Knowledge on intravenous therapy among undergraduate nursing students in Pokhara, Nepal: A cross-sectional study

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ABSTRACT

Introduction: Intravenous therapy is a fundamental skill for nurses, and assessing student's knowledge is crucial for ensuring patient safety. This study was aimed to assess the knowledge on intravenous therapy among undergraduate nursing students in Gandaki province, Pokhara. **Methods:** A cross-sectional study was conducted among purposively selected 208 undergraduate nursing students in Pokhara. Pretested structured self-administered questionnaire was used to collect data which was validated and reliable (r=0.85). Data was analyzed in SPSS version 22.0, using descriptive and inferential statistics (Chi-square test and logistic regression) p-value <0.05 was considered significant. **Results:** The study revealed that 63% had adequate, 35.1% had moderate and 1.9% had inadequate level of knowledge with a mean score of 42.43±7.77. Multivariate logistic regression showed those getting information from friends/senior were twice more likely to have adequate knowledge (p=0.01; AOR= 2.37; CI=1.20, 4.70) and students having clinical experience of ≥2 years were 2.5 times more likely to have adequate knowledge (p=0.04; AOR=2.54; CI=0.99, 6.55). **Conclusions:** The study finds undergraduate nursing students possess sufficient general knowledge of intravenous (IV) therapy, gaps in understanding specific areas like drop factor calculation, recognizing infiltration signs, preventing infection, and the importance of routine IV care, can compromise care quality and patient safety. Furthermore, students should supplement information from peers and seniors with formal education including skills-based training focused on these critical aspects of IV therapy to ensure competency.

Keywords: Intravenous therapy, knowledge, nursing students.

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INTRODUCTION

In hospital settings, peripheral intravenous catheters (PIVCs) are commonly used as a standard clinical intervention, with more than 200 million procedures performed annually.[1] Peripheral venous cannulation is the most frequently used method for intravenous therapy.[2] It involves inserting a small hollow device called a cannula into a vein to provide venous access. This procedure requires thorough knowledge of vascular anatomy and physiology, professional competence, and strong manual skills.[3] Intravenous (IV) therapy has been an essential part of routine nursing care for over 180 years,[4] primarily used to maintain fluid and electrolyte balance and administer medications.[5,6] IV fluids, delivered directly into the bloodstream, are classified as crystalloids, colloids, and blood products.[7,8] However, IV therapy is not without complications. Issues such as phlebitis, infiltration, and IV site infections often necessitate the replacement of catheters, with bloodstream infections from PIVCs occurring at a rate of 0.5 to 0.7 per 1000 catheter days.[9-11]

Given the critical role of nurses in providing high-quality care, it

is imperative that they possess both foundational and advanced knowledge of IV therapy to meet individual patient needs.[12] A study conducted in Saudi Arabia among 132 third- and final-year Baccalaureate nursing students revealed that 22.2% had inadequate knowledge, 66.7% had moderate knowledge, and only 11.1% had an adequate understanding of IV therapy. This points to a pressing need to improve both theoretical knowledge and practical skills in this area.[13] Global data suggests that errors stemming from poor knowledge of IV therapy are common, affecting up to 20% of patients.[14] Furthermore, recent studies have shown that nurses often exhibit either average or inadequate levels of understanding regarding IV fluid therapy.[15,16] Similarly, a study conducted in Nepal assessed the knowledge of IV cannulation among nursing students at Purbanchal University. The results indicated that while 55.8% had adequate knowledge, 44.2% demonstrated inadequate understanding of IV cannulation procedures. This disparity suggests that even within the same academic cohort, there are varying levels of competence, highlighting the need for targeted educational interventions.[17] Inappropriate knowledge on proper catheter placement can lead to infiltration, extravasation, phlebitis; improper securing or placement can cause dislodgement; improper flushing techniques can cause occlusion; poor aseptic technique can lead to local infection which may aggravate to catheter related bloodstream infections. Having improper knowledge in fluid and medication can cause fluid overload leading to pulmonary edema or dehydration; incorrect infusion rate may result in hemodynamic instability or ineffective treatment. Furthermore, poor IV access skills can delay lifesaving therapies, improper technique can cause repeated insertions or complications which often require more interventions and longer hospitalisations.[18,19]

Considering the importance of IV therapy in modern medicine for administering life-saving treatments, correcting metabolic imbalances, and delivering essential nutrients and medications, it is crucial to ensure that both current and future nurses are well-prepared. Nursing students must acquire adequate knowledge and competency to ensure patient safety, minimize complications, and promote positive health outcomes.[20] Despite the significance of this topic, there has been limited research conducted in Nepal to assess nursing students' knowledge of IV therapy. Therefore, this study aimed to assess the level of knowledge on intravenous therapy among undergraduate nursing students in Pokhara, Nepal, highlighting the need for more comprehensive education and training in this critical area of nursing practice.

METHODS

This cross-sectional study was conducted in two government nursing campuses in Pokhara to assess knowledge on intravenous therapy among undergraduate nursing students. The study population were the nursing students of Bachelor in Nursing Science (first and second year) and Bachelor of Science in Nursing (second and third year). In "A" Campus, there were total of 128 undergraduate nursing students from BNS (first year: 36 and second year: 37) and BSN (second year: 39 and third year: 16) and in "B" Campus there were total of 83 undergraduate nursing students of BNS (first year: 15 and second year: 16) and BSN (second year: 15 and third year: 37). The total study population were 211 but three students were absent at the time of data collection. Therefore, the total sample size was 208. Non-probability purposive sampling technique was used for the selection of government nursing colleges in Pokhara. The undergraduate nursing students of Bachelor in Nursing Science (first and second year) and Bachelor of Science in Nursing (second and third year) who were willing to participate and present at the day of data collection were included in the study. While first year of BSN who were not clinically exposed to the practical area of intravenous therapy and, BSN 4th year and BNS 3rd year involved with their research activities were excluded from the study.

Research Instrument

Self–administered structured questionnaire was used for the data collection Independent variables for the study were age, sex, program of study, year of study, duration of clinical exposure, previous work experiences and source of information and dependent variable was knowledge on intravenous therapy assessed using 40 structured questions which included meaning on IV cannulation and IV therapy, IV cannulation process, indications, types of IV fluids/ therapy, monitoring IV complications and IV site care to prevent complications. Each correct response was scored "one", and "zero" was given for the incorrect response. Total score was 60. Score 41-60 was categorized as adequate knowledge, 21-40 was categorized as moderate knowledge and 0-20 was categorized as inadequate knowledge.[13]

To ensure validity, the tool was developed only after extensive literature review, feedback from peer and experts. The tool was pretested among 21 students who were excluded from the study. The reliability of the tool was r=0.85.

Data collection and analysis

The study obtained ethical approval from Institutional Review Committee Tribhuvan University Institute of Medicine (Ref. No. 16(6-11) E2 081/082). The study was done from July to March 2023 with data collection period of two weeks. Formal permission for data collection was obtained from concerned authorities of the campuses. Similarly, the permission was also taken from the coordinator of respective classes of BSN and BNS from both campuses. Researcher herself administered the questionnaire in the classroom setting. Prior to data collection, the researcher introduced herself and the objective of the study was clearly stated and explained to each participant. Written informed consent were taken from the participants before data collection. They were explained that their participation in this study was voluntary and were allowed to leave anytime if they wish. Instructions as directed in the questionnaire were given to the participants for completion of the questionnaire. It took approximately 20 to 25 minutes for the participants to complete the questionnaire. Anonymity was maintained by using a code number. Confidentiality of respondents were maintained by not disclosing the information with others. Data was analyzed in the Statistical Package for the Social Sciences (SPSS) version 22.0 using the descriptive statistics like frequency, percentage, mean and standard deviation, and inferential statistics chi-square test and logistic regression test was used to examine the association between the selected variables and level of knowledge. The p-value <0.05 was considered significant and 95% confidence interval was also computed.

RESULTS

Background Information of respondents

Table 1 shows total (N=208) respondents that are almost equal number in both programs BSN and BNS. About 51(24.51%) were in first year, 129(62.01%) were in second year and 28(13.48%) were in third year. In duration of clinical exposure, 67(32.23%) had three years or above, while 105(50.48%) had previous work experience. There was multiple source of information of IV therapy and care reported, i.e., 159(76.44%) from teachers, 108(51.92%) from course book, 79(37.98%) from friends/seniors, 49(23.55%) from internet. (Table 1)

Table 1: Background information of the respondents (N=208)

Background Variables	Frequency	Percentage (%)
Age in years		
≤23 years	133	63.94%
>23 years	75	36.06%
Program of study		
BSN	104	50%
BNS	104	50%
Year of study		
1st Year	51	24.51%
2nd Year	129	62.01%
3rd Year	28	13.48%
Duration of clinical exposure (year)		
<1	48	23.07%
1-2	58	27.88%
2-3	35	16.82%
≥3	67	32.23%
Previous work experiences		
Yes	105	50.48%
No	103	49.52%
Sources of Information*		
Teacher	159	76.44%
Course book	108	51.92%
Friend/Seniors	79	37.98%
Mass media/ Internet	49	23.55%

*Multiple responses

Distribution of respondent based on level of knowledge

The overall knowledge score was 42.43±7.77 and when knowledge level was categorized, it was found that 131(62.98%) have adequate level of knowledge, 73(35.09%) have moderate level while 4(1.92%) have inadequate level of knowledge on intravenous therapy. (Table 2)

Table 2: Level of knowledge on intravenous therapy (N=208)

Level of Knowledge	Frequency	Percentage (%)
Adequate	131	62.98%
Moderate	73	35.09%
Inadequate	4	1.92%
Mean±SD (42.43±7.77)		
Score Range (17-56)		

Association between selected variables based on level of knowledge on intravenous therapy

There was statistically significant association between level of knowledge on IV therapy and age (p=<0.001; OR=1.24; CI=1.11, 1.38), program of study (p=<0.001; OR=3.46; CI=1.90, 6.29), duration of clinical exposure (p=<0.001; OR = 1.92; CI = 1.46, 2.52), previous work experiences (p=0.005; OR=0.44; CI=0.24,0.78), and source of information from friends /seniors (p=0.006; OR=0.42; CI=0.23, 0.79) in bivariate logistic regression, while in multivariate logistic regression, source of information from friends or senior were 2.3 times more likely to have adequate level of knowledge (p=0.01; AOR=2.37; CI=1.20,4.70) and students having clinical experience of ≥2years were 2.5 times more likely to have adequate knowledge (p=0.04; AOR=2.54; CI=0.99, 6.55). (Table 3)

Table 3: Association between selected variables and level of knowledge on intravenous therapy (N=208)

Variables	Level of Knowledge		p-value	OR(95% CI)	p-value	AOR-(95%CI)
	Inadequate and Moderate n(%)	Adequate n(%)				
Age (in years)						
≤23 years	62(46.61%)	71(53.39%)	<0.001**	1*	0.42	1*
>23 years	15(20%)	60(80%)		1.24(1.11, 1.38)		1.61(0.50, 5.17)
Program of study						
BSN	53(50.96%)	51(49.04%)	<0.001**	1*	0.06	1*
BNS	24(23.07%)	80(76.93)		3.46 (1.90, 6.29)		5.13(0.91, 28.77)
Year of study						
1st year	18(35.29%)	33(64.71%)	0.15	1*		
2nd year	53(41.08%)	76(58.92%)	0.47	0.78(0.39, 1.53)		
3rd year	6(21.42%)	22(78.58%)	0.20	2.00(0.68, 5.83)		
Duration of clinical exposure (years)						
<2	56(52.83%)	50(47.16%)	<0.001**	1*	0.04*	1*
≥2	21(20.58%)	81(79.42%)		1.92 (1.46, 2.52)		2.54(0.99, 6.55)
Previous work experience						
Yes	29(27.61%)	76(72.38%)	<0.001**	1*	0.07	1*
No	48(46.60%)	55(53.40%)		0.44(0.24, 0.78)		4.36(0.88, 21.52)
Sources of information						
Teacher			0.33		0.59	
No	21 (42.9%)	28 (57.1%)		1*		1*
Yes	56 (35.2%)	103 (64.8%)		0.72(0.37, 1.39)		1.2 (0.60, 2.38)
Course book			0.56		0.92	
No	39 (39%)	61 (61%)		1*		1*
Yes	38 (35.2%)	70 (64.8%)		0.84(0.48, 1.49)		0.97 (0.52, 1.80)
Friends/ Seniors			0.00*		0.01**	
No	57 (44.2%)	72 (55.8%)		1*		1*
Yes	20 (25.3%)	59 (74.7%)		0.42(0.23, 0.79)		2.37 (1.20, 4.70)
Mass media/ Internet			0.47		0.78	
No	61 (38.4%)	98 (61.6%)		1*		1*
Yes	16 (32.7%)	33 (67.3%)		0.77(0.39, 1.53)		0.90 (0.42, 1.97)

*Reference; **denotes statistical significance (p<0.05) Hosmer and Lemeshow Test =0.884 (p>0.05)

DISCUSSION

This study aims to assess the level of knowledge on intravenous therapy among undergraduate nursing students in Pokhara. This study showed 63% respondents had adequate level of knowledge on IV therapy, 35.1% had moderate level and 1.9% had inadequate level of knowledge on intravenous therapy which is similar to the previous study conducted in Nepal, which showed 55.8% nursing students had adequate knowledge and 44.2% had inadequate knowledge on intravenous cannulation.[17] Implementation of nursing protocol regarding intravenous therapy could have enhanced the knowledge level of nursing students to adequate level.[21,22] The study done in Kenya also reported 65% of students had average level of knowledge of IV Fluid therapy.[23] While, in contrast to this, a study conducted in Saudi Arabia showed 11.1% had adequate level, 66.7% had moderate level and 22.2% had inadequate level of knowledge.[13] The present study result is higher than the previously reported results in Ethiopia.[24] This study implies that the undergraduate nursing students had significantly basic understanding about intravenous therapy which may be due to more emphasis given during clinical exposure and their practical experiences.

The study also revealed the statistically significant associations between student nurses' knowledge level on IV therapy and age, program of study, duration of clinical exposure, previous work experiences, and source of information as friends /seniors. It is similar to the previous study conducted in Nepal which showed that there were significant influencing variables in level of knowledge regarding IV therapy which were age group, professional qualification, professional designation and, professional experience.[26] But in contrast, a study conducted in India reported no significant association between the knowledge level with demographic variables like age, gender, educational status, marital status, religion, working department, years of experience and any previous training.[27] The difference in the findings might be due to the difference in setting or methods including the instrument used.

To discuss the findings more specific, the undergraduate nursing students at BNS were 3.46 times more likely to have higher knowledge compared to BSN stream. The students who had no previous work exposure, or the nursing students who had no previous work experience were significantly less likely to have knowledge on IV therapy, with the odds of 0.44. A study among Ethiopian nursing students also reported that those who had training were 2.96 times more likely to have higher knowledge on PIVC management. Therefore, this supports the present findings related to clinical exposure and previous work experience.[28] Similarly, this study revealed higher the duration of clinical exposure more likely to have higher knowledge, i.e., those ≥2 years of clinical exposure were 1.92 times more likely to have higher knowledge level than those who have <2 years of clinical exposure. Study from Turkey also revealed that the level of knowledge on peripheral intravenous catheterization was increased with years of study, and students who were in their fourth year of study had higher levels of knowledge about PIVC.[29] Similarly, mixed method study among Spanish nursing students also supports that educational level or their year of study and experience was associated with knowledge on insertion and care of PIVC.[30] Another study from Turkey also reported that year of study

was associated with nursing students' levels of knowledge about the prevention of intravenous catheter infections. Senior students had higher knowledge level than junior students.[31]

Among different sources of knowledge, the significant association was found between friends/seniors with level of knowledge. Those getting information from friends or seniors were two times more likely to have adequate knowledge. In support, a Chinese study among medical students also revealed that friends and seniors were the factors that contributed to academic success.[32] Therefore, from present study, it can be suggested that friends and seniors can become a source of knowledge in learning clinical aspects, where they can share knowledge and practice and can become support system for one another. Another study from India also reported that friends and seniors were the significant source of knowledge on infection prevention among medical students.[33] Therefore, this provides the partial support to present finding. And present study also confirms that friends and seniors can become a significant source of knowledge on IV therapy among nursing students. However, this small scale cross-sectional study among the purposively selected sample of undergraduate nursing students in a particular geographical region could not sufficiently draw the inferences and to assure with the findings. Therefore, future studies with probability sampling and with large sample could be conducted.

The study is limited to the undergraduate nursing students studying in government nursing campuses in Gandaki Province, Pokhara. Therefore, it limits the generalizability. The analysis with the cross-sectional data still does not establish the cause –effect association, thus provides information at a point of time.

CONCLUSIONS

The study concluded that majority of the undergraduate nursing students had adequate knowledge on intravenous therapy. However, inadequacies in knowledge on drop factor, signs of infiltration, infection prevention and need of routine IV care can impact quality care and patient safety. Since, there were significant association between age, program of study, duration of clinical exposure, previous work experiences and source of information as friends/seniors with the level of knowledge in bivariate analysis, multivariate logistic regression showed source of information from friends/senior were twice more likely to have adequate knowledge, suggesting that students should supplement information from friends and seniors with formal education and skill based training. In addition, students having clinical experience of ≥2years were 2.5 times more likely to have adequate knowledge. Hence, there is need of preparing competent undergraduate nursing students through education and skill-based training on these specific areas of intravenous therapy. The findings of the study may also be helpful for the concerned authorities to implement the educational programmes for the quality nursing care and patient safety regarding the intravenous therapy not only emphasizing the adults but pediatrics as well. There is need to update the knowledge of undergraduate nursing students through continuous nursing education and skill training on intravenous therapy and the specific areas identified by the study could be utilized.

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AUTHORS' CONTRIBUTIONS

CT conceptualized the study, design, literature review, data collection, statistical analysis and interpretation of the study. RSB and NS contributed to design, data analysis and interpretation, manuscript preparation, review and editing. All reviewed and approved the final manuscript.

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