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ASSESSMENT OF NURSES' KNOWLEDGE AND PRACTICES REGARDING ANTIBIOTIC-RELATED IV EXTRAVASATION AT HMC PESHAWAR

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Abstract

Background: *IV extravasation is the leakage of IV fluids into surrounding tissues leading to inflammation and possible long-term consequences. This problem is particularly serious with antibiotics. This study aims to evaluate nurses' knowledge about managing antibiotic-related IV extravasation and its association with demographic data.*

Objectives: *To assess nurses' knowledge regarding the management of antibiotic-related IV extravasations and to examine the relationship between nurses' knowledge and demographic factors.*

Methodology: *This was a cross-sectional descriptive study carried out among 208 nurses of HMC Peshawar. An adopted structured questionnaire was used to parallelly collect data on socio demographic characteristics, level of knowledge and practices. The sample size of 208 was based on a 95% confidence level, and the study measured convenience sampling in obtaining efficient data. Data were analyzed using SPSS, with chi-square and Pearson correlation to explore the relationship between demographic factors and knowledge and practices.*

Results: *The findings of the study revealed notable gaps in the knowledge and practices of healthcare professionals regarding IV extravasation management. Among the participants, 49% demonstrated poor knowledge, and 45% displayed inadequate practices. The majority (75%) were aged 20–30 years, with 68% having less than five years of professional experience, and 73% were female. Participants with higher educational qualifications exhibited significantly better knowledge and practices, highlighting the importance of advanced training. These results emphasize the urgent need for targeted educational programs and standardized protocols to improve IV extravasation management and ensure patient safety.*

Conclusion: *Inadequate education and training on IV extravasation management were found at HMC Peshawar. Enhancing nursing education through targeted training and updated curricula will improve patient safety and care.*

INTRODUCTION

IV extravasation is the leakage of IV fluids into surrounding tissues leading to inflammation and possible long-term consequences. Being able to effectively deliver drugs, fluids and nutrients directly

into the patient's bloodstream through IV therapy has placed it as a standard practice in modern medicine(1). Such an approach is more efficient and faster, especially in acute and emergent medicine where timely therapeutic actions are preferable (2) . Vesicant drug leakage or extravasation, whereby the infusion liquid leaks from the IV catheter to the surrounding body tissue, is a common and potentially life-threatening complication of IV therapy (3). This problem is particularly serious with antibiotics like beta-lactams, erythromycin, ceftriaxone and vancomycin due to their vesicant nature. Ranging from mere rash and inflammation to severe skin ulceration, this often complicates the wound repair process and requires complicated dressing and an extensive healing process (4) . Extravasation, in the extreme, can cause necrosis, significant tissue damage, and not only long-term functional impairments. Early signs and symptoms are usually pain in the affected area, redness, swelling and stiffness around the affected area (5). Nurses are able to prevent the above complications through proper adherence to monitoring and specialized knowledge as well as protocol when administering antibiotics with a higher risk of extravasation. The nursing staff is instrumental in the prevention of extravasation to safeguard an effort to maintain optimum quality in patient care and safety (6) . Extravasation through the intravenous (IV) route is divided into four categories by the extent of the injury. Grade 1 includes the inability to easily flush the IV device along with pain at the site and catheter but no sign of inflammation such as swelling or redness. Grade 2 indicates pain around the site of infusion and little inflammation and erythema but no skin sloughing. Grade 3 is characterized by pain on the site of infusion, increased oedema, erythema, and a dry and pale area. Finally, Grade 4 is the most serious: the subject reports severe pain, very pronounced edema, the skin becomes pale at the site of infusion, and the rate of capillary filling is noticeably decreased (7) . An analysis of manuscripts revealed that the frequency of peripheral IV extravasation varies between 0.1 and 6% (8) . It is much higher in high-risk patients such as children as well as cancer patients as their extravasation rates could be as high as 10 % sometimes. One rather alarming publication reported that as many as 75.8% of nurses employed in a pediatric team had no idea about the signs of infiltration and extravasation at an early stage. In pediatric patients, the frequencies were as high as 11 % while only 20 % of the nurses were aware of the early signs of extravasation in pediatric patients (7). The lack of knowledge among nurses about IV extravasation is well documented. A cross-sectional descriptive survey carried out in Namibia with 200 nurses established that 84% of the participants had inadequate knowledge concerning IV fluid therapy, putting the patients at increased risk of extravasation and other issues (9) . According to the study, it was clear that there was a need to address the training aspects of nurses through effective comprehensive training programs to enhance their competencies (10) . Peripheral IV extravasation can be prevented by implementation of an evidence-based clinical practice guideline (CPG) which was demonstrated in a quasi-experimental study involving 150 neonatal nurses. The intervention led to increase in the rate of compliance with best practice but cast light on areas that the participants seemed to lack adequate knowledge about certain antibiotics (11) . This fact supports the need for setting standard measures concerning the extravasation hazards related to specific antibiotics. A study done in India also revealed that less than half of the nurse were able to demonstrate good knowledge about IV extravasation and the appropriate management; 46% of the study participants got the interventions right (12) . The investigated, 220 participants, suggested targeted training interventions for acquiring knowledge gaps. In Pakistan, various gaps in nursing education and experiences are found to be responsible for poor handling of IV extravasation. A survey of 250 nurses was conducted using a cross-sectional study, and the participants demonstrated that they were not fully prepared to handle IV complications since; the training in nursing curricula was insufficient (13) Despite a significant number of works devoted to IV extravasation, there are only a limited number of articles discussing complications related to antibiotics. The management of IV extravasation remains challenging especially when antibiotics are involved, the practices and training of the nurses who work at Hayatabad Medical Complex (HMC) Peshawar in relation to antibiotic related IV

extravasation phenomenon must be investigated. The study may help to visualize and determine the extent of knowledge and practices in Nurses of HMC that will form basis for research and establishing sound, integrated procedures and fostering applied and lasting learning**.** In order to have safer patients, to reduce occurrences of complications related to extravasation, and to raise patients' satisfaction, it is time for the HMC Peshawar nurses to have the proper knowledge and clinical performance.

METHODOLOGY

This research utilized a descriptive cross-sectional design to investigate the knowledge and practices of nurses concerning the management of intravenous (IV) extravasation of antibiotics. The research was conducted in Hayatabad Medical Complex, Peshawar which is a tertiary care hospital in Pakistan. This study targeted nurses working in Hayatabad Medical Complex. This group consisted of Registered Nurses, Nurse Practitioners and Nursing interns who give Intravenous medications. Data collection was facilitated through an adopted questionnaire. Based on the information and research type, the required sample is worked out to be 208 using the sample size calculator named calculator.net that is available online. Participants were selected through convenient sampling. Both male and female nurses who were actively involved in nursing care in Hayatabad medical complex Peshawar and Nurses intern who were doing internship in Hayatabad medical complex Peshawar. Those registered nurses who were on any annual leave, Nursing students doing clinical placements, Operating Room (OT) nurses and Nursing director, supervisor in the hospital were excluded in the study. The data collected from the questionnaires analyzed by means of using SPSS (Statistical Package for the Social Sciences). The analysis conducted and used SPSS for demographic variables frequency tables were found and chi-square crosstabs for association between knowledge of the nurses and practices of extravasation management of nurses with demographic data were showed. In this research, we have offered a data collection letter that has been approved and signed by the director of the Institute of Nursing Science at Khyber Medical University (KMU). This ensures that all ethical issues are well handled while at the same time allowing the research to progress as planned. This study also maintained ethical practice as it involved only individuals who responded willingly to be a part of the study. It was clear to the participants what the study was about and how it would be conducted as well as benefits and risks that would occur, confidentiality was to be respected at all times and supervisor review conducted before data collection began.

RESULTS:

The study evaluates the descriptive statistics about demographic data and crosstab association between levels of knowledge and practices with education levels. The table 1 described the study participants; Most (75.5%) of them were between 20-29 years while the remainder 22.1% was between 30-39 years and only 2.4% was 40-49 years. Regarding gender distribution, females have comprised 73.6 % with a participation of 153 students and males 26.4% of participants with 55 students. With regard to participants' education level 27 participants had post RN qualification, 16 participants had BS nursing and 15 participants had a diploma. The work experience of the participant was also categorized, majority (68.8%) of the participant had less than 4years work experience followed by participant who has 5-9years work experience, 10-14years work experience, 15 and above work experience 20.7%, 6.7% and 3.8% respectively. With regards to programs and the training courses, 40.9% of the participants reported not participating, 34.1% reported participation in one program while 25.0% reported participation in two or more programs. These demographical information outlines the participant's profile by age, sex, education level, experience level, and extent of professional development activities.

Table 1 Demographic data n=208

Variables		Frequency	Per%
Age	20-29 years	157	75.5%
	30-39 years	46	22.1%
	40-49 years	5	2.4%
Gender	male	55	26.4%
	female	153	73.6%
Education level	Diploma	52	25.0%
	Post RN	96	46.2%
	BS Nursing	60	28.8%
Numbers of years of experience	4 and < 4 years	143	68.8%
	5-9 years	43	20.7%
	10-14 years	14	6.7%
	15 and above	8	3.8%
Numbers of participation in programs and training courses	No participation	85	40.9%
	Participation in one program	71	34.1%
	Two and more than 2	52	25.0%

The cross-tabulation considered in this paper also looks at the education level and levels of knowledge of extravasation. Moreover, Diploma had the largest segment of scores depicting "Poor "knowledge (46.2%) as compared to "Good" (19.2 %) or "Excellent" (15.4%). Particularly, Post RN graduates were more evenly spread across the two quadrants of "Good" (28.1%) and "Excellent" (24.0%). The scores of the inter-BS Nursing students are presented in Table 2. The result showed that the good percentage knowledge score of the inter-BS Nursing students was higher than the other groups with 46.7 % Excellent knowledge scores than the overall knowledge of extravasation. The total distribution of participants' Knowledge level reveals that 31.7% have a poor level of a of knowledge and 28.4% have excellent level meaning variability is observed in participants' knowledge levels based on their education levels.

Table 2 Crosstab between Levels of Knowledge with Education levels

Crosstabulation						
	levels of knowledge of extravasation					
	Poor	Fair	Good	Excellent	Total	p-value

Education level	Diploma	24	10	10	8	52	
	Post RN	32	14	27	23	96	0.002
	BS Nursing	10	7	15	28	60	
Total		66	31	52	59	208	

In table 3 practice levels are compared with the levels of education the crosstab shows that the education and practice level are related statistically significant with p= 0.0001. From the 208 participants, diploma holders, the frequency of poor practice 23 and fair practice 15. Good practice 9 and excellent practices 4 diploma holders were few. Regarding practice categories, while Post RN qualification participants 96 also followed more varied practices than BN participants, revealing 37 participants in the poor category, this group had 19 participants in the excellent category only and 25 in the good only. The most participants with a BS Nursing degree were noted to have demonstrated excellent 23, good 20 while the remaining participants had only fairly rated 7 and the least poor practice 10. This implies that better education, especially BS Nursing, are closely related to better practice; and this increases the impact of advanced nursing education in enhancing the best practices in healthcare organization.

Table 3 Crosstab between levels of practices with levels of practices of extravasation management

Crosstab							
			Levels of practices				p-value
		Poor	Fair	Good	Excellent	Total	
Education level	Diploma	23	16	9	4	52	0.0001
	Post RN	37	15	25	19	96	
	BS Nursing	10	7	20	23	60	
Total		70	38	54	46	208	

DISCUSSION

The demographic characteristics determined by this study at HMC Peshawar are in consistent with the international study as far as the knowledge and practices relating to IV extravasation are concerned. With 208 participants, this study is comparable to other studies performed in Namibia with 200 nurses and in India with 220 participants), which identified knowledge gaps in IV therapy resulting from insufficient training (10) . Sex distribution in this study is Male 25% while Female 75% and this conforms to literature that nursing is female dominated profession as evidenced in a study done in South Egypt and Turkey(14). The age distribution of the participants (75.5% 20–29 years) and years of experience distribution (68.8% ≤4 years of experience) are similar to reported self-confidence in handling IV extravasation in Turkey, where nurses with less experience and younger ages had lower confidence (14) . Concerning knowledge and practice, BSN-qualified nurses were significantly more knowledge and practice than diploma and post-RN nurses, in consistencies with previous findings from Iraqi and Chinese studies enumerating better competency and safer practice standards amongst nurses with higher education (15,16) . Additionally, the absence of practical experience in terms of training, seen in this study where 96.6% of the respondents attended two or fewer sessions, was comparable to that seen in Namibia and India; due to scarcity of training opportunities, skills could not enhance (10,12) . Such demographic characteristics emphasize the necessity of designing appropriate educational programs, training, and other evidence-based guidelines all around the world to fill the

existing knowledge and practice deficits concerning the IV extravasation management. Lack of training was the key reason explaining why, as in a study found, only 30% of nurses at Amal National Hospital in Baghdad knew enough about controlling extravasation related to cytotoxic drugs. This situation can be analogous to that at HMC Peshawar, in which there was low participation in training(15). This study was supported by a cross-sectional study conducted in South Egypt; the study found that oncology nurses who underwent the in-service training program would show a considerable improvement in knowledge and safety process of chemotherapy extravasation. These seminars proved that focused educational interventions work with average pre-training score of 52% improved to 78% percent after training.(17).

Together, these investigations highlight a common theme: defensive competence regarding IV extravasation on the other hand lacks practical skills for handling the complication in different hospitals regardless of the variation in the theoretical skills acquired.

LIMITATIONS

There are several limitations that were encountered in this study that need to be acknowledged. First, 208 respondents were considered as a small sample to provide an opportunity to reach out nursing staff in different groups in HMC Peshawar; however, a large sample size including several hospitals could better help the generalization of the results. Furthermore, there was need for a training program like before and after study. In addition, due to cross-sectional approach used in the study, one is limited in observing training impact persistence or continuous use of knowledge and practices within a certain time span. A longitudinal approach would afford a broader understanding of training and its effects on maintenance of skills and practice performance and may well offer a more accurate perception as to the extent of the difference that education really makes when it comes to handling antibiotic-related IV extravasation proficiently.

CONCLUSION

In conclusion, the present study highlighted the following four points: There is a lack of knowledge in the HMC Peshawar nurses and nursing students in the management of antibiotic related IV extravasation; The level of knowledge and practice displayed by majority of the study participants was poor to fair at best. Analysis of the descriptive results also showed that educational level played the most important role on knowledge and practice scores, especially those with a higher qualification like having a BS in nursing. This work therefore identified lack of specific experience and training of the participants, especially in relation to the management of IV extravasation as an area of knowledge deficit. Such conclusions emphasize a severe deficiency in educational programs and the necessity of using professional recommendations to enhance the nursing practice and result in better patient protection and treatment outcomes. Therefore, it is critical that health-care organizations maintain continuity of training and effective skills exposure for management of extravasation in nursing curricula. In this respect, nurses' overall competencies should be improved with reinforce of IV extravasation management in educating and clinical training schemes to minimize the risk to patient. This research paper underscores the need for actual practice that synthesizes knowledge of best-practice and the assimilation of training curriculums in order to fill the current gaps in these domains.

CONFLICT OF INTEREST: None

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