Knowledge, Perception and Confidence in Performance on Infection Prevention and Control Measures among the Nursing Students

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ABSTRACT

Background

Healthcare-associated infections increase the patients' hospital stay, morbidity and mortality. It is important that professionals including students acquire knowledge on infection and acquire skills regarding preventive measures.

Objective

The objectives of this study were to assess the knowledge, perception and confidence on infection prevention and control measures and to find the correlation between variables among nursing students.

Method

A cross-sectional descriptive study was conducted among 163 nursing students where a purposive sampling method was used to collect data using the self-structured questionnaire via emails. The questionnaire contained four parts; part I: demographic characteristics, part II: knowledge (40 items), part III: perception (42 items) and part IV: confidence in performance (42 items) on infection prevention and control. Data was analyzed using descriptive and inferential statistics where analysis of variance using Scheffe's post hoc test and Pearson's correlation test were used.

Result

Overall knowledge of the participants was fair (71%). They had good knowledge in general principles (85%) but notable poor knowledge in waste management (2%). There was a statistically significant difference in the knowledge among different levels of the students. A static correlation was found between the knowledge and confidence in performance whereas, perception was highly correlated with the confidence in performance of the participants.

Conclusion

Based on the findings of this study, it can be concluded that the students had fair level of knowledge regarding infection control measures. This study recommends the revision of nursing curriculum and mandating a standardized infection control curriculum across all schools of nursing in the country to improve the knowledge and practice.

KEY WORDS

Healthcare associated infections, Infection control, Knowledge, Nursing students

INTRODUCTION

Healthcare-associated infections (HAIs) also referred to as "nosocomial" infections occurs in the patients 48 hours or more after admission to a hospital, that were not present or incubating at the time of admission.[1] These include central line-associated bloodstream infections, catheter-associated urinary tract infections, and ventilator-associated pneumonia and surgical site infection.[2] According to the Centers for Disease Control and Prevention (CDC), on any given day, approximately 1 in 31 in-patients have at least one HAIs.[2] Great attention has been paid to the infection prevention and control (IPC) measures focusing on the psychological and financial aspects which may shorten hospital stay, prevent long-term disability, spread of antibiotic resistance, etc.[3]

Nurses responsible for patient care must comply with IPC measures which are extremely important for safe and quality healthcare. There is a lack of evidence regarding explicit IPC measures in the curriculum of most medical and nursing undergraduate courses, which needs to be addressed if HAIs rates are to be reduced.[4] Similarly, many evidences have shown that the nursing students have fair level of knowledge regarding IPC measures.[5-9]

As the potential infectious condition of a hospitalized patient is unknown, nursing students are at high risk for transmission of infectious agents.[4,10,11] Thus, nursing students' teaching and training requirements regarding these practices need to be assessed. This study was conducted to assess the knowledge, perception and confidence in performance on IPC measures and to determine the correlation between the variables. This may help decision makers in improvement of the curriculum to prepare the competent health care workers in the country.

METHODS

This was a descriptive cross-sectional study conducted in Kathmandu University School of Medical Sciences (KUSMS), nursing program from April 1 to May 31, 2023. KUSMS runs an undergraduate program of Bachelor in nursing science (BNS), Bachelor in Midwifery Sciences (B. Mid) and Bachelor of Science in nursing (B.Sc. nursing). All programs are for 4 years, which aims to develop competent nurses who are able to utilize evidence-based scientific knowledge and will ensure that they are well prepared to practice safely and effectively.[12] It also runs a two years postgraduate program of Masters of sciences in nursing (M.Sc. Nursing) Program. Approval from the Institutional Review Committee (IRC) of KUSMS, Nepal (IRC 40/23) was obtained to conduct the study.

A total of 163 nursing students studying in undergraduate and postgraduate level of nursing programs in KUSMS were included in the study with a response rate of 67.3%. Students who were not willing to participate in the study and the students who were studying in first-year of B.Sc. Nursing program were also excluded from the study. A self-structured questionnaire was prepared in English language. Data was collected with a purposive sampling method via online using Google Form. An email was sent to different levels of 242 nursing students, explaining the purpose of the study, and a link to the consent form and the questionnaire. Once the participant had agreed to take part in the study, she could fill the questionnaire. The questionnaire contained four parts. Part I contained demographic characteristics of the participants. Part II contained questions related to IPC knowledge (total 40 items) which were subcategorized into general principles of IPC (6 items), hand hygiene (6 items), use of PPE (13 items), safe injection practice (9 items), aseptic technique (3 items), environmental sanitation (2 items) and waste management (1 item). The minimum score for each item was 0 (for wrong response) and maximum was 1 (for right response). Correct answers were calculated to obtain total scores for knowledge regarding infection control practices. The mean score of less than 50% was considered poor, 50-79% fair, and 80% and above was considered as good.[13] Part III contained questions related to the perception of IPC measures (total 42 items) and part IV contained questions related to the confidence in performance on IPC (total 42 items). Perception and confidence to performance were measured via Likert scale where the minimum score was 1 and maximum was 5 for each item. Results are interpreted as the higher the score, the higher perception and the higher level of confidence on performance. These questions were subcategorized into hand hygiene (6 items), use of PPE (7 items), respiratory etiquette (4 items), safe injection practice (3 items), environmental sanitation (3 items), isolation precautions (9 items), personal hygiene (6 items), and vaccination (4 items).

Pretesting was done among 20 students who were excluded from data collection. The Kuder-Richardson-20 (KR-20) reliability and Cronbach alpha coefficient were calculated to measure the reliability of the questionnaire items. As a result of the reliability verification, the KR-20 reliability of knowledge items was .570, and the Cronbach alpha coefficients of perception and confidence in performance items were .982 and .982, respectively. Data was retrieved from the Google form and checked for accuracy, utility and completeness.

Data was downloaded from Google Forms to Excel format and exported to SPSS version 25. Numbers, proportions, mean, standard deviation and range were calculated to describe the sample. Analysis of variance (ANOVA) was conducted to explore the difference between the group means where Scheffe's post hoc test was used. Pearson's correlation coefficient was calculated to find out the relations between knowledge, perception and confidence in performance among the participants. The level of significance was set at $p < 0.05$.

RESULTS

During the study period, a total number of 163 nursing students were included in the study. There were 21 (12.9%) students from B. Mid, 67 (41.1%) from BNS, 48 (29.4%) from B.Sc. nursing and 27 (16.6%) from M. Sc. nursing. All of the participants had experience in clinical practice and had education on IPC measures before clinical practice (Table 1).

Table 1. Demographic characteristics of the participants (n=163)

Characteristics	Category	n	%
Level of education	B. Mid	21	12.9
	BNS	67	41.1
	B.Sc. nursing	48	29.4
	M.Sc. nursing	27	16.6
Year	First year	46	28.2
	Second year	32	19.6
	Third year	31	19.0
	Fourth year	54	33.1
Experiences in clinical practices	Yes	163	100.0
	No	-	-
Education on IPC measures before clinical practice	Yes	163	100.0
	No	-	-
Place of education (Multiple response)	University	109	66.9
	Hospital	157	96.3
	Others	5	3.1
Contents of education received (Multiple response)	Standards-Use of PPE	152	93.3
	Standards-respiratory etiquette	152	93.3
	Standards-safe injection practice	161	98.8
	Vaccination	103	63.2
	Post exposure reporting system	75	46.0
	Post exposure treatment details	74	45.4
	Others (e.g. prevention of needle stick injury)	83	50.9
Total		**163**	**100.0**

Knowledge on IPC measures was measured with 40 questions among the participants. Overall the level of knowledge was fair; the mean score was 71%. The participants had good knowledge in principles of IPC (85%), however fair knowledge in environmental sanitation (79%), safe injection practice (75%), use of PPE (72%), hand hygiene (71%) and aseptic technique (52%). There was a notable poor knowledge in waste management (2%) (Table 2).

Perception on IPC measures was measured with 42 items on a 5-point Likert scale among the participants. The overall score was 4.33±.82 out of 5. The scores of the subcategories of perception are displayed below (Table 2).

Table 2. Knowledge, perception and confidence in performance on IPC measures among nursing students (n=163)

Variables	Subcategories	Range	Min	Max	Mean±SD
Knowledge	A. General principles	0-1	.33	1.00	.85±.17
	B. Hand hygiene	0-1	.33	1.00	.71±.17
	C. Use of PPE	0-1	.31	1.00	.72±.12
	D. Safe injection practice	0-1	.22	1.00	.75±.18
	E. Aseptic technique	0-1	.00	1.00	.52±.25
	F. Environmental sanitation	0-1	.00	1.00	.79±.28
	G. Waste management	0-1	.00	1.00	.02±.13
	Total	0-1	.45	.90	.71±.09
Perception	A. Hand hygiene	1-5	1.00	5.00	4.27±1.11
	B. Use of PPE	1-5	1.00	5.00	4.45±.89
	C. Respiratory etiquette	1-5	1.00	5.00	4.50±.88
	D. Safe injection practice	1-5	1.00	5.00	4.11±.98
	E. Environmental sanitation	1-5	1.00	5.00	4.39±.95
	F. Isolation Precautions	1-5	1.00	5.00	4.21±.93
	G. Personal hygiene	1-5	1.00	5.00	4.41±.87
	H. Vaccination	1-5	1.00	5.00	4.27±.96
	Total	1-5	1.00	5.00	4.33±.82
Confidence in performance	A. Hand hygiene	1-5	1.00	5.00	4.42±.91
	B. Use of PPE	1-5	1.00	5.00	4.35±.92
	C. Respiratory etiquette	1-5	1.00	5.00	4.38±.90
	D. Safe injection practice	1-5	1.00	5.00	4.17±.88
	E. Environmental sanitation	1-5	1.00	5.00	4.39±.82
	F. Isolation Precautions	1-5	1.00	5.00	4.29±.83
	G. Personal hygiene	1-5	1.00	5.00	4.39±.86
	H. Vaccination	1-5	1.00	5.00	4.19±.96
	Total	1-5	1.00	5.00	4.33±.75

IPC: Infection Prevention and Control; PPE: Personal protective equipment; SD: Standard deviations

Confidence in performance on IPC measures was measured with 42 items on a 5-point Likert scale: the higher the score, the higher the confidence in performance. The overall score of confidence in performance was 4.33±.75 out of 5. The scores of the subcategories of confidence in performance are displayed below (Table 2).

Differences in knowledge, perception and confidence in performance on IPC measures according to the characteristics of the nursing students

For knowledge, there was a statistically significant difference in level of education, place of education, Standards-safe injection practice, post-exposure reporting system, post-exposure treatment details, and others-prevention of needle stick injury (Table 3). All students had fair knowledge regarding IPC measures i.e., M.Sc. nursing (75%) BNS (73%), B. Mid (69%) and B.Sc. nursing students (68%), however this knowledge difference was statistically significant ($p < 0.05$) (Table 3).

For perception, there was a statistically significant difference in post exposure reporting system, post exposure treatment details and others-prevention of needle stick injury in the contents of education. For the post exposure reporting system, post exposure treatment details and others-prevention of needle stick injury in the contents of education, those who answered 'yes' were highly aware of the importance compared to those who answered 'no' (Table 3).

For confidence in performance, there was a statistically significant difference in those participants who were educated in the hospital, received education on vaccination, post exposure reporting system, post exposure treatment details and others (prevention of needle stick injury) (Table 3).

Table 3. Association of demographic characteristics of the participants with knowledge, perception and confidence in performance (n=163)

Characteristics		Categories	N	Knowledge		Perception		Confidence in performance	
				Mean±SD	p-value*	Mean±SD	p-value*	Mean±SD	p-value*
Level of education		B. Mid	21	.69±.07	.002	4.24±.94	.246	4.13±.92	.542
		BNS	67	.73±.09		4.23±.93		4.32±.75	
		B.Sc. Nursing	48	.68±.08		4.36±.67		4.40±.58	
		M.Sc. Nursing	27	.75±.09		4.59±.64		4.39±.86	
Year		First	46	.71±.09	.617	4.22±.96	.592	4.20±.81	.159
		Second	32	.70±.10		4.29±.89		4.20±.99	
		Third	31	.72±.08		4.33±.72		4.35±.60	
		Fourth	54	.73±.09		4.44±.70		4.50±.55	
Place of Education	University	No	54	.73±.09	.298	4.37±.71	.616	4.29±.67	.628
		Yes	109	.71±.09		4.31±.87		4.35±.78	
	Hospital	No	6	.69±.11	.434	3.93±1.16	.224	3.66±.66	.025
		Yes	157	.72±.09		4.34±.80		4.35±.74	
	Others	No	158	.71±.09	.009	4.31±.83	.183	4.32±.75	.226
		Yes	5	.82±.07		4.81±.30		4.73±.48	
Contents of education	Use of PPE	No	11	.68±.09	.116	4.23±.36	.686	4.26±.30	.745
		Yes	152	.72±.09		4.34±.84		4.33±.77	
	Respiratory etiquette	No	11	.68±.09	.116	4.23±.36	.686	4.26±.30	.745
		Yes	152	.72±.09		4.34±.84		4.33±.77	
	Safe Injection practice	No	2	.58±.11	.022	3.70±.42	.278	4.13±.36	.713
		Yes	161	.72±.09		4.34±.82		4.33±.75	
	Vaccination	No	60	.70±.08	.232	4.17±.96	.057	4.17±.87	.036
		Yes	103	.72±.09		4.42±.71		4.42±.65	
	Post exposure reporting system	No	88	.70±.09	.005	4.11±.97	<.001	4.14±.85	<.001
		Yes	75	.74±.08		4.58±.50		4.55±.52	
	Post exposure Treatment details	No	89	.70±.09	.006	4.11±.96	<.001	4.14±.85	<.001
		Yes	74	.74±.08		4.59±.50		4.56±.52	
	Others (prevention of needle stick)	No	80	.70±.09	.010	4.14±.88	.003	4.17±.76	.007
		Yes	83	.73±.08		4.51±.72		4.48±.71	

*Scheffe's post hoc test; B. Mid: Bachelor in Midwifery; BNS: Bachelor in Nursing sciences; B.Sc. Nursing: Bachelor of sciences in nursing; M.Sc. Nursing: Masters of sciences in nursing; N: number; IPC: Infection Prevention and Control; PPE: Personal protective equipment; SD: Standard deviation

Relationship between knowledge, perception and confidence in performance

In correlation analysis, perception on IPC measures was positively correlated with knowledge (r=.329, p<.001), and confidence in performance also had a static correlation with knowledge (r=.343, p<.001). High static correlation has been also observed between perception and confidence in performance (r=.781, p < .001) (Table 4).

Table 4. Relationship between knowledge, perception and confidence in performance (n=163)

	Knowledge	Perception	Confidence in per-formance
Knowledge	1		
Perception	.329(<.001)	1	
Confidence in performance	.343(<.001)	.781(<.001)	1

DISCUSSION

The overall knowledge of the participants on IPC measures was fair i.e. 71%. This result was consistent with previous studies conducted in Nepal, India, Jordan, Iran and South Africa.[5-9] The results observed in our study can be explained by the fact that there is a lack of a specialist course to teach IPC measures within nursing curriculum.[14] The findings of this current study will guide nursing educators in revising curriculum and ensuring that topics related to prevention of HAIs are emphasized within both theory and clinical courses. Evidences also suggested that revising the nursing curriculum and raising the ceilings of units related to infection control measures would be a useful measure to increase the knowledge and enhance the performance of nursing students.[15,16]

We found that many of the participants lacked knowledge in waste management and aseptic technique. This may be due to the reason that these topics were not adequately or poorly incorporated in the curriculum. It is also important to strengthen all nursing curriculum by mandating a standardized infection control curriculum across all schools of nursing.[8] Similarly, conducting workshops and seminars related to the infection control and prevention standards also could improve the students level of knowledge.[17] Many infection control measures, such as appropriate hand hygiene and the correct application of basic precautions during invasive procedures are simple and of low-cost. However, correct use of these practices requires accountability and behavioral change of the health care providers.[18]

In our study, the level of knowledge among participants was different according to the levels of education and there was a statistically significant difference between them. Evidence suggested similar findings regarding this, however all students entering the clinical setting must have sufficient knowledge about the infection control. In the healthcare setting, it is the responsibility of both qualified and student nurses to prevent HAIs, who should have an acceptable level of knowledge and skills regarding IPC measures.[19] Hospitals should take the initiative by mandating infection control guidelines before students start their clinical practice in hospital wards and regular seminars, educational programmes, symposiums and workshops should be arranged by a continuing education department in hospitals.[20]

We also found that perception on IPC measures was positively correlated with knowledge. In other words, as people's perception of IPC measures increases, their knowledge on the subject tends to increase as well. The correlation coefficient (r) of 0.329 suggests a moderate positive relationship. Similarly, confidence in performance of nursing students also had a static correlation with knowledge. As people become more confident in their ability to perform these measures, their knowledge tends to increase. This finding was expected, because evidences suggest that performance improves as knowledge increases.[21,22] However, in some studies, no significant relationship has been found between the knowledge and performance of nurses about IPC measures.[14,23] It is equally important to bridge the gap between knowledge and practice in courses nursing curriculum as a means to address IPC measures.[8] Furthermore, perception has been highly correlated with the confidence in the performance of the participants in our study. This means, as people have a more positive perception of IPC measures, they also tend to be more confident in their ability to execute those measures effectively. These findings can be important for understanding how individuals' attitudes and confidence levels relate to their knowledge in the context of IPC. A study also has advocated that in order to change behavior of the students, the nurse educators should take it into consideration.[24]

A major strength of this study was that the high response rate by the participants was achieved. To ensure adequate response rate and minimize selection bias, all students were sent with the questionnaires and included in the sample. However, it is important to consider that students who did not respond may have differed in terms of demographics, knowledge, perception and confidence in performance from those who participated in the study.

Our study has some limitations. First, purposive sampling method was adopted to obtain the data for the study from only a selected university and therefore the results may not be generalizable to a similar student population across universities in Nepal. Second, the questionnaire did not include all the components of IPC measures as the intention was to evaluate the knowledge of nursing students only. Third, the assessment of knowledge and confidence in performance of the IPC measures does not reflect the actual compliance with IPC measures and might not correlate with this self-answered knowledge evaluation. Fourth, since the questionnaire was sent via Google Form

and without any time restriction, the respondents might have answered the questions after taking external help, thus bringing possible bias.

CONCLUSION

The outcomes of this study reveal that the level of knowledge among nursing students was fair, so there is definitely a need to improve knowledge concerning IPC measures. This calls for a review of nursing curriculum to pave the way for more pragmatic practices e.g. practical, evidence-based strategies and actions and mandating a standardized infection control curriculum across all schools of nursing. Furthermore, perception has been highly correlated with the confidence in the performance of the students therefore when student attitudes are developed, nursing educators should consider it as an important factor in their teaching process.

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