowledge score of the nurses studied regarding prevention of caesarean section wound infection.

Figure (2) shows that (86.0%) had poor knowledge regarding prevention of caesarean section wound infection before implementation of educational program. (70.0%) had good knowledge after implementation of educational program

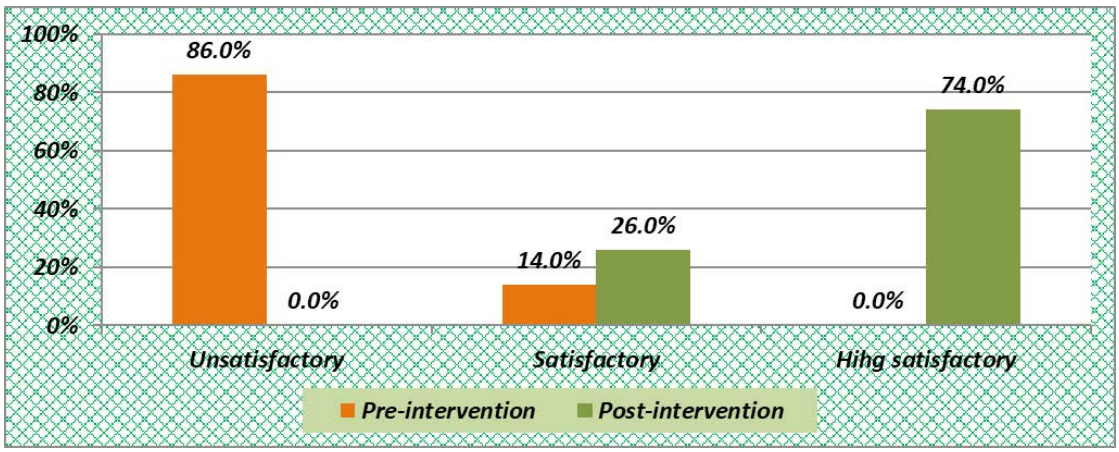


Figure 3: percentage distribution of total practices scores regarding prevention of caesarean section wound infection.

Figure (3) shows that (86.0%) had unsatisfactory total practice pre intervention toward prevention of caesarean section wound infection, (74.0%) had highly satisfactory total practices post intervention.

Table 2. Correlation between studied nurses' total knowledge and practices score at post-intervention (N=50).

Total knowledge	**Post-intervention**			
	r	**P value**		
Total practice	0.476	<0.001**		

Table (2): this table illustrates that there was a highly positive statistically significant correlation between studied nurses' total knowledge & total practices score post intervention (p<0.001**).

Table 3. Relationship between demographic characteristics and total nurses' knowledge regarding prevention of caesarean section wound infection (n=50).

Nurses' knowledge& Demographic Characteristics	Good N= 8		Average N= 21		Poor N= 21		Total	χ^2	P value
	No	%	No	%	No	%			
Age								11.942	**>0.05**
20-<30	6	21.4	7	25.0	10	53.6	23		
30-<40	1	20.0	5	80.0	0	0.00	6		
≥40	1	3.8	9	34.6	11	61.6	21		
Educational level								13.973	**<0.05***
Secondary nursing education	2	10.5	7	36.8	9	52.7	19		
Technical nursing education	2	5.6	2	11.1	9	83.3	18		
Bachelor's degree of Nursing	4	22.2	12	55.6	3	22.2	18		
Years of experience								1.558	**<0.05***
< 5 years	0	0.00	1	50.0	1	50.0	2		
5-10 years	6	15.0	12	30.0	12	55.0	30		
≥10 years	2	11.2	8	44.4	8	44.4	18		
Previous attendance of training programs								1.536	**>0.05**
Yes	7	14.6	15	31.3	16	54.1	38		
No	1	8.3	6	50.0	5	41.7	12		

***= statistically significant at ≤ 0.05**

Table (3): this table shows that there was statistically significant relationship between the level of education and years of experiences of the studied nurses and their total knowledge regarding prevention of caesarean section wound infection.

Table (4): Relationship between demographic characteristics and total nurse's practices regarding prevention of caesarean section wound infection (n=50).

Total nurse's practices & Demographic Characteristics	Satisfactory N= 17		Unsatisfactory N= 33		Total N= 50	χ^2	P value
	No	%	No	%			

Continue....

Age						1.893	<0.05*
20-<30	6	21.4	12	78.6	18		
30-<40	2	40.0	4	60.0	6		
≥40	9	34.6	17	65.4	26		
Educational level						22.517	<0.001**
Secondary nursing education	0	0.00	18	100.0	19		
Technical nursing education	5	27.8	10	72.2	18		
Bachelor's degree of Nursing	12	66.7	5	33.3	18		
Years of experience						1.955	>0.05
< 5 years	11	28.2	23	71.8	34		
5-10 years	4	44.4	5	55.6	9		
≥10 years	2	16.7	5	83.3	7		
Previous attendance of training programs						0.185	>0.05
Yes	13	27.1	25	72.1	38		
No	4	33.3	8	66.7	12		

**** = highly statistically significant at ≤ 0.001 *= statistically significant at ≤ 0.05**

Table (4): this table shows that there was statistically significant relationship between the age and their total practices regarding prevention of caesarean section wound infection. There was high statistically significant relationship between the level of education and their total practices regarding prevention of caesarean section wound infection.

Discussion

The results of the present study showed that two third of the studied nurses were in the age group of 20< 30years with a mean age of 31.98±8.74 years. This result similar to **Musa,** [12] who assess nurses' knowledge and performance regarding infection control in labor room in Omdurman Military Hospital, Khartoum State, Sudan, revealed that most of respondent nurses (60%) were below 30 years.

The result of the current study revealed that more than half of studied nurse had < 5 years of experience with mean 6.68±4.53 years. This finding, according to ***Dhakal et al.,*** [13] who studied the nurses' knowledge regarding aseptic technique in the operation theatre of selected hospitals of Bharatpur, concluded that most of the respondents had working experience of five years and below.

The result of the current study showed that more than half of the nurses studied were in technical nursing education, this result in accordance with ***Arafat et al.,*** [14] who assessed the effect of evidence-based guidelines on nurse's performance in respect to nosocomial infection at medical-surgical and obstetrician departments. Additionally, the result of the present study illustrated that more than three quarters of the nurses studied didn't attend any training programs about caesarean section infection. This result is similar with ***Novelia et al.,*** [10] who identify the level of nurses' knowledge and practices regarding the prevention of Caesarean

Section Surgical Site Infection who found that most of the nurses studied had not trained in an infectious control training program.

The present study revealed that more than half of studied nurses had incorrect answer about definition of caesarean wound infection, this result in the same line with ***Balodimou et al.,***[15] who investigated nurses' knowledge regarding the prevention of surgical site infection, who stated that, the majority of respondents did not chose the correct definition of the time of occurrence of surgical site infection.

The result of the present study illustrates that majority of nurses studied had incorrect answers. This result is similar to ***Sadia et al.,***[8] who studied the knowledge and practices of nurses towards surgical site infection prevention in two public hospitals of Lahore, Pakistan, who found that majority of the participants give wrong answer about the best time of hair removal.

Result of the present study showed that majority of them had complete correct answer.This result consistent with ***Zucco et al.,*** [16] who assess the level of knowledge, the attitudes and the adherence to evidence-based recommendations for surgical site infection prevention, found that more than two thirds (73%) of the participants knew that the appropriate time for shower or bath with an antiseptic agent is the day of the operation or the day before.

The present study revealed that half of the nurses studied had Incomplete Correct answer, these results came in the same line with ***Labeau etal.,*** [17] who assessed intensive care nurses' knowledge of evidence-based strategies for the prevention of SSI, who found that more than half of the sample wrongly classified SSIs in superficial incisional SSI, deep incisional SSI.

The present study showed that more than quarter of studied nurses had complete correct answer about signs of cesarean wound infection, These finding of present study disagreement with ***Suliman S,N,***[18] who assess the nurses knowledge about pre and post-operative care in pediatric surgery, found that, majority of nurses had good knowledge about prevention of wound infection such as observe any sign of infection early and wound is monitored with every dressing change for signs of infection to prevent any complication.

The present study showed that majority of studied nurses had poor knowledge, this result contrast with ***Labrague et al.,***[19] who found that nurses have "Excellent Knowledge" on the concepts/principles of sterile technique and applied it to a "Great Extent". Significant relationship was found between knowledge and extent of practice of sterile technique.

The result of the present study revealed that majority of studied nurses had poor total knowledge score regarding prevention of caesarean section wound infection pre intervention.This result supported by ***Novelia et al.,***[10] who identified the level of nurses' knowledge and practices regarding the prevention of Cesarean Section Surgical Site Infection, found that nurses had low levels of knowledge regarding the prevention of CS-SSI in Indonesia.

Most of the nurses studied had unsatisfactory total practice pre intervention toward prevention of caesarean section wound infection, most of them had high satisfactory total practices post intervention. This result similar with ***Farotimi et al.,***[20] who examined the effect of a training program on attitude and practice of infection control among nurses in two tertiary hospitals in Ogun State, Nigeria, found that there were a Significant difference was observed between mean practice score (P = 0.001), between self-reported and observed practices (P = 0.000),

The result of the present study pointed out that most of studied nurses studied unsatisfactory practices pre intervention self-report practice about general practices regarding prevention of cesarean section wound infection. These results are similar to a study performed by ***Dhakal et al.,*** [13] who identify nurses' practices and their barriers and facilitators for surgical site infection prevention, and propose direction for improving nurses' practices for such prevention.

The present study showed that. These results were in the same line with ***Khudhair, A.S,***[23] who assesses nurse's practice concerning postoperative wound

care, who revealed that nurses' practices were deficit in the most items of post-operative wound care for patients in surgical units.

The present study showed that more than half of studied nurses had unsatisfactory done practices about hand wash before wearing surgical gloves pre intervention and half of them had satisfactory done practices about hand wash post intervention (p<0.001**), this result is supported by ***Phan et al.,***[25] who determined hand hygiene compliance following an educational program in an obstetric & gynecological hospital in Vietnam and found that the hand hygiene compliance rates prior to the intervention were low and hand hygiene compliance increased significantly after intervention ($p < 0.0001$) in the delivery suite and surgical ward.

The present study revealed that more than quarter of studied nurse had satisfactory practice (pre intervention),the result in contrast with ***Alabdulrazaq etal.,***[24] who evaluating knowledge and practice of healthcare professionals towards prevention of surgical site infection, and measuring the incidence of SSI, found that the practice of washing the hands before and after changing the dressing during wound cleaning.

The present study revealed that less than half of studied nurse had satisfactory practice as self-reported (pre intervention) toward educate women on wound care before discharge from the hospital. the result in the same line with ***Ding etal.,*** [26] who described surgical nurses' postoperative wound care practices and the extent to observed surgical wound practices aligned with evidence-based guideline recommendations, stated that more than half of surgical nurses (n=37, 61.7%) did not educate patients on post-discharge wound management.

The present study showed that the most of studied nurses had reported unsatisfactory done practices regarding environmental cleaning as self-reported at pre intervention, this finding is in agreement with **El-*Sayed et al.,***[27] who assessed nurses' knowledge and practice for prevention of infection in burn unit at a University Hospital, revealed that very low percentages among practices of environmental cleaning and pointed out that the nurse is responsible for providing a clean and safe environment for patients closely the burn wound.

These findings of the present study showed that there was appositive statistical correlation between total knowledge and total practices scores before and after phases of instructional guideline implementation (p<0.001**). This result is supported by ***Mohammed, S.A,*** [28] who evaluate effects of implementing nursing guidelines on nurses' knowledge and patient's safety regarding nosocomial infection control measures in burn unit. A study of convenience sample (35 nurses and 40 patients) from Burn Department (BD) at Public Fayoum.

Conclusion

Based on the results of the present study, concluded that an educational program has positive effect on nurses' knowledge and practices regarding prevention of caesarean section wound infection, there was a highly statistically significant difference in relation to total nurses' knowledge regarding prevention of caesarean section wound infection pre intervention and post intervention phases of educational program implementation. There was a highly statistically significant difference in relation to total nurses' practices regarding prevention of caesarean section wound infection pre intervention and post intervention phases of educational program implementation. There was a highly positive statistically significant correlation between studied nurses' total knowledge & total practices score post intervention and the study hypothesis was supported.

Recommendations

- Updating knowledge and practices of nurses through continuous in-service educational programs emphasizing the importance of the evidence-based nursing practices of prevention of caesarean wound infection

Further Researches

- Evaluating the effect of educational program on women regarding prevention of caesarean section wound infection.

- Enhancing quality of care in maternity departments and capabilities to prevent prevention of caesarean section wound infection

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Original Article

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Perception regarding Objective Structured Clinical Examination and Traditional Clinical Examination among Nursing Students in North East India

[1]Dorjee Yanki, [2]lmchasenla Jamir, [3]Lolia Ozhu, [4]Puna Sunku, [5]Viddekhono Rhetso, [6]Bendangmenla Ao

[1-5]A Nursing Student, College of Nursing, Christian Institute of Health Sciences and Research (CIHSR) Nagaland. India, [6]Professor, College of Nursing, Christian Institute of Health Sciences and Research, Nagaland. India

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Abstract

Introduction: Evaluation and assessment is an important aspect for learning to assess the learner and provide feedback. This study aims to assess nursing students' perceptions regarding Objective Structured Clinical Examination (OSCE) and Traditional Clinical Examination (TCE).

Methods: A cross-sectional study was conducted using a total enumerative sampling technique with 122 Nursing students from the College of Nursing in Nagaland, India. A self-structured validated questionnaire, which had two sets of self-administered questionnaires on OSCE and TCE, with 15 questions, was administered to collect data on students' perception towards OSCE and TCE. The participants rated their responses using a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree," regarding the strengths and weaknesses of the practical methods employed.The students' responses were analyzed using descriptive and inferential statistics.

Results: The study revealed that out of 122 samples, 73.77% (90) had a good perception regarding OSCE, and only 26.22% (32) had an average perception. Concerning the Traditional Clinical (TCE) examination technique, 45.90% (56) had a good perception of TCE, and 54.09% (66) had an average perception. Many students found OSCE to be more organized, fair, and reliable, with minimal disturbance from patients during the examination, compared to TCE.There was a significant association between the perception of OSCE and TCE.

Conclusion: Student nurses' perception of practical and clinical assessment was found to prefer OSCE over TCE. Nurse educators can focus on using OSCE as an effective evaluation tool for students and further evaluate to improve the assessment method. However, students felt that a wide variety of clinical skills were also covered in TCE.

Keywords: Perception, Nursing students, Objective Structured Clinical Examination, Traditional Clinical Examination

Corresponding Author: Bendangmenla Ao - Professor, College of Nursing, Christian Institute of Health sciences and Research, Nagaland. India

E-mail:amenlapongen@gmail.com

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Introduction

Evaluation is vital in nursing practice because it supports an evidence-based approach to providing care. Evaluation can be formative or summative, occurring either during the development of a concept or at the end of a course. Methods, especially in practical exams, include projects, practical examinations, viva voce, OSCEs, and so on. In the nursing curriculum, different types of evaluations are employed for both theoretical and practical assessments. [1]

Miller's pyramid, introduced in 1989, provides a framework for various assessment methods with differing expected outcomes in training and education. The earlier assessment tools primarily included written exams, such as short-answer questions, essays, and multiple-choice questions, as well as bedside viva voce, targeting the initial levels of Miller's Pyramid of Assessment. However, higher levels of the pyramid, like "shows how" and "does," were not adequately assessed. [2]Components such as a lack of objectivity and inconsistency in assessment tools reduced the validity and practicality of the assessment tools.[3] To address these limitations, the objective structured clinical examination (OSCE) was introduced in 1975 by Harden to offer more objectivity and comprehensive evaluation of medical students. The high acceptance of OSCE was particularly evident during the COVID-19 pandemic when it was widely adopted to ensure smooth and continuous teaching and assessment for medical students. [5] Practical examinations are a vital part of nursing assessments, aimed at evaluating nursing competence or practical skills. Students undergo various steps and perform practical tasks, such as assessing patients, formulating nursing diagnoses based on priority, implementing, and evaluating care. [6]

The Objective Structured Clinical Examination (OSCE) is an exam specifically designed for medical health science. It encourages students to engage in active participation rather than just theory, enabling them to tackle real-world situations. [7] The OSCE is increasingly used in nursing education to assess clinical skill proficiency worldwide at pre-registration and post-graduate levels. [8]

The traditional evaluation methodassesses the practicesregarding the viva or oral practical examination. Vivas are used to assess communication skills and theoretical knowledge.[9]

A comparative study was conducted between OSCE and TCE among 96 undergraduate student nurses in Saudi Arabia. The study revealed statistically significant differences with a higher prevalence of agreement responses among students for OSCE. Most students (95.8%) exposed to OSCE, compared to 11.9% exposed to TCE, achieved excellent grades in the exam, scoring 90%-100%. The study recommended that OSCE must be used as an integral part of the undergraduate nursing student's clinical assessment.[10]

Similar study was conducted among 50 first-year MBBS students in Mumbai, the study results showed a positive perception of OSCE as a better stimulus for learning (58%), with a satisfactory content of OSPE (72%), perceived as fair and unbiased (54%), having effective administration (60%), and OSCE being considered better than TCE (52%). They felt a lack of fear of facing the examiner, which relieved their anxiety about the examination.[11, 12] The study concluded that students felt that OSCE is an objective, unbiased, and consistent examination method,had a better analysis of structure and level of coordination, and induced lesser anxiety and fatigue.

A similar study among160 BSc Nursing students found that OSCE was effective in terms of student preferences. There was no significant association between preference and the selected variables.[13,14,15]A similar study was conducted which showed that 77.1% of students believed that OSCE was a better exam than 61.9% of students in the TCE group. The study reported improvements in teaching quality (71.6%), connecting theory to practice (71.6%), decision-making skills (70.5%), evaluation methods (70%), and a well-developed exam structure (72%), compared to traditional methods. [10,16]

Although many existing works of literature reveal perceptions and preferences toward OSCE and TCE at different levels among nursing students and the frequency of their administration, OSCE is a relatively new evaluative system in the field of nursing. Therefore, assessing the preferences and perceptions of these two evaluation methods is important for developing a better assessment system. While studies have been conducted at the international and national levels, the application of OSCE in our region is relatively recent, and no studies have yet been performed among nursing students in northeast India. This has motivated us to assess the perceptions of current nursing students regarding OSCE and TCE

Materials and Method

The study design is aCross Sectional Research Design. The study sample consisted of nursing students from the College of Nursing in Dimapur, Nagaland, located in Northeast India. The population consisted of the Nursing students from all programsthree-year Diploma in Nursing (GNM - General Nursing and Midwifery), a two-year Post Basic BSc (Post Basic BSc), and a four-year BSc program (Bachelor of Science). The sample size was determined based on the findings of the pilot study. During the study, 12 observations were made (p = 12), with an estimated sample size of 162 at a 95% confidence level and a 5% margin of error. However, during the main study, 122 samples were recruited, due to practical constraints of participant's unavailability during the data collection period, including limited availability of eligible participants, absenteeism, and non-consent despite repeated follow-ups.The sample size was lower than the estimated requirement as only students who voluntarily provided informed consent were included in the study, which may have resulted in reduced statistical power, resulting in its limitation for generalisability. Total enumerative sampling technique was used to select the participants from the one and only College of Nursing in Dimapur. The inclusion criteria for the study were students who had attempted both OSCE and TCE two or more times.

The research data collection instrument was a self-structured, validated questionnaire. It was a self-administered questionnaire where participants filled it out themselves. Content validity was established by a panel of five experts using a four-point relevance rating scale. The Content Validity Index (CVI) was 0.91, reflecting excellent content validity of the instrument. The instrument was piloted with 12 samples. The questionnaire contained two similar sets of self-administered questions on OSCE and TCE, each with 15 questions using a 5-point Likert scale. It was in English. The instrument had two components: the first was demographic variables, and the second was a perception scale. The 5-point Likert scale ranged from 1 (Disagree) to 5 (Strongly Agree). By summing the responses for each item, scores were graded as ≥70 = good perception, 69 to 40 = average perception, and ≤40 = poor perception.

Data analysis was done using Descriptive and Inferential Statistical methods. Frequency and percentages were used for descriptive analysis, and chi-square was used to find association across the different courses of nursing and the number of times they have appeared for OSCE and TCE at $p>0.05$ with CI at 95%.The research approval was granted by College of Nursing research committee Research committee with study number 009/2021/NRC-CIHSR. Informed consent was obtained from all the participants before recruiting them to the study.

Results

The data was collected from 122 Nursing students of the College of Nursing, CIHSR,to assess students' perceptions regarding OSCE and TCE.

Table 1: For OSCE, 17 (13.93%) appeared OSCE only two times, and105(86.07%) appeared more than two times. Regarding TCE, 66(54.10%) appeared more than two times.

In this study, based on the perception questionnaire about the OSCE, out of 122 students, 78 (63.93%) agreed that students' mistakes could be corrected between the teacher and students after the exam. 76 (62.26%) perceived that it is well organized, and 69 (56.55%) find it fair and reliable. 78 (63.93%) see it as objective, fair, and not too distracting during the exam, 70 (57.37%). (Supplementary Table 2a)

Table 1. Distribution of demographic data

SL NO	DEMOGRAPHIC VARIABLES	FREQUENCY (f) n=122	PERCENTAGE (%)
1	**TYPE OF COURSE**		
A	GNM	30	24.59%
B	BSc Nursing (BSc)	75	61.48%
c	Post Basic BSc Nursing (PBBSc)	17	13.93%
2	**NUMBER OF TIMES APPEARED FOR OSCE AND TCE.**		
i	OSCE		
a	Two times	17	13.93%
b	More than two times	105	86.07%
ii	**TCE**	s	
a	Two times	56	45.90%
b	More than two times	66	54.10%

Note. OSCE (Objective structured clinical examination), (TCE) Traditional clinical examination GNM (General Nursing and Midwife)

Overall most students (73.77%) had a good perception of OSCE. (Fig.1), and only (45.90%) had a good perception of TCE. (Fig.2)

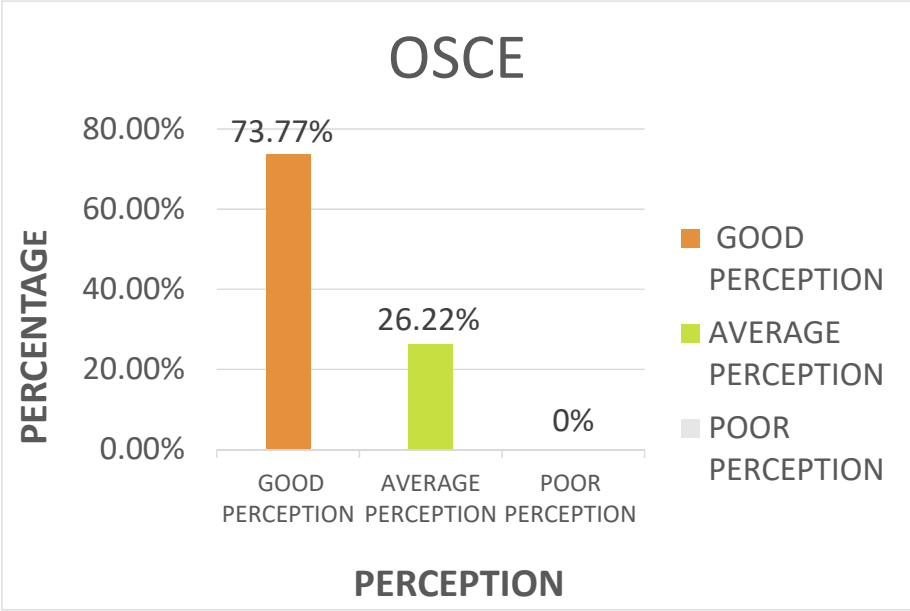


Figure 1: Overall Nursing Student Perception Regarding OSCE

Most students (73.77%) had a good perception of OSCE. None of the Students had a poor perception.

Note: OSCE (Objective structured clinical examination)

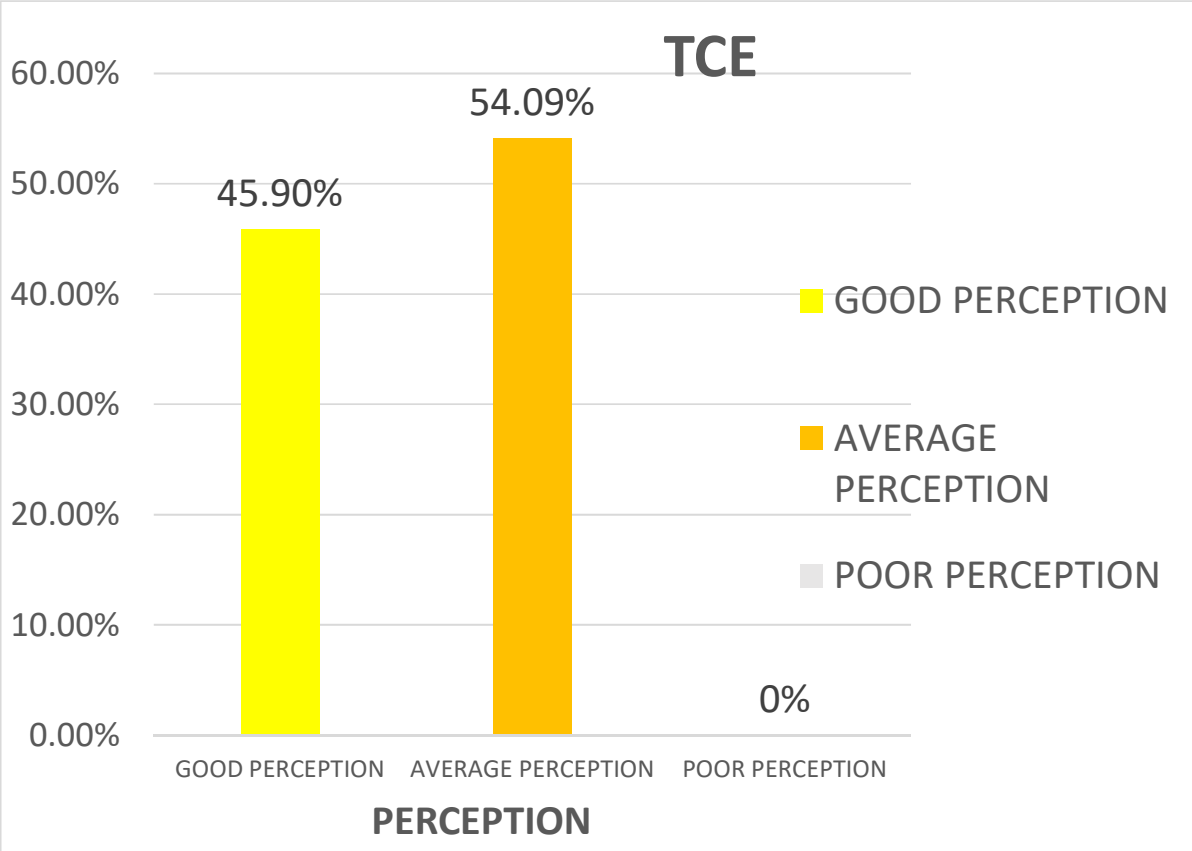


Figure 2: Overall Nursing Students' Perception Regarding TCE

Most students (54.09%) had an average perception of TCE, and (45.90%) of the students had good perceptions. None of the students had poor perception.

Note: TCE (Traditional clinical examination)

On the other hand, regarding the perception of students regarding the TCE, out of 122 students, 73(59.83%) agreed that students are fully aware of the exam's nature and evaluation method. 56 (45.90%) reported that it has lots of distractions with lots of noise. 47 (38.52%) agree that teachers closely observe each student and have fewer chances of biases. 50 (40.98%) agree that time allotment is less, and 71(58.19%) feel that a wide variety of clinical skills are covered in TCE.

As shown in Table 3, participants demonstrated a significantly better perception of OSCE 90 (73.77%) than TCA 56 (45.90%).

Table 3. Distribution of overall perception of OSCE and TCA

OSCE1	FREQUENCY (f) n=122	PERCENTAGE (%)
Good	90	**73.77**%
Average	32	26.22%
TCA		
Good	56	45.90%
Average	66	54.09

ASSOCIATION OF PERCEPTION WITH COURSE AND NUMBER OF TIMES

Table 4 (a) Association of perception of OSCE/TCE with Demographic variables:

Perception of OSCE			**P-value calculated by Chi-square**	**P value**
Course	Good	Average		
GNM	25	5		
BSC	54	21		
PBBSc	11	6	2.23	>0.05
NO OF TIMES				
Two times	11	6		
>2times	79	26	0.82	>0.05
Perception of TCE			**P Value calculated by Chi-square**	**P value**
Course	Good	Average		
GNM	21	9		
BSC	25	50		
PBBSc	10	7	12.9	*<0.05
NO OF TIMES				
Two times	26	30		
>2times	30	36	0.08	>0.05

*Association that was found to be significant at a p-value of 0.05%

Result: There was a statistically significant association of TCE with the various courses of BSc, GNM & PBBSc course at the 5% level of significance (0.05%). No association was found with the other demographic variables.

Discussion of Findings

The study aimed to determine students' perceptions of OSCE and TCE. Our study found that out of 122 students, 90(73.77%) had a good perception of OSCE, while only 56(45.90%) had a good perception of TCE. The study also reported that 76 (62.29%) agreed that OSCE is well-organized and structured, and 63 (51.63%) agreed that there is a uniform scenario for all students, which is fair in assessment, thereby decreasing the chance of bias.A similar study reported that 95.4% agreed the OSCE examination was well-organized, well-structured, and appropriately sequenced, less stressful, allowing students to compensate in some areas and minimize the risk of failure. Thenursing students agreed that the OSCE was fair in testing knowledge and skills, and minimized their chance of failure in the exam compared to other test formats.[17,18,19,20]. However, in another study conducted in Egypt, 52.7% of the respondents believed that the OSCE examination is more complex than a written examination, and 69% found it exhausting and lengthy. In comparison, 88% found itmore stressful. [21,22] Many students preferred OSCE more, perhaps because they had gone through the process multiple times and found it familiar and more accessible.

The present study revealed that 70% of GNM students had a positive perception, while 30% had an average perception of traditional examinations. In contrast, only 33.33% of BSc students had a good perception,while 66.67% had an average perception. Additionally, 59% of Pbbsc students had a good perception, and 41% had an average perception. In the study reported by Mondal,73.8% of the students expressed a preference for OSCE as a better formative assessment tool, whereas 9.5% preferred conventional examinations.[23] In comparison, a study reported by Mohamed showed a significantly higher(percentage) 89.6% for OSCE compared to TCE (76.2%). Students in OSCE agreed that the environment was noise-free, there was enough light, and the exam was more well-structured than those in TCE.[10] Across-sectional study on OSCE vs. TCEstudent perception and preference in Nigerian Medical School who were previously exposed to OSCE and TCE using a structured questionnaire. The study revealed that 131 (84%) respondents felt TCE was a more complex examination, and 142 (91%) felt OSCE was easier to pass. It concluded that students preferred OSCE as a method of assessing clinical competence and considered it a more valid and reliable examination method. No significant association was found between OSCE and courses ($p < 0.05$), but a Significant association was found between TCE and courses ($p < 0.05$). A study by Dhandapani found that 85.51% of nursing students had favorableattitudes, and 13.77% had moderately goodattitudestoward OSCE.[14]

Association of the level of attitude towards OSCE among B.Sc. Nursing students with their selected demographic variables, Age, had a significant association with the level of attitude. The other demographic variables did not show a statistically significant association with the level of attitude toward OSCE.

Conclusion and Recommendation

This study found that student nurses preferred OSCE over TCE. Many students performed OSCE more than twice as often as TCE, which may have increased their familiarity with the process. Students considered OSCE to be more organized, fair, and reliable, with minimal disturbance from patients during the exam, compared to TCE, where they felt the time allotment was insufficient. However, students believed that TCE covered a broader range of clinical skills. Therefore, it is highly recommended that nurse educators and faculty explore different clinical assessment methods, evaluate students' preferences, and emphasize the importance of identifying areas for improvement to enhance learning. The study can help the researcher gain insight into the examination process and improve their scores. A similar study using an experimental research design could be conducted to measure students' knowledge and attitudes regarding OSCE and TCE.

Ethical Approval

The research approval was granted by College of Nursing research committee Research committee with study number 009/2021/NRC-CIHSR. Informed consent was obtained from all the participants before recruiting them to the study

Competing Interest: The authors declare that there are no conflicts of interest associated with this manuscript.

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Impact of Emotional Intelligence and Self-Efficacy on Self-Esteem Among Nursing Students

[1]Sarayu Priya Muthukrishnan, [2]Golden Catherine T, [3]Rajila S, [4]Annlin Smila S

[1]Principal Department of Child Health Nursing, Dr. Jeyasekharan College of Nursing, Nagercoil, Kanyakumari Dist., Tamil Nadu, India, [2]HOD cum Professor, Department of Mental Health Nursing, Dr. Jeyasekharan College of Nursing, Nagercoil, Kanyakumari Dist., Tamil Nadu, India, [3]Professor, Department of Obstetrics and Gynaecological Nursing Dr. Jeyasekharan College of Nursing, Nagercoil, Kanyakumari Dist., Tamil Nadu, India [4]Associate Professor, Department of Medical Surgical Nursing Dr. Jeyasekharan College of Nursing, Nagercoil, Kanyakumari Dist., Tamil Nadu, India

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Abstract

Introduction: Nursing is a profession that demands not only clinical competence but also strong emotional and psychological adaptability. Objectives of the study were to correlate the level of emotional intelligence and self-efficacy on self-esteem and to associate the level of emotional intelligence, self-efficacy, and self-esteem with their selected sociodemographic variables.

Methods: Descriptive cross-sectional research design was used for the research. 289 samples were taken using the complete enumerative sampling technique. The Rosenberg Self-Esteem Scale, the General Self-Efficacy Scale, and the Schutte Self-Report Emotional Intelligence Test (SSEIT) were the tools of the study. The data gathered at the selected nursing college was analyzed by descriptive and inferential statistical methods, and interpretations were made based on the objectives of the study.

Results: The study results show that a moderate positive correlation between emotional intelligence and self-esteem was observed with r = 0.64; on the other hand, a strong positive correlation of r = 0.97 was observed for self-efficacy & self-esteem. Association of the demographic variables revealed that age, course, year of the study, and religion were associated with emotional intelligence at chi-square 0.0270, 0.0038, and 0.0417, respectively, at $p < 0.5$ level at 95% CI.
Conclusion: The study emphasizes that emotional intelligence, self-esteem, and self-efficacy are interrelated constructs influencing one another and that certain demographic factors play a significant role in shaping emotional intelligence among the participants. Promoting emotional intelligence and self-efficacy through targeted educational and psychological interventions may therefore enhance students' overall self-esteem and personal growth.

Key words: *Emotional intelligence,self-efficacy,self-esteem,nursing students*

Corresponding Author: Sarayu Priya Muthukrishnan, MSc (N), PhD Principal Department of Child Health Nursing, Dr. Jeyasekharan College of Nursing, Nagercoil, Kanyakumari Dist., Tamil Nadu, India.

E-mail: sarayukalai@gmail.com

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Introduction

Nursing is a profession that demands not only clinical competence but also strong emotional and psychological adaptability. Emotional intelligence is the ability to identify, understand, and manage one's own emotions as well as those of others. Likewise, self-efficacy, which refers to an individual's belief in their own abilities to accomplish tasks and overcome challenges, contributes significantly to confidence and motivation levels among students. Self-esteem, or the overall self-worth a person feels, is essential for mental well-being and academic success.

As nursing students navigate demanding academic requirements and emotionally charged clinical situations, their emotional intelligence and self-efficacy influence their level of self-esteem. This interrelationship is particularly important because poor self-esteem can lead to increased anxiety, decreased academic performance, and even dropout from nursing programs. Therefore, examining how emotional intelligence and self-efficacy affect self-esteem can help educators develop targeted interventions to strengthen students' emotional health and academic resilience.

Need and Significance in Nursing

The modern healthcare environment demands emotionally resilient, competent, and confident nurses. The rigorous nature of nursing education exposes students to multiple stressors such as high academic workloads, patient care responsibilities, and frequent exposure to suffering and death. These stressors can negatively affect their self-esteem and mental well-being if not managed appropriately.

There is a growing recognition of the importance of emotional intelligence and self-efficacy as protective psychological factors[1] that can buffer against low self-esteem and burnout. Understanding how these traits influence self-esteem will help in designing mental health and personality development programs, enhancing student retention and academic performance, and helping in promoting better coping strategies and communication in clinical practice.

This study is significant because it will provide insights for nurse educators and curriculum planners to foster emotional intelligence and self-efficacy skills in nursing education, ultimately contributing to the development of emotionally strong, self-assured future nurses.

A study conducted by **Merin B.(2023)[2]** on the effectiveness of psychodrama therapy in improving self-esteem among 2nd-year B.Sc. Nursing students in a selected college in Kanyakumari. Using convenient sampling, 40 students were divided into experimental (n=20) and control (n=20) groups. The Rosenberg Self-Esteem Scale was administered after collecting demographic data. Post-intervention revealed 65% of them to have very high self-esteem and 35% with moderate self-esteem, with no cases of very low self-esteem.

Banappagoudar S, Ajetha DS, Parveen A, Gomathi S, Subashini SP, Malhotra P. (2022)[3] conducted a descriptive study at Rama Nursing College, Kanpur, involving 210 nursing students selected through non-purposive sampling. Data were collected using a two-part questionnaire: socio-demographics and the Rosenberg Self-Esteem Scale. Findings showed 73.3% had normal self-esteem, 23.8% low, and 2.9% high. Chi-square analysis revealed a significant association between self-esteem and stress levels. However, these studies did not explore the combined effect of emotional intelligence and self-efficacy on self-esteem, particularly in the context of nursing education.

Bsharat, F.,(2024)[4] a cross-sectional study conducted at the Arab American University. The study aimed to examine the relationship between emotional intelligence and self-esteem in 225 fourth-year nursing students, using convenience sampling. Tools included the Schutte Self-Report Emotional Intelligence Test and Rosenberg Self-Esteem Scale. Results showed high emotional intelligence (mean 151.3±1.9) and high self-esteem (mean 24.3±3.5), with a moderate positive correlation between the two variables

Statement of the Problem

A descriptive study to assess the relationship of emotional intelligence and self-efficacy with self-esteem among undergraduate nursing students in Dr Jeyasekharan College of Nursing, Tamil Nadu

Objectives

The objectives of the study were to assess the emotional intelligence, self-efficacy, and self-esteem among nursing students; to correlate the level of emotional intelligence and self-efficacy with self-esteem; and to associate the level of emotional intelligence, self-efficacy, and self-esteem with their selected sociodemographic variables.

Methodology

A quantitative research approach with a descriptive cross-sectional survey research design was adopted. The study was conducted at a selected college. The complete enumerative sampling technique was adopted. Sample size was 289. The study was conducted at Dr. Jeyasekharan College of Nursing among the B.Sc. Nursing and DGNM students for one week.

Method of Data Collection

The formal administrative permission was obtained from the correspondent and principal. Ethical approval obtained from internal ethical committee (Ref No.JMT-CON/PERMISSION/11938/2024) in the month of July. Informed consent was obtained. Formal permissions were obtained to use the standardized tools in the study. All nursing students were included as samples. The procedure was explained to each participant with confidentiality and anonymity. Self-structured socio-demographic data sheet administered to elicit demographic variables. The Rosenberg Self-Esteem Scale was used to assess self-esteem with 10 items scored on a 4-point scale (0-30). The General Self-Efficacy Scale is a self-report measure of self-efficacy with 10 items with scores ranging from 10 to 40, with higher scores indicating more self-efficacy and the Schutte Self-Report Emotional Intelligence Test (SSEIT) is a 5-point Likert scale, with scores from 33 to 165 were administered. The data sheets were coded, and the files were kept under lock and key.

Demographic variables were analyzed with frequency and percentage distribution. Mean percentages and standard deviations were used to compute the level of emotional intelligence, self-efficacy, and self-esteem. Pearson's correlation coefficient examined relationships, and the chi-square test assessed associations with demographic variables with significance level.

Data Interpretation

The majority of participants (n=150) were aged 19–20 years, while only one participant was older than 22 years. 237 were female and 52 male. 235 of them were undergraduate students, and 54 were diploma holders. 78 were in their first year and 59 in their fourth year. 287 had completed their higher secondary and 2 other qualifications. 182 were from rural areas and 107 from urban areas. 108 were Hindu, and 6 were Muslim. 11 had a family income ≥ ₹159,586.51, and 119 of them were in the ₹39,830-₹79,755 category.

Assessment of Emotional Intelligence, Self-Esteem and Self-Efficacy

Score	Emotional Intelligence		Self-Esteem		Self-Efficacy	
	frequency	percentage (%)	frequency	Percentage (%)	frequency	percentage (%)
High	18	6.23%	281	97.23%	262	90.66%
Moderate	243	84.08%	8	2.77%	21	7.27%
Low	28	9.69%	0	0.00%	6	2.08%

Correlation of Emotional Intelligence and Self-Efficacy on Self-Esteem

According to Cohen's guidelines, an r value of 0.64 ($p<0.05$) indicates a moderate-to-strong correlation and a very strong positive correlation with an r value of 0.97 ($p<0.05$) for self-efficacy & self-esteem. Emotional intelligence and self-efficacy were correlated with r = 0.66. Nursing students with higher emotional intelligence tend to have higher self-esteem.

Association of emotional intelligence, self-esteem and self-efficacy with selected sociodemographic variables.

	Emotional Intelligence		Self-Esteem		Self-Efficacy	
Demographic variables	**Chi square**	**P value**	**Chi square**	**P value**	**Chi square**	**P value**
Age	7.22	**0.0270 ***	1.14	0.5659	5.19	0.0748
Gender	4.49	0.6103	2.79	0.8351	5.68	0.4598
Course	19.22	**0.0038 ***	3.13	0.7930	8.53	0.2016
Year of study	13.08	**0.0417 ***	8.57	0.1995	8.23	0.2221
Previous qualification	1.29	0.5258	5.27	0.0716	2.89	0.2354
Residence	6.77	0.1486	0.96	0.9152	5.51	0.2386
Religion	14.73	**0.0053***	8.09	0.0883	16.10	**0.0029 ***
Family income	0.47	0.7910	1.72	0.4241	0.06	0.9689

Discussion

The majority of the nursing students had moderate emotional intelligence, high self-esteem, and high self-efficacy. A moderate positive correlation between emotional intelligence and self-esteem was observed with r = 0.64; on the other hand, a strong positive correlation of r = 0.97 was observed for self-efficacy & self-esteem. There was a moderate correlation between emotional intelligence and self-efficacy, with an r value of 0.66. A cross-sectional survey conducted on B.Sc. nursing students revealed a significant positive relationship between emotional intelligence and self-esteem. 60 samples were screened using the self-report questionnaires for emotional intelligence, self-esteem, and empathy. The mean self-esteem score of nursing students was 17.27; a positive correlation of 0.548 was found at $p < 0.05$.

Association of the demographic variables revealed that age was significantly associated with a p-value of 0.0270 at $p<0.05$, course of study was significantly associated with a p-value of 0.0270, year of the study with a p-value of 0.0038, and religion with a p-value of 0.0417, respectively. A similar study was conducted by **Rodríguez ES, Martínez ME, Presa CL(2023)**[5] to correlate emotional intelligence and age. 111 first year and 101 final year undergraduates participated in the study. Trait Emotional Intelligence Questionnaire was adopted. The study findings concluded stating the drastic change in the emotional intelligence level of students in first year to third year with mean 154.40 at 95% confidence interval compared to the third year mean value 162.01.

This is consistent with earlier research. For instance, **Bsharat, F., (2024)**[4]identified a moderate positive relationship between emotional intelligence and self-esteem among final-year nursing students.

Karaca et al. (2019)[6] reported that nursing students with higher emotional intelligence had better coping mechanisms and self-worth. A study by **Rao & Kemparaj (2021)**[7] found a strong relationship between emotional intelligence, self-efficacy, and academic performance among nursing

students. Similar findings were observed by **Alavi, N.M., (2016)**[8], where self-efficacy positively predicted self-esteem in nursing students.

As future nurse leaders, students must be equipped not only with clinical skills but also with self-assurance, emotional maturity, and adaptability—traits built through targeted emotional intelligence and self-efficacy training. When such psychological strengths are cultivated during the "learning" phase, students are better positioned to "lead" in tomorrow's complex healthcare environments.

The findings showed a significant positive correlation between emotional intelligence and self-esteem, as well as between self-efficacy and self-esteem.

Recommendation

- Incorporate emotional intelligence training and personality development modules into the nursing curriculum.
- Conduct workshops and seminars to strengthen self-efficacy and communication skills.
- Offer regular counseling services to help students manage academic and clinical stress.
- Create mentorship programs where senior students help juniors build confidence.
- Future research should explore the long-term impact of emotional intelligence and self-efficacy training on professional performance.

Conclusion

The journey of a nursing student is not only academic but deeply personal and emotional.. It starts with curiosity and ends with confidence. Nursing students undergo a structured series of changes as they cross each year of their study. Self-esteem is highly reliant on emotional intelligence and self-efficacy. Self-efficacy is the innate belief about one`s own potentials and it is indeed seen high in most of the nursing students as they master the skills of the profession. On the other hand emotional intelligence is the mastery of emotions which is still in the area of concern. A longitudinal study is planned to be conducted by adopting various settings.

The study revealed a significant positive relationship between emotional intelligence, self-efficacy, and self-esteem among nursing students. These psychological factors play a vital role in student well-being and professional development. Enhancing these qualities through structured interventions can promote emotional resilience, academic excellence, and better patient care outcomes in the future. This study confirms that emotional intelligence and self-efficacy play a crucial role in shaping self-esteem, which in turn influences students' growth into confident and competent future professionals.

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Is The Microlearning Approach A New Way to Influence Learners' Attitudes Towards Nursing Bioscience Education?

[1]Snezana Kusljic, [2]Aleksandra Kusljic

[1]Associate Professor, Department of Nursing, The University of Melbourne, Parkville, Victoria, Australia, [2] BSci & MPH, Department of Nursing , The University of Melbourne, Parkville, Victoria, Australia

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Abstract

Objective: Historically, nursing students have found bioscience subjects challenging and anxiety provoking. To alleviate these factors, an online industry-based short course, *Biochemical Basis for Human Life (BBHL)* was developed. A survey with narrative analysis was used to explore learners' experience and satisfaction with the course and evaluate the effectiveness of microlearning approach in delivering nursing bioscience education.

Methods: Learners enrolled in the short course and following the course completion, they were invited to submit the End of Course Feedback survey. The survey included quantitative measures of course satisfaction, demographics pertaining to learners' country of origin and two open ended qualitative questions.

Results: A total of 444 learners were enrolled in the course, with 33.3% completion rate (148/444). Out of the learners who completed the course, 89.9% (133/148) completed the End of Course Feedback survey. Across all questions, agreement rates exceeded 90%, with negligible disagreement or nonresponse in relation to course satisfaction. Out of the learners who provided a qualitative response, majority expressed positive attitudes towards course delivery and course impact.

Conclusions: This study highlighted the beneficial nature of the course and its microlearning approach in relation to nursing bioscience education. Furthermore, this study provides a new strategy for educators where a bite-sized learning can be used as pre-classroom preparation for students to enhance student engagement and decrease burden associated with extensive material coverage in the classroom.

Keywords: Bioscience education; Microlearning; Nursing; Teaching models; Workforce development

Introduction

An understanding of bioscientific concepts is critical for nurses to deliver effective, evidence-based, safe, and patient-centered care[1,2]. Historically, nursing students have found bioscience subjects challenging and anxiety provoking[3-6] which in turn created the negative attitudes towards bioscience learning[3]. There are many factors that can influence the landscape of bioscience education including different program stages of student's learning , prior knowledge , and ability to apply biosciences to a clinically

Corresponding Author: Snezana Kusljic, Associate Professor The University of Melbourne Department of Nursing, Level 6, Alan Gilbert Building 161 Barry Street, Parkville, Victoria, 3010, Australia.

E-mail: skusljic@unimelb.edu.au;

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relevant situation. For example, a cross-sectional exploratory survey of final year entry-to-practice (undergraduate) nursing students revealed that students who did not complete science in secondary school found bioscience subjects (e.g., anatomy, physiology) difficult to learn whereas those with secondary school science had a better understanding of bioscience and its application to clinical situations[4].

Undergraduate nursing students are often challenged with bioscience subjects for various reasons including the large volumes of content, complexity behind science terminology, limited time to grasp the concepts and apply it to practice[6-9]. While acknowledging a significant challenge during their undergraduate studies, registered nurses wanted more bioscience with greater relevance to nursing practice which they considered crucial in their clinical roles[7]. Registered nurses also reported that limited exposure to bioscience education in their undergraduate program led to inadequate preparation for their clinical roles[10, 11] and a lack of confidence in their bioscience knowledge[12]. Interestingly, registered nurses undertaking bioscience subjects in their postgraduate studies indicated a confidence boost in their bioscience knowledge and application to nursing practice[13].

Academics have employed various educational approaches and teaching methods to deliver bioscience content and enhance bioscience learning including online learning platforms[5], clinically-relevant real-life nursing scenarios[14], virtual reality[15], classroom lectures and group seminars[16]. However, no single educational model was singled out to be the most effective[8]. Therefore, to bridge the gap between postgraduate nursing students' desire to have more bioscience content and undergraduate nursing students' challenges to grasp bioscientific concepts and apply these to practice, wide-angle research is required. Implementation of educational approaches in the preparatory stage before students commence their nursing studies whether undergraduate or postgraduate could contribute to an attitude shift towards bioscience subjects.

A short online course entitled *Biochemical Basis for Human Life* was developed to equip future students with knowledge of the basic concepts of anatomy, physiology, and biochemistry. This industry-based course is not linked to any academic award degree or program and was designed for potential students who are planning to undertake a range of nursing academic programs including Master of Nursing Science (MNSci) entry-to-practice, specialty and advanced programs such as nurse practitioners. Additionally, some individuals undertaking this industry-based course might have already been registered clinicians, i.e. nurses, and they enrolled in the course to refresh their bioscience knowledge rather than pursue additional academic training. Therefore, in this manuscript we use term 'learners' rather than 'students.' The course consists of 5 interactive course units or tutorials, 10 case-based reflective exercises to practice application and 5 tutorial unit self-assessments, and it is delivered through an online learning platform. The learner accesses the materials through a web browser on any device including a mobile phone and works through the materials in a self-directed fashion. The aim of this research is to a) identify learner satisfaction with the course content and its relevance in their current or future role and b) evaluate the effectiveness of pedagogical approaches in delivering bioscience theory and applying it to clinical practice.

Methods

Features of the Short Course

Biochemical Basis for Human Life (BBHL) integrates relevant bioscientific theories with general clinical contexts and it requires approximately 15 hours of learning. A Certificate of Completion is provided upon satisfactory completion of self-assessments and case-based reflective exercises. Utilizing constructivist and humanistic teaching practices, the course design integrates both problem and inquiry-based learning and covers the fundamentals of human life from structural, functional, and chemical angles. Clinical contexts are embedded into the content to enable early exposure and reinforcement of the importance and relevance of understanding bioscientific concepts.

Study Design

A survey with narrative analysis was used to explore learners' experience and satisfaction with the course. The survey included a quantitative questionnaire design for six (6) questions and two (2) open ended qualitative questions to capture ideas from learners about the course.

Participants and Data Collection

Learners enrolled in the course through the Mobile Learning Unit and upon paying the course fee, they agreed with the Magento Store Policy T&Cs including collection of demographic data such as country of origin. Following the course completion,learners submitted the End of Course Feedback survey. The survey captured data relating to learners' satisfaction with the course in two domains: course delivery and course impact. Using two (2) open ended questions, learners were invited to share their perspectives on the relevance and appropriateness of the course content, as well as the overall accessibility of the course materials and resources available to them. All survey responses were anonymized. The survey included quantitative measures of course satisfaction which were measured on a 5-point Likert scale (strongly agree to strongly disagree) and demographics pertaining to learners' country of origin. The two (2) open ended qualitative questions asked learners the following: "*Do you have any additional comments regarding course delivery?*" and "*Do you have any additional comments regarding course impact?*".

Quantitative Data Analysis

Quantitative data from the survey was analyzed using *Microsoft Excel*. The survey measured student satisfaction across the course delivery and impact capturing the material accessibility and interactivity, application of learning to day-to-day practice, appropriateness for current or future role, and overall expectations. Responses were recorded on a five-point Likert scale (1= Strongly Disagree, 5 = Strongly Agree), with an additional "Not Applicable" option where relevant. Descriptive statistics, that is, frequency and percentages were calculated to summarize satisfaction levels for each item.

Qualitative Data Analysis

Open-ended survey responses were analyzed using a qualitative data analysis approach which was informed by the framework proposed by O'Cathain and Thomas (2004). Responses were imported into NVivo 15 (QSR International) for systematic coding. An inductive coding strategy was employed, allowing themes to emerge directly from the data. Initial coding was conducted line-by-line, with codes grouped into categories and refined into overarching themes through iterative comparison. Following the mentioned framework guidance, the analysis treated open-ended responses as a legitimate qualitative dataset[17].

Results

Learner country of origin

A total of 444 learners were enrolled in the course. The majority were from Australia (n = 315; 70.9%), followed by smaller numbers from China (n=16; 3.6%), South Korea (n=5; 1.1%), the United States (n=4; 0.9%), and New Zealand (n=4; 0.9%). Single learners were recorded from Hong King, the United Kingdom, the United Arab Emirates, Kenya, Nigeria, Vietnam, Indonesia, Ireland, Macao SAR China, Singapore, and Taiwan (each n = 1; 0.23%). Two students/learners (0.45%) were from India, and three (0.68%) from Taiwan. A large proportion of students (n = 85; 19.1%) preferred not to disclose their country of origin.

Table 1. Learner country of origin.

Country	n (%) learners
Australia	315 (71)
Hong Kong	1 (0.2)

Continue....

United Kingdom	1 (0.2)
United States	4 (0.9)
United Arab Emirates	1 (0.2)
Taiwan	3 (0.7)
Kenya	1 (0.2)
China	16 (3.6)
India	2 (0.5)
New Zealand	4 (0.9)
Nigeria	1 (0.2)
South Korea	5 (1.1)
Vietnam	1 (0.2)
Indonesia	1 (0.2)
Ireland	1 (0.2)
Macao SAR China	1 (0.2)
Singapore	1 (0.2)
Rather not say	85 (19.1)
Total	444

Learner Satisfaction with The Course – Quantitative

Out of 444 enrolled, 148 participants or 33.3% completed the course with a total number of 133 completing the End of Course Feedback survey. Overall, responses indicated high levels of satisfaction with the accessibility, interactivity, and relevance of the course content (Table 2). Almost all respondents agreed that the course materials were easy to access online, with 98 participants (73.7%) *strongly agreeing* and 35 (26.3%) *agreeing* (Q1). Similarly, most respondents found the course content to be interactive with 77 (57.9%) *strongly agreeing* and 44 (33.1% *agreeing*), while only 11 (8.3% *disagreed*).

Table 2. Learner responses to End of Course Feedback survey.

Please note that learners were not required to answer all questions hence variability in number of responses.

Question	**Strongly Agree n (%)**	**Agree n (%)**	**Disagree n (%)**	**Strongly Disagree n (%)**	**Not Applicable n (%)**	**Total (n)**
Q1. It was easy to access course materials online	98 (73.7%)	35 (26.3%)	0 (0%)	0 (0%)	0 (0%)	133
Q2. The course content was interactive	77 (57.9%)	44 (33.1%)	11 (8.3%)	0 (0%)	1 (0.8%)	133
Q3. I can apply what I have learned to my day-to-day practice	67 (50.4%)	52 (39.1%)	3 (2.3%)	0 (0%)	11 (8.3%)	133

Continue....

Q4. I would recommend the course to my peers	79 (59.4%)	51 (38.3%)	1 (0.8%)	0 (0%)	2 (1.5%)	133
Q5. The course was appropriate/ relevant for me in my current or future role	76 (57.1%)	50 (37.6%)	6 (4.5%)	0 (0%)	1 (0.8%)	133
Q6. The course delivered was what I expected	52 (54.7%)	39 (41.1%)	3 (3.2%)	1 (1.1%)	0 (0%)	95

Regarding the application of learning to practice, 67 participants (50.4%) *strongly agreed* and 52 (39.1%) *agreed* that they had applied what they learned to their day-to-day work (Q3). A comparable pattern was observed for participants' willingness to recommend the course to peers (Q4), with 79 (59.4%) *strongly agreeing* and 51 (38.3%) *agreeing*, and only 1 (0.8%) *disagreeing*.Perceptions of course relevance were similarly positive (Q5), with most respondents indicating that the course content was appropriate to their current roles; however, data for this item was incomplete in the dataset. Finally, more than 95% of respondents agreed that the course met their expectations (Q6), with 52 (54.7%) *strongly agreeing*, 39 (41.1%) *agreeing*, and only 4.3% reporting any level of disagreement. Thus, across all items i.e., all six questions, agreement rates exceeded 90%, with negligible disagreement or nonresponse.

Learner Perceptions of the Course and Ideas for Improvement – Qualitative

Learners' responses to two (2) open-ended questions on course impact and course delivery ranged from a singular word to a few sentences. Many learners chose not to provide further comments pertaining to these two questions. Out of the learners that provided a response, majority expressed positive attitudes towards course delivery and course impact. Three key themes were identified across both open-ended questions and these included: (1) content and relevance, (2) accessibility and delivery and (3) learning modalities. Illustrative quotes were provided, and these were followed by the respondent's identification number (ID) numbers.

Content and relevance

Most learners felt that the course content was too easy with a lack of detail, however they still found the course to be useful as a part of bioscience learning.

"Could have been made a bit trickier." [9]

"It was a bit more basic than I expected, but I still learned a lot." [27]

"The course is great, and I think it may be more useful for me if the course will be more details in anatomy." [86]

"This course is not detailed enough." [92]

In contrast, one learner found the content difficult to follow, suggesting a need for more background information to aid understanding.

"Some parts, specially the first few tutorials, were a bit hard to follow, as I personally felt lost. It has been a long time since most of us have read these subjects. If more background information was provided, it would have been more effective." [86]

Learners have also noted that the course was appropriate and relevant to their roles whether they are students and/or qualified nurses.

"The course has successfully equipped me with the basic knowledge i need before pursing MNSc course." [84]

"I undertook this course, as a refresher. I am a registered nurse of some 20+ years and this course really was supportive in my learning and refreshing of my knowledge." [19]

"Now that I am a practicing nurse, I have more clarity about human physiology and it gives great impact on my practice." [79]

Furthermore, many learners found that the course was informative and beneficial in relation to expanding their knowledge of bioscience and at the same time serving as a good refresher course.

'It provides me with basic knowledge of human biology.' [25]

'Thank you for all the content and i have understand much more through this course. this is really helped me a lot.'[82]

"Overall, I enjoy studying the course, which is a good refresher course for me to revise my science knowledge. Through learning from the course, I managed to recall back the science knowledge that I learned from bachelor degree about 20 years ago! "[19]

Accessibility and delivery

With respect to course delivery a multitude of learners stated that the course was easily accessible and straightforward to use. Additionally, learners expressed positive sentiments towards course delivery in that it was well delivered and uniform throughout.

"Easily accessible and to follow." [13]

"The overall layout was easy to navigate and understand which is excellent." [95]

"The course was well delivered." [88]

"it is consistent." [33]

Learning modalities

This theme revealed conflicting opinions from respondents regarding the course's learning modalities. Many learners expressed a desire for more visual materials to support their understanding of complex concepts. While many respondents suggested a need for a greater number of visual materials to aid in their learning, some felt that the existing visual materials were already effective in enhancing comprehension.

"Can include more visual information like videos." [7]

"It would be great to include more videos in the future to aid our understanding of certain chemical processes." [35]

"more videos required to understand content."[39]

"Probably could add more diagrams." [81]

"There should be more picture of cells, tissue types." [89]

"The additional images provided helped students understanding."[87]

In addition to an expressed need for additional visual aids, many learners called for more interactivity within the course. Most respondents suggested that more engaging features could improve motivation and learning outcomes.

"Could have been more interactive than just reading and answering questions." [10]

"If the student's interaction with the course, would be increased in a way, it would be much more effective." [22]

"The content, which is science heavy, involves a lot of self-reading resource. It would be good to make the content more interactive learning, to engage student learning."[88]

"The course content was not interactive." [90]

Conversely, a few respondents indicated that the current level of interactivity was sufficient for their learning needs.

"easy and interactive." [14]

"The course content was interactive enough." [89]

Finally, some learners expressed a desire for more assessment opportunities to reinforce their understanding and provide a sense of progress.

"I think you could have longer assessments at the end of each section. Maybe 20 questions?" [18]

"I love the quizzes throughout the course and I wish for more quizzes." [26]

"I really liked the integrated test questions. I would, however, have liked to see many more, as it's my preferred learning style." [26]

Discussion

Evaluation of the course enabled an assessment of learners' satisfaction with the course and effectiveness of pedagogical approaches used in delivery of the content and its application to clinically relevant contexts.While the completion rate of 33% may be perceived as low, data from industry shows that only 5-15% of students who start free online courses obtain a certificate of completion[18]. The BBHL is a fee-associated online course and hence

compared to the higher end of industry free online course figures, its completion rate is several folds higher. Furthermore, Celic and Cagiltay (2024) compared Massive Open Online Courses completion rates and suggested that the most effective measure of completion rates is consideration of learners' intent and calculation of completion rates accordingly instead of traditional completion calculation based on all enrolled learners[19]. When this notion is applied to our study,a completion rate of 33% could be translated into almost 100% if only active learners, i.e. those with clear intent, were included.

The demographic data revealed that a composition of the learner cohort was diverse in terms of their country of origin and their professional background as to why they chose to undertake the course. Learners were at varying stages of their careers including registered nurses (RNs) with a long history of clinical practice wanting to refresh their bioscience knowledge and learners planning to enroll into entry-to-practice nursing programs. Despite majority of learners originating from Australia, overall, the responses represented a diverse international learner cohort. A quantitative component of the study identified that the learner satisfaction with the course was extremely high and indicated a consistently favorable evaluation of the course's accessibility, interactivity, relevance, and practical applicability.

The course design utilized pedagogy of bite-sized learning content, engaging activities, and promotion of active learning that facilitates the busy learner to move in and out of the course according to their time schedules, but still complete small learning cycles. Additionally, 10 case-based reflective exercises were embedded within the course to aid in applying bioscience concepts to nursing practice. Learners must complete all tasks within each tutorial and must achieve pass – minimum 80% to successfully complete the course and obtain a Certificate of Completion. While several learners perceived the course content as somewhat basic, the majority still acknowledged its educational appropriateness, value, and relevance to their professional or academic development. These findings highlight the beneficial nature of the course in relation to nursing bioscience education whether it is undertaken as a refresher or as a starter to embark on nursing career journey. Most learners regardless of their career stage found the course content to be relevant to their current or future role. The agreement on the item response relating to appropriateness/relevance of the course was 57.1% for *strongly agree* and 37.6 % for *agree,* which could potentially indicate learners' positive attitude towards bioscience and appreciation of the relationship between bioscience and their role.

Furthermore, this study highlighted the importance of this course in the development of future nursing workforce. For example, due to increased patient acuity and increased life expectancy, there is an exponential need for the uptake of bioscience knowledge by RNs to deliver evidence-based, safe, and patient-centered care[1, 2]. Additionally, in Australia, all RNs who are seeking endorsement as a nurse practitioner (NP) must complete the Nursing and Midwifery Board of Australia (NMBA) approved program of study at master's level in addition to having a significant clinical experience at an advanced practice level i.e., equivalent of three years' or 5,000 hours full-time experience[20]. One of the core subjects in the NMBA-approved program of study includes a standalone pharmacology subject and this short course was also suggested as a good refresher and/or preparatory material for learners planning to embark on their NP journey. Hence, the learners identified as RNs with years of clinical practice could have been those pursuing advanced nursing degrees as NP program of study.

The accessibility and delivery of the course was identified as a strong aspect of learning experience and a diverse range of learner preferences regarding course design were captured. While many advocated for more visual and interactive elements, others were satisfied with the current structure, suggesting that learners engage with materials in varied ways. These differing views identified a need for some course revisions and inclusion of different media elements and formats such as podcasts, custom-made videos that highlight specific aspect of the complex bioscientific principles, text-based interactive materials such as flashcards[21-23]. Based on our

experience with online learning design (unpublished data) we also propose other interactive strategies such as 'respond and reveal' where learners respond to questions and then compare their answer to expert responses.

The pedagogical approach utilized in designing this course is well aligned with recent evidence highlighting the effectiveness of microlearning or bite-sized learning on improving cognitive i.e. knowledge, behavioral i.e., engagement, and affective i.e., motivation learning outcomes[24, 25].Considering that there is a lack of evidence on effectiveness of strategies to best support nursing students' bioscience learning in the classroom[8, 26, 27], this study could help educators to implement microlearning approach as an additional strategy to influence learner attitudes towards bioscience learning. While various learning strategies have been utilized in nursing bioscience education, many students are challenged with extensive content delivery in the classroom[8, 27]. Hence, using bite-sized learning as pre-classroom preparation may improve student engagement and decrease burden associated with extensive material coverage.

Conclusion

The importance of nursing bioscience education cannot be underestimated despite exposed challenges relating to extensive material delivery and concept complexity. The findings of this study have implications for enhancing bioscience-nursing practice nexus, as well as informing the development of future bioscience curricula and delivery. A limitation of this study was the inability to follow learners' career trajectory and assess the course's impact on the application of bioscience knowledge and motivation for any future bioscience-related challenges. Further research should extend to macro-level learning outcomes via structured interviews to examine how microlearning impacts on knowledge retention and application to nursing practice.

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Ethical Clearance: The study was approved by the University of Melbourne Human Research Ethics Committee (Reference Number: 2025-31098-61841-3; approval date 01/11/2024). The Mobile Learning Unit holds custodianship of the data and digital data pertaining to the course delivery and impact is presented to the course director (corresponding author).

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Lifestyle Intervention Program on Quality of Life and Psychological Well-being of Girls with Risk of Developing Polycystic Ovarian Syndrome (PCOS) in Selected Colleges of Bhubaneswar, Odisha

[1]Vandana Kumari, [2]B. Gomathi, [3]Madhusmita Nayak

[1]Nursing Officer, Banaras Hindu University, Varanasi, Uttar Pradesh, [2]Reader / Associate Professor, College of Nursing, AIIMS Bhubaneswar, Odisha, [3]Associate Professor, Dept of OBG Nursing, SUM Nursing College, SOA (DTU), Bhubaneswar, Odisha

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Abstract

Background: Globally, Polycystic Ovary Syndrome affects 5–10% of the population of reproductive age, making it the most prevalent endocrine condition. Symptoms often include oligomenorrhea, hyperandrogenism, and obesity.

Objective: The main objective of the study is to assess the effect of life lifestyle intervention program on quality of life and psychological well-being among girls at risk of developing PCOS.

Method: A quasi-experimentalstudy was conducted among 120 girls at risk of developing PCOS in a selected college in Bhubaneswar (60 in the experimental group and 60 in the control group). Girls aged 16-20 years, with a PCOS risk assessment score greater than 5 and staying in the hostel, were selected purposively. Tools include 1. Socio-demographic questionnaire, 2. Risk assessment checklist to identify the risk of PCOS girls,3. Standardised SF-36 QOL questionnaire to assess the Quality of life and 4. Standardised Riff's psychological well-being scale to assess the psychological well–being of girls with risk of developing PCOS.

Result: Study result shows that there was a significant improvement in the post-test mean quality of life (QOL) score in the experimental group as compared to the control group (U=1746.0, P=0.002) and a significant reduction was seen in the post-test mean psychological well-being score in the experimental group as compared to the control group (U=1523,P=0.00). There was a significant association found between quality of life and age (χ^2=1.159, p=0.021), menstrual flow (χ^2=7.402, p=0.025), and BMI (χ^2=3.726, p=0.023). And significant association was found between the psychological wellbeing and type of family (χ2 = 5.574, p 0.01), menstrual flow (χ2 = 7.402, p = 0.04), and BMI (χ2 = 3.726, p = 0.02).

Conclusion: The lifestyle intervention program was an effective non-pharmacological nurse-led intervention in improving the quality of life and reducing psychological well-being of girls with risk of developing PCOS.

Keywords: Lifestyle intervention program, Quality of life, Psychologicalwell-being

Corresponding Author: Dr. B. Gomathi, Reader/ Associate Professor, College of Nursing, AIIMS Bhubaneswar

E-mail: bgomathi84@gmail.com

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Introduction

Adolescent gynaecological problems occupy a special space in the spectrum of gynaecological disorders of all ages. Menstrual abnormalities are frequently encountered in this age group. Polycystic Ovary Syndrome (PCOS) is the most common cause of anovulatory infertility in women.[1]Polycystic ovary syndrome (PCOS) is the most common endocrine condition affecting between 8% and 13% of women of reproductive age and 6%–18% of adolescent girls, depending on the diagnostic criteria used and the population studied.[2]

Polycystic ovarian syndrome (PCOS) has been defined by the National Institute of Health and Rotterdam criteria as a hormonal disorder characterised by the presence of at least one polycystic ovary (presence of multiple cysts), accompanied by ovulatory dysfunction and excessive secretion of androgen. [3.]

First-line effective treatment for Polycystic Ovary Syndrome (PCOS) involves lifestyle changes. Even minor lifestyle adjustments have been shown to reduce symptom severity and improve psychological well-being.[4] The positive impact of exercise on psychological outcomes in PCOS has been specifically explored in two clinical trials. Furthermore, studies have indicated that women with PCOS have a significant prevalence of anxiety, and this anxiety appears to be a risk factor for developing depression.[5]

Yoga has been widely recognised as an effective complementary therapy for treating various psychological issues, including anxiety and depression, across scientific studies.[6] Specifically, it can alleviate symptoms of depression, anxiety, stress, and post-traumatic stress disorder, while also promoting overall well-being.[7] Ultimately, adopting a healthy lifestyle that incorporates diet, exercise, and yoga is known to significantly improve psychological status and quality of life.[8]

Adolescence is a stage of transition from childhood to adulthood. This period includes several physiological changes, such as body growth, hormonal fluctuations, and the rapid development of primary and secondary sex characteristics.[9]Adolescents are more prone to health risks due to these hormonal and lifestyle changes, as well as a potential lack of knowledge. Therefore, it is important to minimise complications in later adolescence by increasing awareness, encouraging the adoption of healthy lifestyles, and promoting the early recognition of health problems.[10]

Method and Materials

Quantitative research approach with Quasi experimental design was adopted to assess the effect of lifestyle intervention program on Quality of life and Psychologicalwell-being of girls with risk of developing PCOS.The present study was carried out in the Rajdhani College and Ravenshaw College, Bhubaneswar. The girls whose risk assessment score was more than 5 and aged 16-20 years were included in the study, and those who had major associated health problems and mentally ill girls were excluded from the study. A totalof 120 adolescent girls were selected by a purposive sampling technique.Subjects were assigned to the experimental (n=60) i.e Rajdhani College of Bhubaneswar,and the control group (n=60), i.e, Ravenshaw College of Nursing,before conducting the study.Ethical permission was taken from the institutional ethical committee (IEC), and administrative permission was taken from thePrincipal of Rajdhani College and Ravenshaw College.The tools used to collect the data were:1. Socio-demographic questionnaire, 2. Risk assessment checklist to identify the risk of PCOS, 3. Standardised SF-36 QOL questionnaire to assess the Quality of life and 4. Standardised Riff's psychological well-being scale to assess the psychological well–being of girls with risk of developing PCOS. Baseline assessment was done on the 1st day,and the lifestyle intervention program was given in the next day. Lifestyle intervention program was implemented on the experimental group. The lifestyle intervention program includes knowledge regarding PCOS, dietary patterns, and demonstration of exercise and relaxation techniques.Follow-up was done by visiting the college weekly. The data was analysed using descriptive and inferential statistics with SPSS 21 version.

Result

Demographic characteristics of adolescent girls show that the highest percentage of girls in the experimental group (53.34%) and control group (55%) were aged between 16-18 years. Highest percentage (68.3%) in the experimental group belongs to the nuclear family,and 55.0% in control group belongs to Joint family.The majority of girls in the experimental group (55.34%) and control group (65.0%) were non-vegetarian. Nearly one fourth (21%) in the experimental group and 20% in the control group had polymenorrhea. And equal (23.4%) of girls in the control and experimental group had oligomenorrhea. One third of (30%) girls in the experimental group and 23.3% in the control group had scanty menstrual flow. And 20% in the experimental group and 21.7% in the control group had heavy menstrual flow. Highest percentage of girls (66.66%) had BMI between 20-29.9 in the experimental group and in control group, 66.66% had BMI between 18.5-24.9. Nearly one fourth (23.34%) in the experimental group and 25% in the control group had hypothyroidism. And 11.66% in the experimental group and 10% in the control group had hyperthyroidism as an associated medical disorder. Chi-Square test was computed to assess the homogeneity. Both groups were homogeneous in terms of all demographic characteristics.

Table No 1. Demographic Characteristics of Girls with risk of developing PCOS

$N=n_1$ (60) $+n_2$ (60)

S. No	Characteristics	Experimental Group f (%)	Control Group f (%)	χ^2 Value	P value
1	Age (In years)				
	16-18	32 (53.34%)	33 (55%)	0.09	0.85
	19-21	28 (46.66%)	27 (45%)		
2	**Type of family**				
	Nuclear	41 (68.30%)	27 (45%)	6.65	0.99
	Joint	19 (31.66%)	33 (55%)		
3	**Type of Diet**				
	Vegetarian	28 (46.66%)	21 (35%)	1.69	0.19
	Non-Vegetarian	32 (55.34%)	39 (65%)		
4	**Nature of Menstrual Cycle**				
	Normal (21-35 Days)	33 (55%)	34 (55.7%)	0.07	0.97
	Polymenorrhea (< 21 Days)	13 (21.7%)	12 (20%)		
	Oligomenorrhea (> 35 Days)	14 (23.4%)	14 (23.4%)		
5	**Nature of menstrual flow**				
	Normal	30 (50%)	33 (55%)	0.68	0.71
	Scanty	18 (30%)	14 (23.3%)		
	Heavy	12 (20%)	13 (21.7%)		

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6	**BMI**				
	Below 18.5	8 (13.33%)	4 (10%)	28.09	0.95
	18.5-24.9	10 (16.66%)	40(66.66%)		
	25-29.9	37 (61.66%)	8 (13.34%)		
	30 & above	5 (8.35%)	6 (10%)		
7	**Associated Medical Problems**				
	Hypothyroidism	14 (23.34%)	15 (25%)	0.40	0.81
	Hyperthyroidism	7 (11.66%)	9 (10%)		
	None	39 (68%)	36 (60.7%)		

Table: No-2: Shows the comparison of domain-wise posttest quality of life scores between experimental and control group. In all six domains, the posttest quality of life score in experimental group is higher than control group. And statistically significant differencewas shown in physical functioning (t =3.219,P= 0.035), vitality (t = 3.368, P = 0.001), and Role Emotion (t = 3.507, P = 0.001). Since it can be interpreted that life lifestyle intervention program has improved the quality of life in the experimental group compared to control group.

Table No 2: Comparisons of domain-wise post-test score quality of life (QOL) in experimental and control groups.

$N=n_1$ (60) $+n_2$ (60)

Sl no	Domain	Mean±SD		t value	P value
		Experimental group	Control group		
1	Physical functioning	12.63±5.16	11.57±4.33	3.219	**0.035**
2	Bodily pain	3.25±1.57	2.83±1.5	1.498	0.137
3	Vitality	6.71±2.95	5.11±2.20	3.368	**0.001**
4	Social function	3.08±1.41	2.63±2.64	1.165	0.247
5	Role Emotion	4.23±2.06	3.11±1.37	3.507	**0.001**
6	Mental Health	6.41±3.14	5.78±2.34	1.246	0.215
Overall		34.11±12.34	32.78±9.67	0.657	0.512

P<0.05 Statistically significant, Independent 't' test, df=118

Table: No-3: Shows the comparison of domain wise posttest of psychological well-being score between experimental and control groups. Here, the lower the score indicate the better the psychological well-being. In all six domains, the posttest psychological well-being in the experimental group is lower thanthe control group. And statistically significant difference shown in personal growth (t = 1.99, P = 0.049), positive relation (t = 0.44, P = 0.039), and purpose in life (t = 1.63, P = 0.078). Since it can be interpreted that life style intervention program has improved the psychological well-beingin all domain in the experimental group thancontrol group.

Table: No-3: Show the comparison of Overall post-test mean quality of life score and Psychological well-being (PWD) score between experimental and control group. The quality of life score in the experimental group is higher as compared to the control group. And the psychological well-being score in the experimental group is lower than the control group. And also showing the statistically significant difference in Quality of life (t=1.263, p=0.035) & Psychological wellbeing (t=1.263, p=0.035). Hence, it can be interpreted that lifestyle intervention program given for the adolescent girls improved their quality of life and psychological wellbeing.

Table No 4. Comparison of the overall posttest mean quality of life score (QOL) and psychological well-being among (PWD experimental and control group.

N=n_1 (60) +n_2 (60)

Variable	Mean±SD		t value	p value
	Experimental Group	Control group		
Quality of life	34.43±12.256	31.85±10.01	1.263	0.035
Psychological well being	124.42±40.493	134.25±39.20	1.351	0.023

P<0.05 Statistically significant, Independent ' t' test, df=118

Table No-4: Shows the correlation between the pretest score of quality of life and psychological well-being score. There was a very weak correlation found between quality of life (QOL) and psychological well-being (PWD) and there was no significant relation found (r=0.126, p=0.339).

Table No 4. Relation between pretest quality of life (QOL) and psychological wellbeing (PWD)

N= 120

Criteria	Mean±SD	r	P value
Quality of life	29.9 ± 8.25	0.12	0.33
Psychological well being	127.96 ± 39.45		

P≤0.05 Statistically significant, Karl Pearson correlation coefficient.

Association between demographic characteristics and Quality of Life & Psychological Well-being

Chi-Square test was computed to find the association between quality of life and socio-demographic characteristics. There was a significant association found between age (χ^2=1.159, p=0.021), menstrual flow (χ^2=7.402, p=0.025), and BMI (χ^2=3.726,p=0.023). The association between psychological well-being and socio-demographic characteristics shows a significant association found between the type of family (χ2 = 5.574, p= 0.01), menstrual flow (χ2 = 7.402, p = 0.04), and BMI (χ2 = 3.726, p = 0.02).

Discussion

In the present study, the highest percentage of participants were aged between 16 and 18 years. This aligns with findings by Zeinab et al. (2021), who studies the effect of educational programs on the lifestyles of paramedical students and reported that the majority of female participants (73.5%) fell within the 16–20 age bracket.[11] These findings suggest that the risk factors and early manifestations of Polycystic Ovarian Syndrome (PCOS) are highly prevalent among adolescent girls, highlighting a critical window for early intervention.

Furthermore, the majority of participants across both groups belonged to nuclear families. This demographic trend may be attributed to the urban settings typical of nuclear families, which are frequently associated with more sedentary lifestyles

and a higher reliance on processed foods compared to traditional joint families.

Additionally, baseline data showed that a majority of the girls in both groups were overweight. Excess adipose tissue is known to increase insulin resistance, which subsequently stimulates the ovaries to produce higher levels of androgens. This resulting hormonal imbalance is recognised as a primary driver of the PCOS disease process.

The finding of this study is that the lifestyle intervention program significantly improved both the Quality of Life (QOL) and Psychological Well-Being (PWB) of girls at risk for PCOS. This is supported by recent research by Nahidi (2024), which revealed that a lifestyle promotion program successfully improved anthropometric and clinical manifestations of PCOS in adolescents. And also emphasised that educational institutions are highly appropriate settings for both identifying at-risk individuals and implementing these modifications.[12]

Hesari et al. demonstrated the efficacy of targeted dietary additions, noting that eight weeks of regular garlic consumption resulted in significant reductions in both weight and body mass index (BMI) ($P < 0.01$). Furthermore, this dietary intervention led to significant enhancements across all domains of the Modified Polycystic Ovary Syndrome Health-Related Quality of Life Questionnaire (MPCOSQ) ($P < 0.001$).[13]

The receptiveness to such programs in our study reflects findings by Saslow et al., who noted that a majority of individuals with PCOS express a strong interest in lifestyle interventions designed to increase energy, reduce anxiety and depression, promote weight loss, prevent diabetes onset, and regulate menstrual cycles.[14]

The psychological benefits observed in our intervention are corroborated by Adshead et al. Their systematic review confirmed that psychological and lifestyle interventions yield beneficial effects on depression, anxiety, stress, general body image, and multiple specific domains of the PCOSQ (including menstrual, hirsutism, infertility, emotion, and weight domains).[16]

Regarding physical activity, a meta-analysis by Hafizi Moori et al. reported that exercise training can significantly lower serum levels of C-Reactive Protein (CRP), reducing systemic inflammation in PCOS patients.[15] Similarly, De Lima Nunes et al. reported that physical exercise improves a variety of health outcomes in the PCOS population, including increased ovulation rates, menstrual regularity, and cardiorespiratory fitness, alongside reductions in mental health disorders, waist circumference, and body fat. [17]

Consequently, current clinical practice guidelines strongly advocate for physical exercise as a cornerstone in the non-pharmacological management of PCOS.

Conclusion

The findings overwhelmingly suggest that a lifestyle intervention program is a highly effective, non-pharmacological strategy for mitigating the psychological and quality-of-life impacts in girls identified as being at risk for developing Polycystic Ovary Syndrome (PCOS). The study provides strong evidence that empowering at-risk girls with sustainable lifestyle tools is crucial for holistic health management, resulting in tangible, positive gains in both their mental resilience and daily functioning.

Conflict of Interest: None

Ethical permission: Taken from Institutional Ethical Committee (Ref.no/IEC/IMS.SH/SOA/2022/352 Date: 18th May 2022)

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The Influence of Caregiver, Social Support and Quality of Life in Elderly People with Type 2 Diabetes Mellitus in Thailand

[1]Worapath Kratoo, [2]Rathawit Suntorn

[1] Ph.D, Department of Public Health, Phetchabun Provincial Administrative Organization, Muang Phetchabun, Phetchabun, Thailand, [2] M.D., Department of Obstetrics and Gynecology, Nong Khai Hospital, Nong Khai, Thailand

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Abstract

Background: Diabetes mellitus significantly impacts the quality of life (QoL) of older adults, particularly in rural Thailand. Beyond clinical management, caregiver support and social networks are considered to be crucial determinants of well-being. However, research regarding these factors remains limited in this specific context. This study examines the influence of caregiver, perceived social support, and QoL among elderly with type 2 diabetes mellitus.

Methods: A cross-sectional study was conducted among 366 elderly patients with type 2 diabetes mellitus(aged ≥60 years). Data were collected by structured questionnaires. Multiple linear regression analyses were performed to examine associations while controlling sociodemographic and health-related variables.

Results: The mean age of participants was 67.70 years (SD = 4.99), with 69.67% female. Most received care from a spouse (54.37%) or family members (28.69%), while 16.94% had no caregiver. High perceived social support($\beta = 0.507$, $p < 0.001$). was associated withbetter quality of life. Similarly,family caregivers($\beta = 0.229$, $p < 0.001$),spousal care($\beta = 0.114$, $p < 0.05$), secondary/vocational education($\beta = 0.367$, $p < 0.001$)were also associated with better quality of life. Conversely, hypertension($\beta = -0.153$, $p < 0.001$), depression symptoms($\beta = -0.139$, $p < 0.05$) were negative associations.

Conclusion: Caregiver and perceived social support were associated with better quality of life in elderly diabetic patients in rural Thailand. These findings showed the importance of psychological management in diabetes mellitusand underscore the need for holistic, community-based interventions that establish caregiving networks and social support systems to improve well-being

Keywords: Caregiver, Social Support, Quality of Life, Elderly, Diabetes Mellitus Thailand

Introduction

Diabetes mellitus is a major public health concern in elderly populations worldwide, with the majority having type 2 diabetes. The burden of this disease is shifting toward the Low and middle-income countries (LMICs) and aging populations[1,2] which isrisingfrom 200 million cases in 1990 to 830 million in 2022.[3]In Thailand, the prevalence of diabetes mellitus has been increasingfrom 7.5% in 2004 to 10.1% in

Corresponding Author: Worapath Kratoo, Ph.D. Phetchabun Provincial Administrative Organization, Muang Phetchabun, Phetchabun, 67000, Thailand

E-mail: rworapath@gmail.com

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20204, thereby leading to high morbidity, disability, and expenditure on health care.[4] The prevalence of diabetes mellitus among the geriatric population affects their health, thereby resulting in the loss of quality of life (QoL), including the psychological aspect as well.[5–8]

The quality of life experienced by the elderly with diabetes mellitus is poor compared with the general population and progressively worsens with the progression of the disease with older age, loneliness, residence in rural settings, unemployment, and low educational achievement.[9–11] Management of diabetes mellitus in older adults is uniquely complex, involving not only glycemic control but also the navigation of age-related comorbidities, polypharmacy, and the risk of functional decline.[5,6] Consequently, the primary clinical goal is often shifting from disease control to optimization of multidimensional well-being, encompassing physical, psychological, social, and environmental aspects.[9]

A good QoL for elderly diabetic patients is influenced by various factors beyond clinical interventions[12,13] with strong familial bonds and respect toward elders, family caregivers influenced by traditional Thai social structures were central pillars in chronic disease management.[14]These caregivers provide crucial assistance such as reminders to take medications, help in preparing meals, transportation to healthcare facilities for medical appointments, and assistance in the performance of activities of daily living.[15,16] Moreover, the support structures that include friends, social, and religious groups provide the needed emotional support, informational support, and protection against the potential isolation.[17,18]

Thailand is in the middle of a rapid demographic transition, with a resulting strain on traditional support mechanisms from family members due to low fertility rates and rural to urban migration.[15,19]Increased labor force participation and rural to urban migration may decrease both the number and competence of family caregivers.[15] This coincides with the transformation of the country's healthcare systems, thereby increasing the vulnerability of the diabetic aged population to poor self-management, increased levels of psychological distress, and poor quality of life.[10]

Risk factors known to exist within the Thai diabetic population, including old age and being overweight, are recognized to impact the awareness and control of diabetic diseases associated with socioeconomic factors.[4,20] However, there is the essential gap in the relationship and impact of social support and caregivers on the qualityoflife in elderly diabetic patient within the Thai cultural setting. This study aimed to examine the influence of caregiver presence and perceived social support on the quality of life among elderly people with diabetes mellitusin Lomkao district, Phetchabun province which is aged society. These findings will inform the development of culturalinterventions and policies that strengthen support systems, ultimately empowering older adults with diabetes mellitus to achieve not just longer life, but better quality of life.

Methods

Research Design

This was an analytical cross-sectional studyto investigate the influence of caregiver, social support levels, and quality of life among elderly patients with type 2 diabetes mellitus.

Population

Older adults aged 60 years and over, confirmed diagnosis of diabetes mellitus, residing in Lomkao District, Phetchabun Province, Thailand. Participants met the following criteria: (1) aged 60 years or over, (2) confirmed diagnosis of type 2 diabetes mellitus, for at least three months prior to study participation, (3) registered residency within Lomkao District, Province of Phetchabun, Thailand, (4) capacity to communicate in Thai, (5) willingness to be part of this study. Exclusion criteria: (1) severe cognitive impairment, difficulty understanding questions or signing consent, (2) having acute medical conditions needing hospital care during data gathering, (3) severecognitive impairmentor communication barriers to questionnaire completion.

Sample Sizeand Sampling Techniques

The sample size was calculated using the standard formula identified for the evaluation of the association between categorical and continuous data. With reference to a pilot study on the issue of quality of life against the background of elderly people suffering from diabetes mellitus, taking an expected effect size of 0.25, a significance level of $\alpha = 0.05$, statistical power of 0.80 or $1-\beta$, the minimum sample size amounted to 150 elderly diabetes mellitus patients. However, in order to reduce the effects of missing data and attrition, the sample size was adjusted by adding 10%, and the result was 165 elderly patients suffering from diabetes mellitus. The actual sample size consisted of 366 persons. This study applied simple random sampling techniques using computer-generated random numbers.

Data Collection

The face-to-face interviews were conducted in a private and comfortable setting in order to ensure confidentiality and minimize the risk of distractions. The process began with a written informed consent before proceeding with interviews. The structured instrument was also implemented. The participants were encouraged to ask questions when in doubt and enough time was taken at the end of each interview to enable the respondents to answer accordingly. The length of each interview was between 20 to 40 minutes in length and included a break when appropriate.

Measurement Tools

The questionnaire consisted of six sections: (1) Sociodemographic characteristics (gender, age, level of education, occupation, monthly income, history of illnesses), (2) Functional status and behavior (physical activity measured by International Physical Activity Questionnaire, IPAQ, Barthel Index with ten activities of daily life, scored 0-20, alcohol consumption within past three months, smoking status), (3) Presence and type of caregiver, (4) Social Support, measured by MSPSS-Thai. It has a total score of 12-84, divided further intolow(12-35), moderate(36-60), or high perceived support(61-84), (5) Quality of Life, using WHOQOL-BREF-Thai, with a total score of 26-130, and (6) DASS-21 Thai, a scale consisting of twenty-one items using a scale measuring depression, anxiety, or stress, referring to past week experiences.

Statistical Analysis

Descriptive statistics were employed in data analysis for describing variables. Frequency and percentage were used in describing categorical variables. Mean, standard deviation (SD), minimum, and maximum were used in describing continuous variables. Multiple linear regression was used to examine the associations between caregiver presence and perceived social support with quality of life as the dependent variable, adjusting for socio demo graphic and health-related factors. In this study, significance was established in tests at a level of significance of $p < 0.05$.

Ethical Considerations

Phetchabun Hospital's Institutional Review Board granted ethical approval (IEC-20-2565, approved November 9, 2022).

Table 1. Demographic characteristics of the participants

Demographic characteristics(n=366)	**n**	%
Gender		
Male	111	30.33
Female	255	69.67

Continue....

Age (years)		
Mean (SD)	67.70(4.99)	
Min - Max	60-80	
Educational level		
No education	47	12.84
Primary school	205	56.01
Secondary/Vocational	48	13.11
Higher or equal to Vocational Certificate	66	18.03
Occupation		
Unemployed	80	21.86
Farmer	183	50.00
Gov. Officer (Retired)	78	21.31
State Enterprise Officer	13	3.55
Company Employee	3	0.82
Business Owner	9	2.46
Monthly Income		
≤ 10,000 Baht	195	53.28
10,001-20,000 Baht	90	24.59
v>20,001-30,000 Baht	81	22.13
vIllness history		
None	265	72.40
Hypertension	77	21.04
Kidney disease	21	5.74
Hypertension and Kidney disease	3	0.82

Table 2. Functional status and health behaviors

Functional status (n=366)	**n**	%
Moderate physical activities		
No	126	34.43
Yes	240	65.57
Moderate physical activities (Days per week)		
Mean (SD)	1.25(1.98)	
Min - Max	0-7	

Continue....

Moderate physical activities (Minutes per day)		
Mean (SD)	18.93(33.07)	
Min - Max	0-150	
The activities of daily living (ADLs)		
Mean (SD)	18.53(2.03)	
Min - Max	10-20	
Alcohol drinking in last 3 month		
Never	324	88.52
Monthly or less	27	7.38
2 to 4 times a month	15	4.10
2 to 3 times a week	0	0.00
4 or more times a week	0	0.00
Smoking		
Never	301	82.24
Former	26	7.10
Current	39	10.66

Table 3. Caregiver, social support and quality of life

Factors (n=366)	**n**	%
Caregiver type		
None	62	16.94
Husband or wife	199	54.37
Family (Lineage or relatives)	105	28.69
Social support level		
Low perceived support	6	1.64
Moderate perceived support	274	74.86
High perceived support	86	23.50
Mean (SD)	54.40(9.42)	
Min - Max	25-84	
Depression		
Mean (SD)	2.18(1.98)	
Min - Max	0-13	

Continue....

Anxiety	
Mean (SD)	2.10(2.22)
Min - Max	0-13
Stress	
Mean (SD)	2.72(2.42)
Min - Max	0-10
Quality of life score	
Mean (SD)	93.25(7.22)
Min - Max	77-111

Table 4. The influence ofcaregiver and social support on quality of life

Factors(n=366)	Full model			Final model		
	Unstandardized		β	Unstandardized		β
	B	SE of B		B	SE of B	
Cons.	80.043	5.193				
Gender						
Male	Ref.			Ref.		
Female	1.533	0.630	0.098	1.592	0.603	0.101*
Age (years)	0.015	0.056	0.010			
Educational level						
No education	Ref.			Ref.		
Primary school	2.925	0.955	0.201*	3.377	0.891	0.232**
Secondary/Vocational	6.918	1.525	0.324**	7.854	1.147	0.367**
Higher or equal to Vocational Certificate	6.610	1.743	0.352**	7.276	1.088	0.388**
Occupation						
Unemployed	Ref.					
Farmer	1.071	0.739	0.074			
Gov. Officer (Retired)	0.356	1.079	0.020			
State Enterprise Officer	2.583	1.643	0.066			
Company Employee	5.334	3.138	0.067			
Business Owner	-4.368	1.830	-0.094*			

Continue....

Monthly Income						
≤ 10,000 Baht	Ref.					
10,001-20,000 Baht	-0.238	0.828	-0.014			
>20,001-30,000 Baht	0.451	1.369	0.026			
Illness history						
None	Ref.			Ref.		
Hypertension	-2.570	0.705	-0.145	-2.716	0.687	-0.153**
Kidney disease	-0.009	1.219	0.000	-0.401	1.194	-0.013
Hypertension and Kidney disease	-1.209	3.027	-0.015	-1.433	3.025	-0.018
Caregiver type						
None	Ref.			Ref.		
Husband or wife	1.489	0.759	0.103	1.645	0.757	0.114*
Family (Lineage or relatives)	3.406	0.835	0.214**	3.659	0.833	0.229**
Social support level						
Low perceived support	Ref.			Ref.		
Moderate perceived support	4.267	2.212	0.257	3.547	2.199	0.213
High perceived support	9.131	2.299	0.537**	8.636	2.293	0.507**
Moderate physical activities						
No	Ref.			Ref.		
Yes	2.642	0.958	0.174*	1.592	0.612	0.105*
Moderate physical activities (Minutes per day)	-0.019	0.013	-0.086			
Alcohol drinking in last 3 Month						
Never	Ref.					
Monthly or less	1.195	1.075	0.043			
2 to 4 times a month	0.814	1.529	0.022			
Smoking						
Never	Ref.					
Former	-1.357	1.203	-0.048			

Continue....

Current	-0.862	0.914	-0.037			
ADL Score	0.028	0.152	0.008			
Depression	-0.834	0.227	-0.229*	-0.506	0.151	-0.139*
Anxiety	0.221	0.212	0.068			
Stress	0.183	0.201	0.061			

Note: *<0.05, **<0.001, Ref. = Reference, Cons. = Constant

Full model: R-squared =0.5560, Adj R-squared = 0.4953, F(15, 350) =24.88

Final model: R-squared =0.5090, Adj R-squared = 0.4909, F(12, 353) =28.07

Results

Demographic Characteristics of the Participants

The participants were 366 elderly people with diabetes mellitus. They had a mean age of 67.70 years (SD = 4.99 years). Most participants were female (69.67%), had a primary school education (56.01%), and were farmers (50.00%). Most participants earned $\le$ 10,000 Baht a month (53.28%); additionally, 72.40% of the participants did not have any comorbidity.

Functional Status and Health Behaviors

Most participants (65.57%) engaged in physical activity, with an average of 1.25 days per week (SD = 1.98) and an average duration of 18.93 minutes per day (SD = 33.07 minutes). The activities of daily living scores, which had an average of 18.53 (SD = 2.03). Furthermore, the majority of patients had never been an alcohol user (88.52%) or a smoker (82.24%).

Caregiver, Social Support and Quality of Life

Over half the participants (54.37%) received care from a spouse, followed by other family (28.69%), while 16.94% reported none. The mean social support score was 54.40 (SD = 9.42, while a majority (74.86%) rated their support level as moderate, and 23.50% reported it to be high. The mean score for depression was 2.18 (SD = 1.98), anxiety (2.10, SD = 2.22), and stress (mean = 2.72, SD = 2.42). The mean score of quality of life was 93.25 (SD = 7.22).

The Influence of caregivers and Social Support on Quality of Life

High perceived social support was associated with better quality of life ($\beta = 0.507$, $p < 0.001$); those with high support scored 8.636 points higher than those with low support. Family caregiver was associated with a 3.659-point higher level of quality of life ($\beta = 0.229$, $p < 0.001$), while spousal caregiving was associated with a 1.645-point increment in the enhanced level ($\beta = 0.114$, $p < 0.05$). Higher education levels showed a positive association, particularly for secondary education ($\beta = 0.367$, $p < 0.001$). Hypertension was related to a 2.716 point reduction in the level of quality of life ($\beta = -0.153$, $p < 0.001$), and depressive symptoms demonstrated a negative association ($\beta = -0.139$, $p < 0.05$). The female gender and physical activities demonstrated a higher level of quality of life.

Discussion

This study examined associations between the caregivers, social support, and quality of life in older people with diabetes mellitus in rural Thailand. The findings demonstrate social support was the highest association with quality of life, followed by family caregiving presence, education level, and physical activity engagement. Hypertension and depression were found to negatively associated with quality of life.

High perceived social support was associated with a better quality of life, which is consistent with the

notion that social support protects health and well-being. This emphasizes the importance of establishing and promoting strong social networks and support systems among elderly diabetic patients.[21] Especially, perceived social support has been found to encompass material assistance and spiritual encouragement from family and friends, which effectively integrates interventions for care and enhances the quality of life for the elderly.[22]

Family caregivers are associated with a better quality of life for elderly diabetes mellitus patients in Thailand. Specifically, family members play a critical role in the practical managementof the disease.[15] The performance of family caregivers has been found to have a greater effect on the quality of life than that of spousal caregivers. There is support for previous research that points to the daughter caregiver being related to experiencing happiness in old age in Thailand.[14] Moreover, the synergistic effect between perceived support and caregiving.[23]The capacity for the caregivers to offer comprehensive support on the levels of emotional support, moral support, and appraisal support, along with the instrumental support, would provide an essential function in optimizing the quality of life for those with type 2 diabetes mellitus.[24]This is more important in the context of Thai society, which emphasizes the familial bonding in the community.[16]

The higher education with improved quality of life in elderly patients with diabetes mellitus is consistent with the general trend in which outcomes of health-related quality of life in elderly diabetics were often worse in the less educated groups.[9,13] This was influenced by several pathways, such as more educated people having improved health literacy, easier access to information and healthcare facilities, improved ability to manage their health on their own, and usually improved socioeconomic status associated with education levels.[21]Furthermore, the studies conducted in low as well as middle-income nations have found that an individual's education often impacted on incidence and diabetes mellitus management.[2]

The engagement in physical exercises was associated with a high level of life quality for the elderly patients with diabetes mellitus. Notably, physical exercise as a lifestyle behavior is modifiable and contributes to the higher quality of life for the elderly population.[22] Specifically, the regular engagement in physical exercise was proven to improve the quality of life, and the attitudes towards the exercise bythe persistent engagement.[25] Additionally, the physical exercise has a direct impact on the level of diabetes mellitus control, being an essential aspect for the management of the type 2 diabetes mellitus and for the minimization of the potential life-quality-reducing complications.[26]

In contrast, the hypertension and the depression were associated with a lower quality of life. This aligned with comorbidities that contributed to the burden on the elderly with diabetes mellitus.[10]The effect of depression on the quality of life are consistently with the studies indicates the crucial role of mental health in determining the level of the quality of life, and the negative effect of depression on the quality of life has been thoroughly established in the relevant sources.[13] Moreover, the mental health comorbidities decreased the level of life satisfaction and the functional health of seniors with chronic diseases.[26]This underscored the necessity to consider the importance of holistic care models in addressing the challenges of elderly patients with diabetes mellitus.[27]

The Strengths and Limitations

This study has various strengths, with the sample size and the use of valid instruments for the assessment of quality of life and the perception of social support in an appropriate rural context in Thailand. However, the issue of generalization could be limited due to the cross-sectional study approach. Another limitation could be the use of measures with the potential for recall bias.

Implications for Community Nurses

Community nurses need to begin concentrating on their evaluation processes for geriatric diabetic patients on clinical data as well as the availability of caregivers and social support systems. The nursing practice can involve organizing family sessions

for the implementation of caregiving, referring diabetic patients to social support groups within the community, and screening for depression as part of comprehensive diabetic care. The implementation of nursing initiatives for improving social networking and conducting caregiver teaching can help improve patients' quality of life in resource-poor and rural areas.

Recommendations

Healthcare settings should consider integrating psychosocial support services along with diabetic care, especially in rural areas, where changes are occurring in the social structure of family life. Community-based trials should target strengthening support networks through support group programs, together with caregiver training programs. Longitudinal studies should be conducted to determine causality, along with the level of care provided, and evaluate the outcome of interventions aimed at improving social support networks of elderly diabetic patients.

Conclusion

This study revealed the critical importance of support provided to caregivers, especially in the support provided by family members, and the level of perceived social support to the overall quality of life of the older diabetic population in the rural areas of Thailand. The study emphasizes the critical need to consider the psychosocial dimensions of the condition, in addition to the treatment of the condition, to bring improvements in the well-being of the patients.

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Declarations

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Ethical Clearance: The study was approved by the Institutional Review Board at Phetchabun Hospital (IEC-20-2565, approved November 9, 2022)

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