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Research Article

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Nursing Student's Knowledge and Perception of Preventing Intravenous Catheter Infections in West Bank, Palestine

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ABSTRACT

Aim of study: The aim of this study is to assess nursing students' knowledge and perception of preventing intravenous catheter infections.

Methodology: A cross-sectional study including 300 nursing students from Nablus University for Vocational and Technical Education and An-Najah National University was carried out. A questionnaire that was self-administered and covered demographics, perceptions of infection prevention, and knowledge of peripheral intravenous cannulation was used to gather data. The analysis employed both descriptive and inferential statistics.

Result: the participants in the study, 66.1% were female, 56.7% were from NNUH, and 39.4% were in their second year of study. In terms of peripheral cannulation knowledge, 70.6% of respondents were informed; NNU students scored better (9.11 ± 1.29, p=0.013) and females scored higher (8.49 ± 1.65, p=0.012). Of the participants, 65.6% reported having a positive perception, which was substantially correlated with being female (7.41 ± 2.06, p=0.000), enrolled at NNU (7.38 ± 2.19), and in the fourth academic year (7.76 ± 2.27, p<0.05).

Conclusion: The student's level of knowledge of PVC insertion and care was (70.6%), and this show more than half of student above average. About the perception the result show that the participants had positive perception (65.6%). The female higher score than male and the NNU higher score than Nablus University in both knowledge and perception.

Keywords: Knowledge, Perception, Peripheral Intravenous Catheter Nursing Student, Infection

Introduction

Clinical therapies need the use of central venous access devices (CVADs), which include hemodialysis vascular access devices, implanted venous access ports, peripherally placed central catheters, and central venous catheters. One In order to create efficient venous catheters for treatment [1]. CVADs are widely utilized in parenteral nutrition, chemotherapy, immunotherapy, hemodynamic monitoring, and blood purification [2-4]. Vascular catheter-associated infections (VCAIs) are among the most common issues linked to CVADs, while they can also cause other complications [5,6]. Intravenous catheters (IC) are necessary for many interventions such as fluid treatment, parenteral nutrition, monitoring, blood and blood products, infusion of various medicines. Particularly, IC applications are often performed in intensive care units [7-9].

There were issues with early intravenous (IV) drug delivery, including steel needle migration, intra-arterial injection, and fracture, which might have put limbs in danger if left untreated. A more dependable indwelling catheter had to be developed in order to reduce these dangers. In 1950, Dr. David J. Massa designed the "Rochester plastic needle," which included a polyvinyl chloride (PVC) tube covering a needle that could be

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fastened to a hub after it was in place. With this invention, the contemporary IV cannula that is now commonly used was born [10]

One of the most frequently used medical devices in the world is the peripheral venous catheter. In today's health care, intravenous therapy with medications, nutrition, and blood components is essential. In order to put a temporary plastic tube into a vein, the patient's skin is perforated during a technique known as peripheral intravenous (IV) cannulation. The cephalic or basilic vein in the lower arm or a metacarpal vein on the back of the hand are the typical locations for the peripheral IV cannula (PIC). The larger density of skin flora in this area, which would place the patient at an elevated risk of infection, makes femoral veins to be avoided [11].

According to estimates, 60% of hospital inpatients receive therapeutic IV medicine each year through peripheral IV cannulation. Patients are at risk for a variety of dangers during the procedure because it includes penetrating the skin and placing a foreign body in a vein. The most common complications are phlebitis (44%), infiltration (16,3%) and, subsequently, a lower incidence of occlusion and catheter dislodgement (7.6% and 5.6%, respectively) [12].

Peripheral venous catheter (PVC) management is a fundamental nursing responsibility aimed at preventing complications such as phlebitis and infection. The Centers for Disease Control and Prevention (CDC) advises removing PVCs if signs of phlebitis, infection, or malfunction occur. Accurate documentation of catheter details including date, time, size, and insertion site—is essential for patient safety. As future healthcare providers, nursing students must possess a thorough understanding of infection prevention strategies related to intravenous therapy [13].

Vascular catheter maintenance is a common task for nursing students participating in clinical practice, so understanding vascular catheter-associated infections (VCAIs) is crucial for efficient diagnosis, management, and high-quality patient care. Prior studies have mostly examined clinical nursing staff awareness and knowledge of VCAI prevention and control, pinpointed factors affecting their knowledge, and assessed how well intervention strategies improved VCAI prevention knowledge and practice [14,15]. However, evidence of current status of nursing students' knowledge of VCAIs was limited. In light of this, this study conducted a cross-sectional study on the nursing students to assess students' knowledge and perception of preventing intravenous catheter infections. Despite the importance of preventing IVCIs, there is a lack of research on nursing students' knowledge and perception of IVCIs prevention in Palestine, and there is a gap in nursing students' knowledge and practice

Methodology

Research Design

A descriptive - cross - sectional design conducted in Palestine from March 26 to May 31, 2024.

Study Setting and Sample

Three Palestinian universities-Nablus University for Vocational and Technical Education, Ibn Sina College for Health Professions, and An-Najah National University-were the sites of the current study. Three hundred undergraduate nursing students in all were asked to take part. 266 of these students finished the survey, yielding an impressive 88% response rate.

The Inclusion and Exclusion Criteria

The study included nursing students in their second, third, and fourth years. Due to their lack of exposure to clinical training, probable lower levels of competency, and limited subject-matter knowledge, first-year students were not accepted. Furthermore, incomplete surveys were not included in the final analysis.

Instruments

A self - report questionnaires used consisted of three parts: (a) Demographic information, (b) Knowledge about peripheral intravenous cannulation, (c) Student perception toward prevention of intravenous catheter infection. Demographic characteristics of the participants included their year of study (second, third and fourth-year), gender, University name (Nablus University for Vocational & Technical Education- Ibn Sina College for Health Profession-, and An-Najah National University), training received, place of training, and the number of wards practiced.

A 'Questionnaire' developed by researchers is a 23-item tool clustered to 2 subscales: students' Knowledge about peripheral intravenous cannulation (10 item: Yes or NO questions) and Student perception toward prevention of intravenous catheter infection (consisted of 9 multiple choice questions with only one possible correct answer, 4 yes or no questions), option "I do not know" to equivocate guessing. Each correct answer was given one point. It had 10 statements on how nursing student perceived peripheral venous catheter care guidelines. Student' responses were rated from 0 to 1 as 0 – disagree, and 1– agree. The total score ranged from 0 to 10. The mean was calculated based on the maximum and minimum scores of students in the perception tool. The above mean score was considered a positive perception and the below mean was a negative perception.

Data Collection

Data was collected during from March 26 to May 31, 2024. by hard copy and electronic copy of Questionnaire forwarded to nursing students in the selected nursing schools, the questionnaires were administered to the participants during their free time after clarifying the purpose and the benefits of the research and take the verbal consent from them to participate.

Ethical Consideration

IRB approval was obtained from our institutional review committees, nursing students were informed of the nature of the research along with their rights as a participant, the benefits that could be derived from participation in the study were likewise explained to the nursing students and nursing students' anonymity was assured.

Results

The response rate was 88%, a total of 300 questionnaires were distributed to the nursing students at An Najah National University NNU and Nablus University for Vocational and Technical Education. 266 respondents voluntarily submitted complete questionnaires; three questionnaires were excluded because they were incomplete.

Participants' Demographics

Table one illustrates that among the 266 students, 66.1% were females, more than half were students at NNUH 56.7% and the larger number of participants were nursing students in the second academic year 39.4%

Table 1: Nursing Students' Demographics, N =266

Characteristics	Frequency	Percent %
Gender		
Male	90	33.9
Female	176	66.1
University		
An Najah National University	151	56.7
Nablus University	115	43.3
Academic year		
Second year	105	39.4
Third year	80	30.0
Fourth-year	81	30.6

Table 2 The mean knowledge score was 8.87 (SD =1.47). 47.8 % of the nurses score full marks in the knowledge and the minimum score was four and reported for 2.2 % of the nurses (n= 4). According to the mean knowledge score, 70.6% of the participants were knowledgeable regarding peripheral cannulation (see Table two).

Table 2: The knowledge and Perception level of nursing students regarding peripheral IV cannulation N=266

	Frequency	Percent %	Mean (SD)	Minimum	Maximum
Knowledge			8.87 (1.47)	4/10	10/10
Below average	78	29.4			
Above average	188	70.6			
Perception			7.01 (2.16)	2	13
Below average	91	34.4			
Above average	175	65.6			

SD: Standard Deviation,

Table three, it showed that the majority of the students 97.2 % knew that it is important to positively identify the patient and introduce it and 95.0% knew that the patient should be informed about the procedure and recognize the importance of performing Hand hygiene before cannula insertion. The least scored question related to peripheral cannula insertion was that the 18 G cannula is suitable for adults with students (76.7%) answering it correctly.

Table 3: Knowledge about Peripheral Intravenous Cannulation

Items	Know correct answer		Do not know the correct answer	
	Frequency	Percent %	Frequency	Percent %
Self-introduction to the patient and clarification of the patient's identity is important before performing intravenous cannulation.	258	97.2	8	2.8
The patient should be informed of the procedure and verbal consent should be obtained.	252	95.0	14	5.0
18G cannula is suitable to be used for adult peripheral intravenous cannulation	204	76.7	62	23.3
Factors that influence the choice of the cannula are the purpose of cannulation and the size of the vein to be cannulated.	245	92.2	21	7.8
Cephalic and Basilic veins on the forearm are frequently used in intravenous cannulation.	208	78.3	58	21.7
Hand hygiene before performing intravenous cannula insertion is important to reduce the risk of infection.	252	95.0	10	5.0
Peripheral intravenous cannula cannot be left in situ for more than 72 hours irrespective of the presence of infection.	214	80.6	52	19.4
Maintaining an aseptic technique during the insertion of an intravenous cannula helps in reducing the risk of infection.	245	92.2	21	7.8
Wearing gloves during the insertion of an intravenous cannula is advisable.	239	90.0	27	10.0
Skin preparation of the insertion site is required before intravenous cannulation is performed.	239	90.0	27	10.0

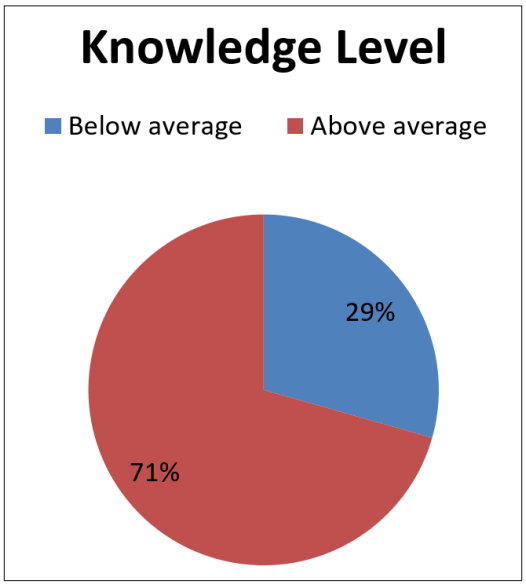


Table 4 Regarding the relationship between knowledge score and demographics the knowledge was significantly higher among females (8.49 ± 1.65), and it was significantly higher among the NNU students (9.11 ± 1.29), the p value respectively was, 0.012 and 0.013, The mean perception score was seven out of 11 (SD= 2.16) with a minimum of two and 13 maximum. More than half 65.6 % (n=118)of the participants had positive perception (above average) as revealed in Table two and concerning the demographics, the perception score was significantly associated with the gender, university, and the academic year that the female students had more positive perception than male (7.41 ±2.06), P value = 0.000, and being students at NNU got more positive perception (7.38 ± 2.19) and the same with being at the fourth academic year (7.76 ±2.27), p value < 0.05.

Table 4: The relationship between the students' demographics, and the knowledge and the perception of peripheral IV access.

Characteristics	Knowledge Score			Perception		
	Mean	SD	P value*	Mean	SD	P value*
Gender			0.012			0.000
Male	8.49	1.65		6.21	2.15	
Female	9.07	1.33		7.41	2.06	
University			0.013			0.007
An Najah National University	9.11	1.29		7.38	2.19	
Nablus University	8.56	1.63		6.51	2.04	
Academic year			0.515			0.007
Second year	8.83	1.36		6.62	1.701	
Third year	8.74	1.51		6.74	2.41	
Fourth-year	9.05	1.57		7.76	2.27	

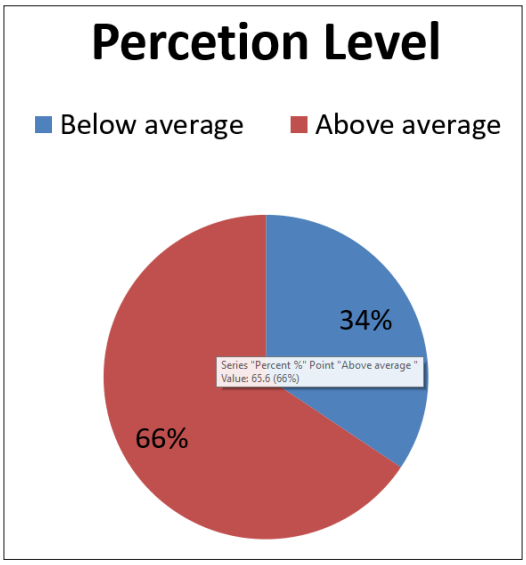
SD: standard deviation, P value< 0.05

Table 5 The majority of nursing students agreed that the multiple attempts of IV cannulation increase the risk for phlebitis and thrombosis; however, the majority disagrees that the infusion set should be replaced every 96 hours (see Table Five).

Table 5: The Perception of Peripheral Intravenous Cannulation n= 266

Items	Agree		Disagree	
	Frequency	Percent %	Frequency	Percent %
It is recommended to replace peripheral venous catheters (PVCs) routinely every 72-96 hours.	195	73.3	71	26.7
It is recommended to perform an antiseptic hand wash before the insertion of PVCs.	200	75.0	66	25.0
It is recommended to use an aseptic technique during connecting/disconnecting the infusion lines.	163	61.1	103	38.9
It is recommended to change the dressing on the catheter insertion site daily.	157	58.9	109	41.1
It is recommended to cover up the catheter insertion site with Polyurethane Dressing (transparent).	103	38.9	163	61.1
It is recommended to disinfect the catheter insertion site with 10 % alcohol.	112	42.2	154	57.8

It is recommended to apply an antibiotic ointment at the insertion site of PVC.	58	21.7	208	78.3
When lipid emulsions are administered through PVC, it is recommended to replace the administration set within 24 hours.	114	42.8	152	57.2
When neither lipid emulsions nor blood products are administered through PVC it is recommended to replace the infusion set every 96 hours.	18	6.7	248	93.3
Routine replacement of peripheral venous catheters is not necessary for pediatric patients unless complications develop.	117	43.9	149	56.1
Multiple attempts of intravenous cannulation increase the risk of phlebitis, thrombosis, and cannula-related infection.	229	86.1	37	13.9



Discussion

This study assessed the level of knowledge and the perception of peripheral intravenous access cannulation. The analysis revealed a high level of knowledge and perception level among nursing students at NNU and Nablus University The mean knowledge score was 89 % in this study compared with a 48% score in a study conducted in Spain and targeted nursing students in the second, third, or fourth year from three nursing schools, and in the same study, there was no relationship between gender and university which is in contrary to this study [16].

The nursing students in both nursing schools in this study were knowledgeable regarding their academic years and this may relate to the synchrony between the theoretical part and clinical training system that is adopted in our nursing schools and so students keep in touch with updated knowledge and evidence-based practice. These results were opposite to the study of in which 267 Ethiopian nursing students showed unsatisfactory knowledge levels and it was not related to gender and academic year [17].

On the other hand, in a study conducted in Malaysia in 2019, the medical students showed a high level of knowledge of Peripheral IV cannulation, the same as the results of this study however, there was no association between demographics and knowledge level. In the Malaysian study, the self-introduction, identifications, and informing the patient about the procedure before inserting the cannula were answered correctly by 100% of the participants, meanwhile in this study non achieved 100% in a single item of the knowledge section of the questionnaire, but the highest score 97.2% obtained for the item of the importance of identification and 95% of the students would inform the patient of the procedure [18].

A study conducted in Italy, the level of knowledge of peripheral cannulation procedure was assessed for 1056 nursing students from three universities and e results showed that 33.5 % of the students did not know the right way to wash their hands before CVPs insertion, the proper time to replace the infusion set after blood and lipid administration, the type of dressing, the use of antibiotic and the disinfectant of the insertion site and all of these were not congruent with this study in which the previous items was correctly scored by the majority of nursing students [19].

On the other hand, nursing students had positive perceptions of Peripheral IV cannulation and a risk factor for phlebitis which were affected by participant demographics. However, in the study conducted by the University of Lahore to measure the nursing students' perception of peripheral iv cannulation and risk factor of phlebitis they found that the perception was negative regarding the cannula size and insertion-related practices but good perception regarding IV therapy through the cannula, for example, the minority of students were agreed that the multiple attempts of IV cannulation increase the risk for phlebitis and thrombosis that is opposed to the result of this study in which a majority perceive positively the importance of minimizing attempted cannulation [20].

In the study of Lanbeck et al. the author found that the majority of the sample nurses agreed that insertion of a peripheral venous catheter in the forearm and catheter rotation within 48 hours was protective against phlebitis and thrombosis but in this study, more than half of the students agreed that the peripheral cannula should be rotated minimally every 72 which is congruent with last updated practices [21]. In our opinion there was a discrepancy between the percentage of knowledge in our research and the other research mentioned above as a result of the language difference, the presence of many courses that are given to students, and the number of samples in other studies.

Limitation

Numerous restrictions on the study could have affected how representative the results were. Because this study is cross-sectional, it is unable to identify causal correlations; therefore,

future research must be longitudinal. Self-reporting bias: We cannot be sure that every participant can honestly and seriously complete the survey because it was administered online for this study. Participants may encounter circumstances when they are unable to respond honestly in order to conform to societal norms, such as while looking up answers online. Out of all the West Bank, we selected two universities, but it's possible that those two don't accurately reflect the region's overall state.

Conclusion

According to the study, nursing students generally showed high knowledge and a favorable opinion of IVCI prevention. Nonetheless, certain deficiencies were noted, emphasizing the necessity of ongoing education and hands-on training. The results highlight how crucial it is to incorporate infection prevention and control into nursing courses and provide frequent training to improve students' proficiency. This study offers insightful information that can aid in the creation of focused educational initiatives and health regulations meant to lower infections linked to healthcare. Improving patient safety and the standard of care requires strengthening nursing students' understanding and use of infection control. The study concludes by highlighting the vital role that nursing students play in preventing IVCIs and the significance of continuous initiatives to enhance their clinical readiness and education in this field.

Recommendation

Based on the study findings, several recommendations are proposed for further research and improvement in nursing education and practice. Greater emphasis should be placed on simulation lab training, particularly on proper techniques for cannula insertion and inflammation prevention. The incorporation of modern teaching methodologies, including online, technological, and interactive resources, is encouraged to enhance learning outcomes. Additionally, the routine use of standardized nursing guidelines is essential for the prevention of IV catheter-related infections. Each hospital ward should have access to a written, up-to-date procedure manual outlining infection control precautions during IV infusion, serving as a reliable reference for staff. Future studies should also investigate the contributing factors of IV catheter infections to deepen understanding and improve management, ideally involving licensed clinical samples. Lastly, developing a health promotion program for university students based on the Health Belief Model can support improved patient care and awareness regarding IV catheter use.

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Declaration of Conflicting Interests

Authors have no conflict of interests

Data Availability

Author(s) should guarantee that data of the study are available and will be provided if anyone needs the data

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