

The knowledge and attitudes of nursing students towards nosocomial infections in Morocco

Los conocimientos y las actitudes de los estudiantes de enfermería hacia las infecciones nosocomiales en Marruecos

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Abstract

Introduction: Learning about nosocomial infections is an essential component for improving measures against these infections and for developing effective preventive and curative strategies. The objective of this study is to evaluate the level of knowledge of nursing students at the Higher Institute of Nursing Professions and Health Techniques of Agadir.

Method: This is a cross-sectional self-administered questionnaire for students in the care sector.

Results: One hundred fifty-nine students participated in this study. The average general knowledge score was 3.42 ± 1.50 . The mean knowledge of practices and attitudes score was 11.50 ± 3.42 . The total mean score was 14.92 ± 5.007 . We found that the total score was better in students trained in nosocomial infections ($P < 0.05$). The versatile nurse option recorded the best knowledge scores compared to the other options. The definition of nosocomial infection and its mode of transmission of germs by the hands not identified by more than half of the students. Bacteria were the most cited microbial agent in relation to nosocomial infections. The regulatory aspect of nosocomial infection has been overlooked by most students. Managing feces and preventing blood exposure accidents are the most overlooked standard precautions.

Conclusion: A low level of knowledge of nosocomial infections was observed. Similarly, we should note a difference in the knowledge score between the trained and untrained groups. In conclusion, we propose a teaching of generalization of nosocomial infection for nursing training at the Higher Institute of Nursing Professions and Health Techniques of Agadir.

Key words: Knowledge, attitudes, practices, Nosocomial infections, Nursing care.

Resumen

Introducción: El aprendizaje de las infecciones nosocomiales es un componente esencial para mejorar las medidas contra estas infecciones y para desarrollar estrategias preventivas y curativas eficaces. El objetivo de este estudio es evaluar el nivel de conocimientos de los estudiantes de enfermería del Instituto Superior de Profesiones de Enfermería y Técnicas Sanitarias de Agadir.

Método: Se trata de un cuestionario transversal autoadministrado a los estudiantes del sector asistencial.

Resultados: Ciento cincuenta y nueve estudiantes participaron en este estudio. La puntuación media de los conocimientos generales fue de $3,42 \pm 1,50$. La puntuación media de conocimientos de prácticas y actitudes fue de $11,50 \pm 3,42$. La puntuación media total fue de $14,92 \pm 5,007$. Encontramos que la puntuación total fue mejor en los estudiantes formados en infecciones nosocomiales ($P < 0,05$). La opción de la enfermera versátil registró las mejores puntuaciones de conocimiento en comparación con las otras opciones. La definición de infección nosocomial y su modo de transmisión de gérmenes por las manos no fue identificada por más de la mitad de los estudiantes. Las bacterias fueron el agente microbiano más citado en relación con las infecciones nosocomiales. El aspecto normativo de la infección nosocomial ha sido pasado por alto por la mayoría de los estudiantes. El manejo de las heces y la prevención de los accidentes de exposición a la sangre son las precauciones estándar más olvidadas.

Conclusión: Se ha observado un bajo nivel de conocimientos sobre las infecciones nosocomiales. Asimismo, se observa una diferencia en la puntuación de conocimientos entre los grupos formados y no formados. En conclusión, proponemos una enseñanza de generalización de la infección nosocomial para la formación de enfermería en el Instituto Superior de Profesiones de Enfermería y Técnicas Sanitarias de Agadir.

Palabras clave: Conocimientos, actitudes, prácticas, infecciones nosocomiales, cuidados de enfermería.

Introduction

Infections that occur in hospitals are referred to as hospital-associated infections. These infections are also called "nosocomial infections" and sometimes "hospital acquired infections". As ambulatory care is increasingly given to outpatients, it is also referred to as healthcare-associated infections¹.

Nosocomial infections represent a real public health problem, because of their frequency, their severity, and also their socioeconomic cost². In addition, the infection contracted in the hospital environment is the result of the dispensation of unsafe care³. In the same perspective, the World Health Organization (WHO) revealed that on average 8.7% of hospitalized patients had acquired a nosocomial infection and that Developing countries would be up to 20 times more likely to contract a nosocomial infection than developed countries⁴.

In Morocco and according to WHO, the prevalence rate of nosocomial infection is 17.8%⁵. Although infection is more common in patients upon admission, healthcare professionals also act as potential carriers of pathogens.

Hospitals provide a favorable transmission route for the spread of nosocomial infections, in part because of poor infection control practices among healthcare workers and overcrowding of patients in most clinical settings⁶. The factors of these infections are generally multiple, namely, environmental factors such as the cleanliness of instruments, floors and walls and resistance to antimicrobials, as well as factors related to the knowledge and attitudes of health personnel in terms of infection prevention⁷.

As a result, and to deal with these factors which are linked to the knowledge of personnel, the World Health Organization (WHO) recommends programs for the fight against nosocomial infections for which must be very complete and cover both activities monitoring and prevention as well as staff training. In this regard, prevention and monitoring alone do not guarantee their reduction without resorting to good training for caregivers. In this sense, a study is carried out in western Algeria revealed that the lack of respect for standard precautions which aim to prevent the transmission of infectious agents by blood and bodily fluids was mainly due to a lack of knowledge⁸.

One of the components of caregivers are nursing students who are exposed to the hospital environment during their clinical internship and who are required to provide care to patients, regardless of their disease status⁹, thus the limited clinical experience of novice nurses with regard to the usual precautions, their lack of knowledge of the use of personal protective equipment, as well as insufficient training in clinical procedures are contributing factors to the increased risk of nosocomial infections⁹.

Cross-sectional surveys of nursing students in Africa showed that the majority of this population had poor knowledge, attitudes and practices regarding nosocomial infection control measures¹⁰, and that a structured educational program was needed¹¹.

The place of nursing students in the patient safety process and also in ensuring their own protection during training courses remains little explored in Morocco. With this in mind, this work aims to assess the knowledge and attitudes of students in the nursing care sector on the risk of infection and on the rules of precaution and hand hygiene and barriers to ensure patient safety as well as self-protection of student nurses.

Methods

This is a descriptive, cross-sectional study that took place at the Higher Institute of Nursing Professions and Health Techniques of Agadir. Target population was students in the care sector which includes five options: Polyvalent Nurse, Anesthesia and Resuscitation Nurse, Family and Community Health Nurse, Mental Health Nurse and Emergency and Intensive Care Nurse. They are included in this study. Students enrolled in the spring session of semester four and semester six of the current year. The total number of students enrolled was 169 students, and the sampling in the present study was exhaustive.

Data collection

A self-administered questionnaire was used to assess students' knowledge. This questionnaire was sent to all students in the Nursing department present on the day of the survey. The questionnaire comprised 27 questions divided into two sections: i) general knowledge of healthcare-associated infections. ii) knowledge of attitudes and practices for the prevention of nosocomial infections. A repository of recommendations updated in 2017 for the surveillance and prevention of healthcare-associated infections was used to identify the different variables.

Knowledge score

A Knowledge Score was used to assess general knowledge and knowledge of attitudes and practices regarding nosocomial infections.

We set a knowledge score as follows. A total score noted out of 30, including 10 points on general knowledge of nosocomial infections and 20 points on knowledge of attitudes and practices for the prevention of nosocomial infections. A total score interpretation scale was presented as follows:

- A total score of 0 to 9 is considered as level of knowledge: Low

- A total score of 10 to 19 is considered as level of knowledge: Medium
- A total score of 20 to 30 is considered as level of knowledge: Good

Statistical analysis

The data collected was analyzed using the “SPSS.13” software, The margin of error is calculated for a confidence level of 95%, The quantitative variables were expressed as the mean ± the standard deviation. The variables qualitative are presented by tables of frequencies and frequencies. The Chi-square test was used for the correlation between the qualitative variables and the ANOVA test was used for the correlation between the quantitative variables.

Ethical consideration

The authorization of the Higher Institute of Nursing Professions and Health Technologies was obtained to conduct the study. Consent was obtained from the students for their participation in the study. The collection, entry and processing of data were done while respecting the anonymity of the participants.

Results

Participant characteristics

As part of this survey, one hundred and fifty-nine students in the Nursing sector (n=159) were questioned. That is a participation rate of 94.1 %. The analysis of the results showed an average age of the participants of 20.74 years ± 1.04 with a minimum age of 18 years and a maximum age of 25 years. A female predominance with a sex ratio of 0.35.

According to the analysis of the training descriptions of the Nursing Care options, 76 students, or 47.79%, took a course on nosocomial infections as part of their basic training.

Knowledge Score

The majority of students 88.7%, obtained an unsatisfactory general knowledge score (<5). In addition, half of the students had an Attitudes and Practices score below the average (<10). Overall, the total score was less than or equal to 15 in 58% of students (Table I)

The average of the general knowledge in all the options of the care sector is below the average of the note of this fixed already (5/10), of this fact the totality of the students of the care sector do not have a good level related to general knowledge.

For The score of knowledge in attitudes and practices of prevention of nosocomial infections was higher among students of the general nursing option compared to the other options, more precisely the nursing option in emergency care and intensive care and the mental health option.

The total score follows the same previous results, and shows a very high knowledge score among students of the general nursing option and the family and community health nursing option. However, students who had already undergone training in nosocomial infection obtained

Table I: Characteristics of participants.

Variables	F (%)
Sexe	
F	117
M	42
Age (M ±SD)	20,74 ans ± 1,04
Option	
Polyvalent Nurse (PN)	52 (32,7)
Anesthesia and Resuscitation Nurse (ARN)	35(22,0)
Family and Community Health Nurse (FCHN)	24 (15,1)
Emergency and Intensive Care Nurse (NEIC)	35(22,0)
Mental health nurse (MHN)	13(8,2)
Score	
General knowledge score (M ±SD) ‡	3,42 ± 1,50
Knowledge of attitudes and practices score £	11,50 ± 3,86
Total score ¥	14,92 ± 5,01

‡ General knowledge score is scored out of 10; £ knowledge of attitudes and practices score is scored out of 20; ¥ total score is noted out of 30.

Table II: Distribution of student knowledge scores according to option, training and number of internships.

	General knowledge score Mean ±SD	Knowledge of attitudes and practices score Mean ±SD	Total score Mean ±SD
Options:			
PN	4,90 ± 1,14	15,79 ±1,78	20,69 ±2,02
ARN	2,40 ± ,97	8,71 ±2,21	11,14 ±2,64
FCHN	2,83 ±1,27	11,83 ±3,01	14,66 ±4,11
MHN	2,91 ± ,95	8,77 ±2,30	11,68 ±2,80
NEIC	2,69 ±1,10	8,54 ±1,80	11,23 ±2,58
Follow-up of training in nosocomial infection			
Oui	4,25 ± 1,52	14,54 ±2,89	18,78 ±3,99
Non	2,66 ± 1,01	8,71 ±2,17	11,38 ±2,68
Number of Hospital internships			
≤ 3	3,77 ± 1,50	12,81 ±3,71	6,56 ±4,76
Between 4 and 5	3,28 ± 1,45	10,57 ±3,68	13,88 ±4,83
> 5	2,08 ± ,76	8,46 ±2,53	10,53 ±3,12

PN: Versatile Nurse, ARN: Nurse in Anesthesia and Resuscitation, FCHN: Family Health and Community Health Nurse, MHN: Mental Health Nurse, NEIC: Nurse in Emergency and Intensive Care.

better scores for general knowledge, a knowledge score for attitudes and practices in the prevention of nosocomial infections and a total score, compared to untrained students. (Table II).

The appreciation of the knowledge of the nursing students on the nosocomial infection concerned the definition of this one, the factors, the reservoir, the susceptible host, the modes of transmission and the germs responsible for this infection.

The definition of IN was correct in half of the students in the care sector with a majority of correct answers in the students of the polyvalent option and a majority of incorrect answers in the mental health option. with a significant difference compared to the different options of the students. ($p < 0,001$) (Table III).

The transmissible nature of the nosocomial infection is well known in 92.5% of cases. For the hand-carrying mode of transmission only the general-purpose nurses who have a significant percentage of the correct answers, on the other hand for almost all the students

Nurse in emergency care and intensive care and Nurse in family health and community health the importance of the role of the hand in the occurrence of nosocomial infections is ignored, as well as for the reservoir of this infection most of the students of the option anesthesia and resuscitation and emergency care and intensive care declared incomplete answers.

There is also poor knowledge of students vis-à-vis the host and the reservoir of the nosocomial infection. Regarding the microbial agents responsible for nosocomial infection, the majority of students linked nosocomial infection especially to bacterial agents, however the virus is rarely mentioned in most of the answers, especially among students in emergency care and intensive care. The recommendation of the nature of the gown that the caregiver should wear was not known by the majority of ARN and FCHN students compared to the students of the PN option, 92.30% of whom declare a good knowledge of this attitude (Table III).

The students of the care sector surveyed have a good knowledge of the interest of applying standard

Table III: Distribution of general knowledge according to options.

Questions	PN (n)	ARN (n)	FCHN (n)	MHN (n)	NEIC (n)	P value
Definition of NI						< 0 ,001
True	50	15	12	06	09	
False	02	20	12	29	04	
Declared NI factors:						0,003
≤ 2 factors	16	10	17	22	09	
> 2 factors	35	21	07	12	04	
No factor	01	04	00	01	00	
Handheld transmission mode						< 0 ,001
True	35	06	02	08	03	
False	17	29	22	27	10	
The NI is not transmissible						0,131
True	01	03	04	04	00	
False	51	32	20	31	13	
Receptive host of NI						0,469
Complete answer	28	14	13	16	04	
Incomplete answer	24	21	11	19	09	
Reservoir of NI						0,034
Complete answer	32	09	12	12	04	
Incomplete answer	19	26	12	23	09	
Bacteria is responsible for NI						0,079
True	50	29	22	34	13	
False	02	06	02	01	00	
Virus is responsible for NI						< 0 ,001
True	48	11	05	11	02	
False	04	24	19	24	11	
Parasite is responsible for NI						< 0 ,001
True	43	21	07	25	08	
False	09	14	17	10	05	
Champignon is responsible for NI						0,002
True	38	19	8	12	07	
False	14	16	16	23	06	
The shape of the blouse recommended						< 0 ,001
Short sleeve blouse	48	11	04	18	07	
Long sleeve blouse	04	48	20	17	06	

PN: Versatile Nurse, ARN: Nurse in Anesthesia and Resuscitation, FCHN: Family Health and Community Health Nurse, MHN: Mental Health Nurse, NEIC: Nurse in Emergency and Intensive Care.

precautions to protect all patients and all health personnel (Chi-square value of 0.002). Almost all of the students in the section consider hand hygiene among the standard precautions for the management of excreta. We note a low knowledge of this measure by the students with a flagrant figure among the students of the intensive care and primary care option. emergencies where no one cited this as a standard precaution.

Regarding the indications for hand hygiene, they were well known in half of the general-purpose nursing students, compared to the other options who have little knowledge, especially the students of the intensive care and emergency care option.

For the attitude recommended for wearing gloves, we note a low knowledge among students of the mental health option, the majority of whom declare that it is recommended to keep them on between the two treatments. Washing hands before wearing gloves was well known in almost all student responses from all options (Table IV).

Discussion

Nosocomial infections are found all over the world. They are one of the main causes of mortality and morbidity in hospitalized patients. This type of infection represents a significant burden for both patients and public health¹.

Several observations were made based on the assessment of the state of knowledge of our student community and our results corroborate those found in other studies carried out at the international level. The main revelations were in favor of a better total knowledge score among students who had already undergone basic training in nosocomial infection. The same result was obtained in recent research which showed an improvement in the knowledge of students participating in an online training module on standard precautions for the prevention of nosocomial infections¹².

Compared to the level of knowledge according to the semester, the general score is high among students in semester four compared to the sixth semester, something that may call into question the question of memorization of course content related to nosocomial infections among the latter. As for the different knowledge inherent in attitudes and practices, a better score was noted among students in the sixth semester. This could be explained by the number of internships in higher clinical settings compared to fourth semester students. This is in agreement with a similar study which showed that among nurses, the score of attitudes and practices increases proportionally with the years of practice¹³.

Regarding general knowledge, more than half of the students gave a correct definition of nosocomial infections. The transmissible nature of the nosocomial infection was well known by almost all of the participants (92.5%). These results are similar with other studies

Table IV: Distribution of knowledge about attitudes and practices according to the options.

Questions	PN (n)	ARN (n)	FCHN (n)	MHN (n)	NEIC (n)	P value
Interest of standard precautions						0,002
True	48	31	14	25	12	
False	04	04	10	09	01	
Standard precautions include:						
Hand hygiene						0,013
True	50	26	23	28	12	
False	02	09	01	07	01	
Excreta management						< 0,001
True	22	02	03	09	00	
False	30	33	21	26	13	
Environment management						0,040
True	37	15	13	25	09	
False	15	20	11	10	04	
Prevention of healthcare exposure accidents						0,229
True	25	10	09	15	08	
False	27	25	15	20	105	
Indications for hand hygiene						< 0,001
True	35	09	08	13	02	
False	17	26	16	20	11	
Keep the gloves between two treatments						< 0,001
True	07	10	10	24	09	
False	45	25	14	11	04	
Hand washing is required before wearing the gloves						0,007
True	46	19	16	22	10	
False	06	16	08	13	03	

PN: Versatile Nurse, ARN: Nurse in Anesthesia and Resuscitation, FCHN: Family Health and Community Health Nurse, MHN: Mental Health Nurse, NEIC: Nurse in Emergency and Intensive Care.

which have concluded a percentage of 98% of good answers regarding nosocomial infection as well as a satisfactory level of knowledge of the definition of a nosocomial infection among nursing students in Africa¹⁴, on the other hand, a modest level was noted with regard to the epidemiological chain was listed according to our investigation. Something which is also corroborated by the study of Kra et al¹⁴. It is therefore clear that it will be difficult for these nursing students to undertake preventive actions if they have knowledge gaps in the epidemiological chain and the modes of transmission.

furthermore, the manual transmission mode was recognized by only one third of the students. However, this percentage is much higher than that described by Kra and collaborators who mentioned only 6%¹⁴. The importance of the role of the hand in the occurrence of nosocomial infections is well underlined in the literature, it is estimated that 30% to 40% of nosocomial infections are due to hand-borne transmission of an infectious agent¹⁵.

In the present study, the majority of students evoked the bacterium as the microbial agent responsible for the nosocomial infection while 51.6% did not designate the virus. This is consistent with a similar study showing a good knowledge of nursing students, especially bacterial agents compared to other agents responsible for nosocomial infection¹⁴.

Almost all of the students in the care sector do not know the committee for the fight against nosocomial infections as the body responsible for the prevention of nosocomial infections in hospital structures. On the other hand, another study has shown that this instance is correctly recognized by a third of students¹⁶. This finding could be explained in our context by the non-integration of the regulatory aspect related to nosocomial infection in the course taught to students.

The integration of standard precautionary measures for prevention against NI is of crucial importance in the daily practice of nursing professionals in order to ensure their protection and that of their patients¹⁷. In this regard, the majority of student responses linked the interest of standard precautions with the protection of patients and all healthcare personnel. The same results were obtained in another study, which revealed a high rate of between 60% and 90% of correct answers on the interest of standard precautions¹⁸.

the present survey also revealed low student knowledge of excreta management and respiratory hygiene, as two standard precautionary measures, even among students

who had previous training in nosocomial infection. This can be explained by the non-updating of the content taught.

Knowing that wearing gloves does not exclude hand washing, then the students participating in the present study showed a good knowledge in this direction which is in agreement with another study carried out with novice nurses¹³. The caregiver blouse should be understated, comfortable, ergonomic with short sleeves, so almost 44.7% failed to meet the nature of the gown recommended for caregivers, unlike the study by Hien et al. which found showed that 87.5% of nursing students mentioned a correct answer¹³.

Conclusion

The results of this study made it possible to highlight an unsatisfactory level in terms of nosocomial infections. compared to the formed group. The integration of theoretical and clinical training modules is very important in order to anchor good practices and attitudes in the prevention and fight against nosocomial infections in the current practice of nursing students. Similarly, continuing education programs, through the organization of seminars, symposia or workshops for the benefit of student trainees also remains essential in order to follow the news with regard to the latest recommendations of learned societies. Indeed, more efforts are needed to improve or revise training curricula so that the knowledge of nursing students on infection prevention and control is improved.

Said investigation was limited by the evaluation of the behavioral and attitudinal aspect only on the theoretical level. As a result, other studies on the evaluation of behaviors and attitudes of students in terms of NI on the empirical level via participant observation, proves to be very crucial to demystify the hidden facet of the current practices of nursing trainees in the various hospital internship sites.

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References

1. Mehta Y, Gupta A, Todi S, Myatra S, Samaddar DP, Patil V, Bhattacharya PK, Ramasubban S. Guidelines for prevention of hospital acquired infections. *Indian J Crit Care Med*. 2014 Mar;18(3):149-63. doi: 10.4103/0972-5229.128705.
2. Organisation mondiale de la Santé 2018 . Available at: Un soin propre est un soin plus sûr - IDC Medical (idc-medical.com)
3. Allegranzi B, Bagheri Nejad S, Combescure C, Graafmans W, Attar H, Donaldson L, et al. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *Lancet*. 2011 Jan 15;377(9761):228-41. doi: 10.1016/S0140-6736(10)61458-4.
4. WHO 2005. Recommandations OMS pour l'hygiène des mains au cours des soins (version avancée): synthèse: des mains propres sont des mains sûres. Available at: <https://apps.who.int/iris/handle/10665/69144>
5. WHO Guidelines on Hand Hygiene in Health Care: First Global Patient Safety Challenge Clean Care Is Safer Care. Geneva: World Health Organization; 2009.
6. Samuel SO., Kayode OO, Musa OI, Nwigwe GC, Aboderin AO, Salami TAT, et a. Nosocomial infections and the challenges of control in developing countries. *African Journal of Clinical and Experimental Microbiology* 2010; 11(2):102-10.
7. Ward DJ. The role of education in the prevention and control of infection: a review of the literature. *Nurse Educ Today*. 2011 Jan;31(1):9-17. doi: 10.1016/j.nedt.2010.03.007.
8. Beghdadli B, Belhadj Z, Chabane W, Ghomari O, Kandouci AB, Fanello S. Respect des "précautions standards" par le personnel infirmier d'un centre hospitalo-universitaire de l'ouest algérien. *Sante Publique*. 2008 Sep-Oct;20(5):445-53. doi: 10.3917/spub.085.0445.
9. AL-Rawajfah OM, Tubaishat A. Nursing students' knowledge and practices of standard precautions: A Jordanian web-based survey. *Nurse Educ Today*. 2015 Dec;35(12):1175-80. doi: 10.1016/j.nedt.2015.05.011.
10. Ojulong J, Mitonga KH, lipinge SN. Knowledge and attitudes of infection prevention and control among health sciences students at University of Namibia. *Afr Health Sci*. 2013 Dec;13(4):1071-8. doi: 10.4314/ahs.v13i4.30.
11. Thakker VS, Jadhav PR. Knowledge of hand hygiene in undergraduate medical, dental, and nursing students: A cross-sectional survey. *J Family Med Prim Care*. 2015 Oct-Dec;4(4):582-6. doi: 10.4103/2249-4863.174298.
12. Hassan ZM. Improving knowledge and compliance with infection control Standard Precautions among undergraduate nursing students in Jordan. *Am J Infect Control*. 2018 Mar;46(3):297-302. doi: 10.1016/j.ajic.2017.09.010.
13. Hien H, Drabo M, Ouédraogo L, Konfé S, Sanou D., Zéba S, et al. Connaissances et pratiques des professionnels de santé sur le risque infectieux associé aux soins: étude dans un hôpital de district au Burkina Faso. *Santé Publique* 2013; 25(2), 219-26.
14. Kra O, Aoussi E, Ehui I, Ouattara B, Bissagnéné E. S-10 Attitudes, connaissances et pratiques des élèves infirmiers face aux infections nosocomiales à Abidjan (Côte d'Ivoire). *Medicine et Maladies Infectieuses* 2009; 39:S77-S78.
15. Loczenski B. Hygiene in der Pflege--Teil 1: Hände können unsichtbare Gefahren verbreiten [Hygiene in nursing-- 1: Hands can transmit invisible dangers]]. *Pflege Z*. 2005 Jul;58(7):432-4. German.
16. Chevalier B, Margery J, Wade B, Ka S, Diatta B, Gueye M, et al. Perception du risque nosocomial parmi le personnel hospitalier de l'Hôpital Principal de Dakar. *Med Trop (Mars)*. 2008 Dec;68(6):593-6.
17. Liu LM, Curtis J, Crookes PA. Identifying essential infection control competencies for newly graduated nurses: a three-phase study in Australia and Taiwan. *J Hosp Infect*. 2014 Feb;86(2):100-9. doi: 10.1016/j.jhin.2013.08.009.
18. Rahiman F, Chikte U, Hughes GD. Nursing students' knowledge, attitude and practices of infection prevention and control guidelines at a tertiary institution in the Western Cape: A cross sectional study. *Nurse Educ Today*. 2018 Oct;69:20-25. doi: 10.1016/j.nedt.2018.06.021.