

Efficacy of Structured Teaching Intervention on Knowledge Regarding Prevention of Nosocomial Infections among Nursing Students in University of Buraimi, Oman

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Received January 19, 2024; Revised March 13, 2024; Accepted April 22, 2024

Cite This Paper in the Following Citation Styles

(a): [1] Limna Mahaboob, Hilal Alrahbi, Sabitha Sadanandan, Gopi Suresh Vankudre, "Efficacy of Structured Teaching Intervention on Knowledge Regarding Prevention of Nosocomial Infections among Nursing Students in University of Buraimi, Oman," *Universal Journal of Public Health*, Vol. 12, No. 2, pp. 326 - 331, 2024. DOI: 10.13189/ujph.2024.120217.

(b): Limna Mahaboob, Hilal Alrahbi, Sabitha Sadanandan, Gopi Suresh Vankudre (2024). Efficacy of Structured Teaching Intervention on Knowledge Regarding Prevention of Nosocomial Infections among Nursing Students in University of Buraimi, Oman. *Universal Journal of Public Health*, 12(2), 326 - 331. DOI: 10.13189/ujph.2024.120217.

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Abstract Nosocomial infections are hospital-acquired medical emergencies that have equal impacts on patients, healthcare workers (HCW), and the entire healthcare system. The current rise in health care associated infections (HAI) rates worldwide indicates a better periodic education and training of HCWs. The objectives of this study were to (1) assess the current knowledge level of nursing students on prevention of nosocomial infections, and to (2) find out the efficacy of structured teaching intervention on knowledge regarding the prevention of nosocomial infections among nursing students. A one-group pretest-posttest, Quasi experimental design was adapted to determine the efficacy of structured teaching intervention for nosocomial infections. A total of 56 nursing students from the University of Buraimi were enrolled in the study using a convenient sampling approach. A self-designed structured, validated questionnaire was used to assess the knowledge of the nursing students. The impact of the intervention was evaluated after seven days of intervention using the identical questionnaire. The results revealed a statistically significant improvement after intervention from (4.68 ±1.597) to (7.11 ± 1.997), a statistically significant (p<0.05) improvement. Before the intervention, only one student (1.79%) had good knowledge, 14 (25%)

had average knowledge, and 41 (73.21%) had poor knowledge. After the intervention, eight (14.29%) had good knowledge, 38(67.86%) had average knowledge, and only 10 (17.86%) had poor knowledge. It can be concluded that the post-intervention participant population with good and moderate knowledge related to nosocomial infection increased from 1.79% and 25% to 14.29% and 67.86%, respectively. Hence, the researchers suggested that the structured teaching program in the present study plays a crucial role in improving nursing students' knowledge of the prevention of nosocomial infections and enables the students to practice infection control measures during their clinical placement.

Keywords Nosocomial Infections, Nursing Students, Knowledge, Teaching Intervention, Oman

1. Introduction

A person's quality of life (QOL) is negatively impacted by nosocomial infections. World Health Organization defined nosocomial infections as infections obtained in

hospitals that are either absent or present when a patient is admitted. Extended hospital stays beyond seven days are primarily linked to nosocomial infections. A literature review on nosocomial infections revealed that surgical site infections accounted for the majority (27.1%), followed by lung infections (22.0%) and urinary tract infections (17.0%). Five types of microorganisms were identified as the cause of nosocomial infections namely: *Salmonella typhimurium* (1.7%), *Pseudomonas aeruginosa* (5.1%), *Escherichia coli* (11.9%), *Shigella* (5.1%) and *Staphylococcus aureus* (6.8%) [1], [2], [3].

The prevalence of nosocomial infection within the developing countries is higher compared (10%) to the developed countries (7%). Hospital acquired infections are a potential risk for nursing students. Moreover, due to a lack of awareness and preventive measures for nosocomial infections, nursing students from the lower semesters might spread the infection. Therefore, the assessment of student knowledge about the prevention of nosocomial infections is crucial [4], [5]. As a requirement of the nursing curriculum, nursing students spend a significant amount of time dealing with the patients during their clinical practice. During this clinical exposure the students are more likely to come into contact with infectious pathogens than practicing nurses as they lack familiarity with clinical procedures and are not prepared for safety incidents [6]. In order to lower the incidence rate of nosocomial infections among patients and themselves, it is imperative that infection control education serves as a basis for nursing students to enhance their knowledge and proficiency in infection control.

The current study concentrates on evaluating the efficacy of structured teaching intervention. The preventive strategies could further reduce the condition related health burden. As observed in the literature review, healthcare settings receive limited compensation from the infection control division to address this issue. Subsequently, this escalates the hospital budget for infection control. The study outcomes can support the healthcare system and investors in enhancing infection control strategies [7].

By implementing techniques like hand cleanliness, environmental hygiene, patient screening and clustering, surveillance, antibiotic stewardship, adhering to patient safety recommendations, and safety culture, nosocomial infections can be avoided [8]. Nursing students that get instruction on infection prevention adhere to standard measures more closely. For instance, lowering infection rates and decreasing nosocomial infections are two benefits of teaching infection control in nursing education. Globally, nurses play a critical role in providing care for patients who have contracted infections. Designing future strategies to minimize the burden of such infections in healthcare settings and in the public is crucial. Enhancing knowledge of nosocomial infections can help student's nurses to prevent such infections among patients in future [9].

Few studies have been conducted within the Sultanate of Oman to investigate knowledge related to nosocomial

infections and related prevention strategies. This study highlights the importance of nosocomial infection-related personal safety and preventive measures. It provides baseline evidence on the status of knowledge of nosocomial infections among nursing students. It also assessed the impact of structured teaching programs among nursing students to minimize the rate of nosocomial infections, and the study outcomes can support future evidence-based strategies in enhancing both patient and occupational safety of nurses in day-to-day clinical interactions with patients. Furthermore, the study outcomes can support the preparedness of the healthcare system during pandemics, especially during emergency outbreaks.

2. Materials and Methods

2.1. Study Design and Participants

A one-group, pre-test-post-test, Quasi experimental design was adapted for this study. This interventional study design assessed the nosocomial infection-related knowledge level among nursing students before and after the educational intervention.

2.2. Setting

The study was conducted at the University of Buraimi, Sultanate of Oman.

2.3. Study Population

This study included second-year students of Bachelor of Science in Nursing who were undergoing clinical placements in the academic year 2022–2023. Additionally, participants had to be available during the study period, willing to participate, able to read and write English, and have at least one semester of clinical experience. In addition to that, the nursing students who were not available at the time of data collection, non-willing participants, those who had not completed one semester of clinical practice and the students having previous condition related educational exposure were excluded from the study.

2.4. Sample Size

All 56 nursing students enrolled in a second-year clinical course during the summer semester were included in the study.

2.5. Sampling Technique

The study was carried out using a non-probability convenience sampling technique. The sampling approach was followed to ensure the viability of conducting the study and the accessibility of samples within the setting.

2.6. Questionnaire

A self-designed questionnaire following the literature review [1-15] was used to gather data. The questionnaire consisted of two parts. The first part of the questionnaire aimed to collect information related to demographic characteristics such as gender, age, marital status, academic year, and main source of information on the prevention of nosocomial infections. The second part of the questionnaire is the ‘Structured Knowledge Questionnaire’. It consists of 12 closed-ended knowledge-related questions on the prevention of nosocomial infections. Additionally, the model answers were designed and validated by experts. Each item had a score of one for the correct answer and zero for an incorrect answer. The participant scores were further converted to percentile values. Percentage scores (%) ≤ 50 were classified as poor knowledge, 51 ≤ 75% as average, and knowledge score > 75% as good knowledge.

2.7. Validity and Reliability

The questionnaires covered risk factors, mode of transmission, prevention, and standard precautions for nosocomial infections. The questionnaire was validated using a face validity approach. Modifications were made in consultation with two subject experts in Medical Surgical Nursing. Cronbach's alpha (0.76) was applied to assess the internal consistency of the questionnaire. For internal reliability, 12 items focused on collecting knowledge-related questionnaire responses were considered. Five participants who completed the questionnaire at their initial visit were randomly chosen and contacted again after 15 days. The participants were asked to complete the same questionnaire and submit their answers. However, to avoid biases the need for repeated responses from participants for questionnaire was not disclosed to the participants. Prior to the questionnaire used, a pilot study was conducted with 10 participants, and statistically significant changes were observed in the post-intervention knowledge score (P=0.001).

2.8. Data Collection Process

Research and Ethics Committee, College of Health Sciences, University of Buraimi granted permission for the study to be carried out with the grant number IRG/UOB/CoHS-005/2022. Data was collected from October 2022 to December 2022. Confidentiality was assured to all subjects and informed consent was acquired. A structured knowledge questionnaire was used to assess Pre- and Post-interventional knowledge levels. The structured knowledge questionnaire took 10–15 minutes on average to administer and a structured teaching intervention was provided using relevant visual teaching aids, such as PowerPoint presentation which included definition, risk factors, mode of transmission, prevention,

and standard precautions for nosocomial infections administered for a time period of 30-45 minutes. To evaluate the educational impact on nursing students, a post-intervention test was carried out on the seventh day of the intervention, using the identical questionnaire.

3. Results

Table 1 presents participants’ characteristics. All the participants (100%) were female, aged between 20 and 25 years, and unmarried. The participants were in the second year of the undergraduate nursing program. Most of the students received information about nosocomial infection from their teachers 38 (67.9%), followed by their peers 14 (25%), and social media 3 (5.4%). Only one student (1.7%) lacked prior knowledge about the prevention of nosocomial infections.

Table 1. Distribution of Nursing Students according to Demographic Variables

Sociodemographic variable	Respondent	
	Frequency(n)	Percentage (%)
Gender:		
Female	56	100%
Age:		
20 – 25 years	56	100%
Marital status:		
Single	56	100%
Academic year:		
2 nd year	56	100%
Main Source of information on prevention of nosocomial infections		
Peer group	14	25%
Teacher	38	67.9%
Social Media	3	5.4%
No information	1	1.7%

Figure 1 illustrates the comparison of the frequency and percentage of knowledge related to nosocomial infection prevention among nursing students between their pre and post-test levels. As observed in the figure, only one (1.79%) had good knowledge, 14(25%) had average, and 41(73.21%) had poor knowledge about nosocomial infection. Post-intervention, eight (14.29%) had good knowledge, 38(67.86%) had average, and 10(17.86%) still had poor knowledge.

Figure 2 depicts the comparison of nursing student’s knowledge of nosocomial infection prevention between the pre- and post-test mean and standard deviation values. Following the intervention, a significant improvement (p<0.05) in the mean knowledge score was observed, as the means score of nosocomial infections improved from 4.68±1.597 to 7.11 ±1.997.

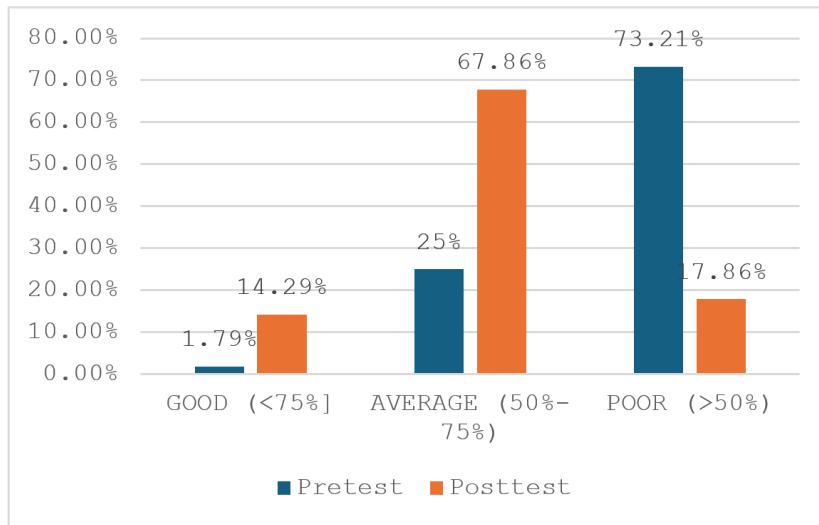


Figure 1. Comparison of pre-test and post-test knowledge levels regarding prevention of nosocomial infections

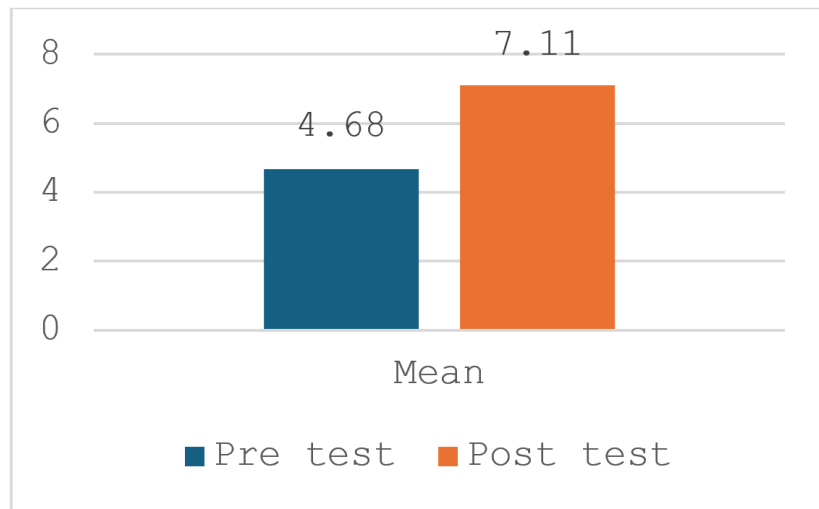


Figure 2. Comparison of change in knowledge level post intervention

4. Discussion

Nosocomial infections, often known as hospital-acquired infections, impact millions of people annually and are defined as infections that appear three days after discharge, thirty days after surgery, or within 48 hours of hospital admission. Hospital environments are the location for these types of illnesses. The most common ways that nosocomial infections spread are from patient to patient, healthcare worker to patient, medical and surgical equipment to patient, and environment to patient [1]. Most nosocomial infections happen to people who are seeking medical care. These infections occur in both developed and underdeveloped countries and it is reported in 7% of developed countries and 10% of developing countries [2]. Some cross-sectional studies have indicated that nursing student’s knowledge of nosocomial infection is insufficient and poor. According to Alriyami et al. [15] study findings, participant’s average knowledge total adjusted score was

(51.53 ± 0.89). The present study was compared with a similar study conducted by Harman et al. [12] which examined the knowledge regarding the nosocomial infection prevention. The study conclusions demonstrated that 10.7% of student nurses had good knowledge, 87.9% had average knowledge, and 1.7% had poor knowledge. Whereas in present study, only one student (1.79%) had good knowledge, 14 (25%) had average knowledge, and 41 (73.21%) had poor knowledge.

According to a study by Meera Raj and Hari Mohan Singh, 20 (40%) student nurses had inadequate knowledge prior to implementing structured education programs, 30 (60%) had average knowledge, and 0 (0%), student nurses had a high understanding regarding prevention of nosocomial infections. Following the implementation of a systematic education program to avoid hospital-acquired infections, post-test results showed that nine student nurses (18%) had good knowledge scores and 41 (82%) had average knowledge scores [2]. The outcomes of this study

showed that 73.21% of the student nurses had poor knowledge regarding nosocomial infection prevention, 25% had average awareness, and 1.79% had poor knowledge before the pretest. The study findings in the posttest revealed that, at least 10 (17.86%) students had poor knowledge, 38 (67.86%) had average knowledge, and eight (14.29%) had good knowledge. The present study represents only the female student population; hence, the results cannot be generalized, and similar studies can be conducted, including the male student population. Furthermore, future studies can incorporate different teaching methods, such as video-assisted teaching programs.

5. Limitations of the Study

The current study considered a convenient sampling approach involving the student group from a university and all were females. Similar studies can be conducted involving both genders and further studies can be conducted by randomized controlled trials using probability sampling technique to reduce bias.

6. Conclusions

The nosocomial infection prevention related structured teaching intervention improved the mean knowledge score from (4.68 ± 1.597) to (7.11 ± 1.997). Post-intervention participant population with good and moderate knowledge related to nosocomial infection increased from 1.79% and 25% to 14.29% and 67.86%, respectively. Similar studies can be conducted, including the male student population, and incorporating different pedagogical approaches.

Acknowledgements

We would like to acknowledge the University of Buraimi (UOB) for funding this study with an internal grant. Our grateful thanks to all participants and our colleagues who helped to conduct this study. We also extend our thanks to Research committee, University of Buraimi for their kind support.

Conflict of Interest

The authors declare that they have no conflicts of interest.

Funding

This study was funded by the University of Buraimi in Oman [IRG/UOB/CoHS-005/2022]. Funding organizations did not have any role in the surveys, design, implementation, or analysis.

Data Availability Statement

The corresponding author can provide the dataset created and/or analyzed during the current investigation upon reasonable request.

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