Assess Knowledge, and Compliance with Standard Precautions for Infection Control among Nursing Students at University of Nizwa

Bara'ah Saleem Salim Al Batrani

College of Health Science School of Nursing

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ABSTRACT

Background: Standard precautions of infection control are the most important practices that help to protect nursing students and health care providers from acquiring and transmission of communicable diseases. Communicable and infectious diseases are still existed in hospitals in Oman especially in critical areas and medical wards. Since communicable diseases are existed in hospitals around the world as well as in Oman, it becomes a challenge for infection prevention and control to control spread of infectious diseases especially in clinical settings. One of the factors that lead to transmission of communicable diseases is improper use of SPs. **Methodology:** This is a quantitative descriptive cross sectional study of knowledge, and compliance with SPs of infection control among Nursing students at Nizwa university. In this study 81 nursing students completed the self-administered questionnaire nursing students to obtain data about nursing student's knowledge and compliance to standard precautions. **Result:** This study revealed that nursing students of University of Nizwa has a satisfactory level of knowledge (80.51%) on standard precautions, and have suboptimal compliance to SPs practices (51.79%) (n= 3.1). **Conclusion:** It is important to investigate the reasons of the suboptimal compliance of nursing students to standard precautions, the topic of nursing students' compliance to SPs is an important topic for further and wider researches to be done.

Keywords: practice, standard precautions, infection control, hospital acquired infections, compliance, communicable diseases.

INTRODUCTION AND STATEMENT OF THE PROBLEM

Standard precautions for infection control are fundamental practices that protect nursing students and healthcare providers from acquiring and transmitting communicable diseases. These precautions, which include hand hygiene, use of personal protective equipment, and safe handling of sharp instruments, form the foundation of infection prevention in clinical settings. Despite their established importance, communicable and infectious diseases continue to pose significant risks in hospitals worldwide, including in Oman, particularly in critical care areas and medical wards.

The burden of healthcare-associated infections (HAIs) in Oman is substantial. A study conducted by El-Beeli et al. (2023) titled "Estimation of Prevalence of Hospital-Acquired Blood Infections among Patients Admitted at a Tertiary Hospital in Oman over a Period of Five Years" reported 1,246 cases of hospital-acquired bloodstream infections out of 139,683 total admissions over five years. This equates to approximately 8.9 cases per 1,000 admissions, highlighting the persistent challenge of infection control within Omani healthcare facilities.

The presence of communicable diseases in hospitals both globally and in Oman presents an ongoing challenge for infection prevention and control efforts. Among the various factors contributing to disease transmission, improper adherence to standard precautions remains a significant and preventable cause. Healthcare workers, including nursing students, play a dual role in this context: through proper compliance with standard precautions, they can serve as barriers to infection transmission; conversely, through non-compliance, they can become vectors that contribute to the spread of infectious diseases.

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Nursing students occupy a unique position in the clinical environment. They are simultaneously learners and practitioners, and their infection control practices during clinical training can have immediate consequences for patient safety and long-term implications for their professional development. Understanding the extent to which nursing students comply with standard precautions is therefore essential for ensuring both current patient safety and the future competence of the nursing workforce.

International research has documented concerning gaps in nursing students' infection control practices. A study by Stephane et al. (2021) investigating nursing students' application of infection prevention and control precautions revealed significant deficiencies in adherence to standard precautions. Similarly, research by Kim et al. (2021) on compliance with infection prevention and control practices among prospective nursing graduates in South Korea found that students demonstrated insufficient knowledge of standard precautions. Notably, this study also reported that students who had experienced needlestick injuries or contact with blood or body fluids exhibited significantly lower compliance with standard precautions, suggesting that negative experiences may not necessarily translate into improved practices.

Despite the documented prevalence of healthcare-associated infections in Oman and the recognized importance of standard precautions, there appears to be a notable gap in the literature. To date, no published studies have specifically examined nursing students' knowledge of and compliance with standard precautions in the Omani context. If such research exists, it has not been disseminated through accessible academic journals. This gap is particularly concerning given that standard precautions are not merely theoretical concepts but are integral components of competent nursing practice. They are embedded within the checklists and competency assessments for clinical procedures, meaning that failure to apply standard precautions effectively perpetuates the chain of infection transmission.

The consequences of inadequate compliance with standard precautions extend beyond individual patient encounters. The prevalence of healthcare-associated infections in Omani hospitals, as documented by El-Beeli et al. (2023), suggests an urgent need for research that addresses healthcare workers' and students' understanding, perceptions, and practices regarding infection control. If compliance with standard precautions is not adequately observed and improved, the incidence of HAIs is likely to increase, leading to elevated healthcare costs, prolonged patient care, and greater burdens on the healthcare system.

This quantitative, descriptive cross-sectional study at the University of Nizwa aims to address this gap by assessing nursing students' knowledge of and compliance with standard precautions for infection control. By investigating current practices among nursing students, this study will provide valuable insights into areas of strength and opportunities for improvement. The findings will contribute to efforts to protect both students and future healthcare workers, enhance patient safety, and ultimately reduce the prevalence of healthcare-associated infections in Omani healthcare settings.

Aim of the Study

The primary objective of this study is to assess knowledge, and compliance with standard precautions of infection control among Nursing students at University of Nizwa: A survey on nursing students in university of Nizwa.

There are several secondary objectives beside the main objective which are:

I. Examine nursing students’ knowledge in standard precautions of infection control.

II. Identify the compliance with standard precautions of infection control among nursing students.

Research questions

Based on the objectives above, several research questions are formulated to guide the study to meet its objectives.

I. What is the knowledge level of standard precautions of infection control of nursing students?

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II. What is the level of compliance with standard precautions of infection control among nursing students?

Significance of the Study

Infection prevention and control audits have revealed that some healthcare workers, including nursing and medical students, fail to adhere to proper infection control practices. This noncompliance contributes to the transmission of healthcare-associated infections (HAIs) and places healthcare workers, students, and patients at significant risk. Addressing this issue through research is essential for protecting all individuals within the healthcare environment.

This study holds significance for several key areas:

For Nursing Education and Curriculum Development

The findings of this study will identify specific gaps in nursing students' knowledge of and compliance with standard precautions. By pinpointing areas where students demonstrate inadequate understanding or poor adherence, nursing educators can strengthen the curriculum to address these deficiencies. For example, if the study reveals that students comply with hand hygiene but fail to properly use personal protective equipment, targeted educational interventions can be developed. This will help produce more competent graduates who are better prepared for safe clinical practice.

For Clinical Practice and Patient Safety

Understanding the current levels of compliance among nursing students will contribute to improving infection control practices in clinical settings. Students who are knowledgeable about and compliant with standard precautions serve as barriers to infection transmission rather than vectors of disease. By identifying and addressing compliance gaps, this study aims to reduce the incidence of healthcare-associated infections in hospitals, which directly enhances patient safety and improves clinical outcomes.

For Healthcare System and Resource Management

Healthcare-associated infections impose substantial burdens on the healthcare system, including prolonged hospital stays, increased treatment costs, and additional demands on healthcare resources. By contributing to the reduction of HAIs, this study supports efforts to minimize these economic and operational burdens. The findings can inform hospital infection control committees and policymakers in developing more effective training programs and monitoring systems.

For Nursing Students and Future Healthcare Workers

This study directly benefits nursing students by identifying areas where they need additional support and education. Protecting students from occupational exposures to infectious diseases is a priority, and improved compliance with standard precautions reduces their risk of needle stick injuries, bloodborne pathogen exposures, and other occupational hazards. Furthermore, establishing sound infection control practices during training ensures that students carry these habits into their professional careers.

For Addressing the Research Gap

To date, no published studies have specifically examined nursing students' knowledge of and compliance with standard precautions in Oman. This research will provide baseline data that can guide future studies and serve as a reference point for measuring improvements over time. It addresses a critical gap in the literature and contributes to the body of knowledge on infection control practices among nursing students in the Gulf region.

For Informing Policy and Guidelines

The results of this study may provide evidence to support the development or revision of infection control policies and guidelines within nursing programs and healthcare facilities. By identifying specific areas of

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noncompliance, the study offers actionable insights that can be translated into practical recommendations for improving infection control practices at institutional and national levels.

In summary, this study will identify the level of nursing students' knowledge and compliance, pinpoint specific practice gaps, and provide a foundation for targeted interventions. Ultimately, it aims to enhance nursing students' competence in clinical areas, reduce the incidence and burden of healthcare-associated infections, and contribute to a safer healthcare environment for students, healthcare workers, and patients alike.

LITERATURE REVIEW/BACKGROUND OF THE STUDY

There were many studies conducted on nursing students' knowledge and compliance to standard precautions. According to a study of "Knowledge and behavior of nursing students on the prevention of healthcare associated infections" conducted by (F. Brosio, et al. 2017) involving 1st, 2nd, and 3rd year nursing students at Ferrara University in Italy, they distribute a questionnaire assesses their knowledge on 3 parts which are: Healthcare associated infections, standard precautions, and hand hygiene, it revealed that an adequate level of knowledge by the three groups of students was showed only in the SPs area, but the lowest score was in the area of healthcare-associated infections by the all three years students.

In another study of "Compliance with Infection Prevention and Control Practice among Prospective Graduates of Nursing School" by a convenience sampling in South Korea conducted by (Kim. H and Park. H, 2021). They have used self-administered survey and it has revealed that the participants have deficient knowledge of infection prevention control which was 14.82 ± 2.12 out of 25, with 59.30% correct answers, and their compliance to infection prevention and control practices at clinical training was moderate, which was 4.09 ± 0.43 out of 5.

In a cross sectional study of "Nursing students' knowledge and practices of standard precautions: A Jordanian web-based survey" conducted by (AL-Rawajfah. O and Tubaishat. A. 2015) showed only about part of the students described excellent in knowledge of standard precautions, and the mean score of the practice was 67.4 (SD = 9.9) out of 80.

A descriptive, cross sectional study of "Compliance with standard precautions among baccalaureate nursing students in a Saudi university" done in Saudi Arabia using the CSPS scale revealed that nursing students showed only 60.1% compliance to standard precautions which considered suboptimal according to the CSPS scale interpretation (Colet. P, et al. 2016).

In a cross sectional study of "Predictors for compliance of standard precautions among nursing students" conducted by (Cheung. K, et al. 2015), were 678 questionnaire analyzed, of a sample of nursing students who have studied in a full-time undergraduate program in Hong Kong University, it showed that compliance of nursing students to standard precautions is high, and found that their practice affected by the nursing staff, wherein the second and third year students has lower compliance than first and second year, and the reason behind that the first and second year students are supervised by clinical instructors and the second, third, and fourth year students are supervised by registered nurses. This study considered a large study but the limitation is that it is conducted only for one university.

In an institutional centered cross sectional study of "Compliance with standard precautions and associated factors among undergraduate nursing students at governmental universities of Amhara region, Northwest Ethiopia" conducted by (Getachew. D, et al. 2022), they select 423 undergraduate BSc nursing students using simple random sampling. In the study of compliance, they have used the CSPS scale and it revealed that nursing students' compliance to standard precautions is suboptimal (51.4%). They found that the factors affecting the compliance were: workplace safety, knowledge, and having training.

In a qualitative study of "Clinical Experiences as Related to Standard Precautions Compliance among Nursing Students: A Focus Group Interview Based on the Theory of Planned Behavior" conducted by (Kim. K, et al. 2015), showed that the students showed knowledge deficit regarding standard precautions, also they expressed that they were been on a vulnerable situation where they risked exposure to pathogens due to noncompliance

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to standard precautions, and the noncompliance was due to different barriers such as noncompliant role model, and poor information about the patient.

In a cross sectional study of "Standard Precautions: Knowledge and Practice among Nursing Students in UiTM Puncak Alam" conducted by (Nordine. I, et al. 2019), from 264 nursing students, 159 was chosen as a sample via stratified random sampling. The result showed that 94.3% of respondents has a good level of knowledge, but 5.7% of respondents showed moderate level in knowledge, and 0.00% has poor level of knowledge. For the practice of standard precautions 95.6% of respondents categorized as having good level of practice, 4.4% moderate, and 0.00% has poor level of practices.

In a cross-sectional study of "Knowledge and Factors Associated with Compliance of Standard Precautions in Clinical Exposure among Proficiency Certificate Level Nursing Students of Pokhara, Nepal" conducted by (Thapa.K, and Khaphle. H. 2019), 208 out of 478 nursing students of second and third year from 6 schools of nursing were chosen via simple random method. In the study CSPS scale used that is the same scale that is used also in this study, and the result showed the overall compliance to standard precautions was 65.0% which is considered suboptimal. In the knowledge part, 91.3% of respondents have fair knowledge, 5.8% have poor knowledge level, and 2.9% have good knowledge.

In another descriptive correlational study of "Knowledge and Compliance with Standard Precautions among Nursing Students in Mosul University" conducted by (Younis. M, et al. 2014), 158 nursing students of third and fourth year were selected via simple random method from College of Nursing- University of Mosul. The result showed a high knowledge and compliance of the nursing students to standard precautions.

In a cross- sectional study of "Knowledge and Compliance Regarding Standard Precautions among Nursing Students at University Sains Malaysia" conducted by (Atiqah. T, et al. 2021), 134 nursing students were requited through simple random method. The result showed that the knowledge of degree nursing students (15.4 ±2.4) is higher than diploma nursing students (14.7±2.5), and the compliance among diploma nursing students 89.8% were higher than degree nursing students 85.3%. So, the knowledge and compliance of standard precautions is very good. The strength of the study is that the participant has been chosen via simple random method with controlling selection bias, and the limitation of this study is that it was conducted on only one university, and this will affect the generalization of the results.

In a quantitative cross-sectional study of "Knowledge, Attitude, and Compliance to Standard Precautions Among University Malaysia Sarawak Nursing Students" conducted by (Kaushal. D, and Clement. E, 2022), 167 undergraduates nursing student of second to fourth year involved, the results showed that the majority of nursing students showed good knowledge of standard precautions (50.9%), and their compliance to standard precautions is high (89.8%).

In a quasi-experiment study of "Improving knowledge and compliance with infection control Standard Precautions among undergraduate nursing students in Jordan" conducted by (Hassan. Z, 2017), 256 undergraduate nursing students from 2^{nd}, 3^{rd}, 4^{th} year were involved in an online education module about infection control standard precautions. The students undergo for pre-test and post-test online questionnaire about knowledge and compliance to standard precautions. The results showed that the pretest knowledge was 57% and it is scored as inadequate, and half of students showed high knowledge posttest. The results for compliance showed poor compliance pretest but moderate compliance posttest.

In a cross sectional study of "A Study on Knowledge, Attitude and Practice of Universal Precautions among Medical and Nursing Students" conducted by (Paul. B, 2014), the study revealed that nursing students showed low level of knowledge, and their compliance to universal precautions is poor.

According to a literature review of "Knowledge and practice of standard precautions by nursing student and teaching techniques used in training" conducted by (Bouget. S, and Landelle. C, 2023), the literature review done using the PRISMA method in the interval from 2010-2021. The selected articles were 81; 36 about nursing student's knowledge of standard precautions, 43 about their practice of standard precautions, and 21 about hygiene teaching techniques in nursing training. The results revealed that the nursing student's knowledge and practice of standard precautions was moderate.

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In a cross sectional study of "Knowledge, Attitude, Practice, and Perceived Barriers for the Compliance of Standard Precautions among Medical and Nursing Students in Central India" conducted by (Sharma. M, et. al. 2023), 600 nursing and medical students showed interest in participating in the study and posted to clinical; 423 medical students, and 177 nursing students. The study revealed that both of the groups have poor knowledge of standard precautions, and to assess their practice of standard precautions, 6 hypothetical cases were given, and the students showed ideal practice of standard precautions. The strength of the study is that the data collected by students, this will minimise the social pressure, and will minimise biased response. The limitation is that the students respond to the hypothetical questions but their actual practice not observed.

In a cross sectional study of "An investigation into nursing students' application of infection prevention and control precautions" conducted by (Bouchoucha. S, et.al, 2021), 321 undergraduate nursing students from nursing school and midwifery at an Australian university. The results showed that students' compliance to standard precautions was high. The strength of the study that is very subjective to a specific social desirability. The limitations are that the study conducted only in a one university, and also the study is not based on a direct observation.

According to a cross sectional study of "Turkish nursing students' compliance to standard precautions during the COVID-19 pandemic" conducted by (Topcu. S and Emlik. Z, 2023), 816 nursing students participated in the study, and CSPS questionnaire used to assess compliance to standard precautions. The study revealed that the compliance of nursing students during COVID-19 was 76.8% which is optimal.

In across sectional study of "Nursing students' knowledge, attitude and practices of infection prevention and control guidelines at a tertiary institution in the Western Cape: A cross sectional study" conducted by (Rahiman. F, et.al, 2018), 301 nursing students from second, third, and fourth year were participated in the study, at Western Cape. The results showed that nursing students have good knowledge regarding standard precautions, and little difference in the practice of standard precautions.

In a cross sectional study of "Factors influencing self-reported adherence to standard precautions among Thai nursing students: A cross sectional study" conducted by (Gulic. N, et.al, 2021), 533 nursing students from school of nursing in Bangkok; 155 from 2nd year, 215 from 3rd year, and 163 from 4th year. CSPS tool were used in this study, and the overall compliance to standard precautions were 68.5%, which is considered suboptimal compliance to standard precautions. The limitation of this study is that the study conducted only at one university, and this may make the findings of the study not generalized to other universities.

Study Design and Research Methods

This study employed a quantitative, descriptive cross-sectional design to assess the knowledge of and compliance with standard precautions for infection control among nursing students at Nizwa University. Data were collected using a self-administered questionnaire completed.

Location of the study

The study was done at university of Nizwa in the nursing school. University of Nizwa located in Sultanate of Oman, in Al Dakhilia governorate. It contains 4 colleges (college of Health Sciences, college of Engineering and Architecture, college of Economic, Management, and Health System, and college of Arts and Sciences) and it have 14 academic departments.

Population and sampling

The study population consisted of 318 nursing students at the University of Nizwa. A sample of 81 participants was selected using a convenience sampling method during the spring semester of the 2024/2025 academic year. Participants were recruited based on their availability on the days of data collection and were asked to complete a self-administered questionnaire assessing their knowledge of and compliance with standard precautions. The inclusion criteria specified nursing students from the second year (who had completed their Fundamentals of Nursing course) through the fourth year. First-year students and those currently enrolled in

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the Fundamentals of Nursing course were excluded, as they had only recently begun their clinical placements and lacked sufficient clinical experience. Bridging students were also excluded due to their prior work experience, which could have influenced their knowledge and compliance levels, potentially biasing the results.

Research tool and pilot study

The self-administered questionnaire used in this study. It contains 3 parts:

Part 1 contain demographic data.

Part 2 contain 12 questions about knowledge of standard precautions it includes 4 sections (true and false questions): section I is about general concept of infection control and standard precautions, section II is about hand Hygiene, section III is about personal protective equipment, and section IV is about sharps disposal and sharp injuries.

Piloting of part 2:

The result of piloting showed that the questionnaire reliability is acceptable.

Cronbach's alpha test

Table 1: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.719	.745	12

Part 3 is CSPS scale to assess compliance with standard precautions' practices, that developed by Lam. S. 2022 which contains 20 items; 16 items are positively phrased items and 4 are negatively phrased items, 6 items of use of protective devices, 3 items of discarding of sharps, 3 items of decontamination of spills and used objects, 1 item of disposal of waste, and 7 items of prevention of cross infection from person to person, the response is 4-point Likert scale, such as: always, sometimes, seldom, and never. The score 1 is for always and 0 for other responses, and the score ranges from 0-20.

Data collection

Following approval of the research by the Assistant Dean for Research and the Dean of the College of Health Sciences, data were gathered via a self-administered questionnaire. The instrument was administered to nursing students during class time, with participants selected based on their availability at the time of data collection. The process was completed upon the return of the answered questionnaires.

Data analysis and presentation

According to Burns and Grove (2011), data analysis is a method utilized for accurate data display. Data statistically assessed using a statistical program (SPSS version 20) when data collection is completed. Descriptive statistics, such as percentages and means calculated to summarize the participants' features and their responses to the survey questions, also some percentages calculated manually such as the compliance rate and knowledge rate by getting the average of students' answers scores and then multiplied by 100% to get the percentage. Graphs and tables utilized to visually present the analyzed data, providing a clear and concise representation of the findings. The results organized and presented in a comprehensive report, which included the research methodology, literature review, data analysis, and discussion of findings.

Additionally, a whole report prepared and submitted to the board of examiners appointed by the University of Nizwa for grading. The report included a thorough description of the data analysis methods used, the results obtained, and the interpretations of those results within the context of the research objectives.

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Ethical consideration

Consent to join in the study gotten before conducting the study. Personal visit done to explain to the participant in the study about the study, process, and also to inform them that confidentiality of information is maintained in the study. Moreover, they informed that they have the right to withdraw at any time. The questionnaire is obtained after requesting permission and an application has been filled and the request had been accepted.

RESULTS

In this study, in realizing the objective, the analysis of the data was done using the Statistical Package for Social Sciences (SPSS) Version 20. The presentation of the results was divided into three parts: **Part A**: results related to demographic data, **Part B**: results related to Knowledge of Standard precautions, **Part C**: results related to Compliance to standard precautions,

Part A: Results related to demographic data:

Table.1 Demographic data

Demographic data	Percentage %
Age:	
19-22	78%
23-25	14.6%
26-28	7.3%
29 or above	0.0%
Gender:	
Male	3.7%
Female	96.3%
Marital status:	
Single	3.7%
Married	96.3%
Stream of study:	
BSN regular program	92.7%
DN regular program	7.3%
Year in the program:	
Second year	34.1%
Third year	35.4%
Fourth year	30.5%
Clinical exposure:	
Less than 1 year	26.8%
1-2 years	36.6%
3-4 years	36.6%
Attended seminars of infection control:	
Yes	57.3%
No	42.7%

Table.1 showed Out of 81 students, most of them are single and 96.3% are female, 3.7% are male, most of them aged from 19-22 years, 92.7% studying bachelor, and 7.3% are studying diploma. 34.1% are second year of studying, 35.3% are third year of studying, 30.5% are fourth year of studying. For the clinical exposure, 26.8% they have less than 1year exposure, 36.6% have 1-2years exposure, and 36.6% have 3-4years exposure to the clinical, and 57.3% of them attended infection control seminars.

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Part B: Results related to Knowledge of Standard precautions:

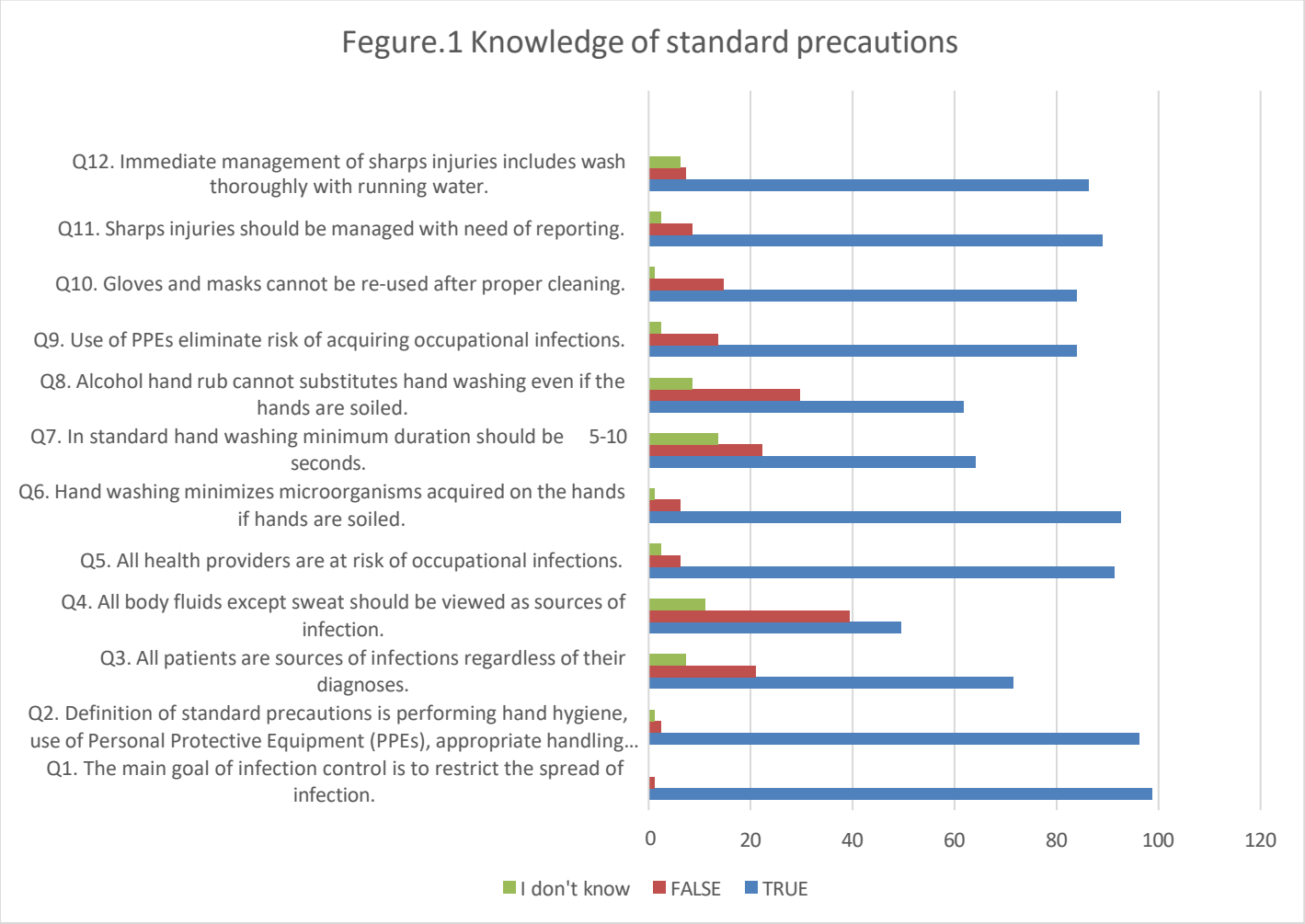

Figure.1 showed that the knowledge of standard precautions participants showed higher knowledge in the domains of "general concept of standard precautions", "personal protective equipment", and "sharps disposal and sharps injuries" more than 80%. The results showed that nursing students' knowledge of standard precautions is 74.07% which is considered good knowledge.

Table.2: Knowledge of Standard precautions:

	Mean	**Percentage**		
		True	**False**	**I don't know**
Q1. The main goal of infection control is to restrict the spread of infection.	1.99	98.8	1.2	0.0
Q2. Definition of standard precautions is performing hand hygiene, use of Personal Protective Equipment (PPEs), appropriate handling of bodily fluids & patient wastes and prevention of needle stick/sharp injuries	1.95	96.3	2.5	1.2
Q3. All patients are sources of infections regardless of their diagnoses.	1.64	71.6	21.0	7.4
Q4. All body fluids except sweat should be viewed as sources of infection.	1.38	49.4	39.5	11.1
Q5. All health providers are at risk of occupational infections.	1.89	91.4	6.2	2.5
Q6. Hand washing minimizes microorganisms acquired on the hands if hands are soiled.	1.91	92.6	6.2	1.2
Q7. In standard hand washing minimum duration should be 5-10 seconds.	1.51	64.2	22.2	13.6

Q8. Alcohol hand rub cannot substitutes hand washing even if the hands are soiled.	1.53	61.7	29.6	8.6
Q9. Use of PPEs eliminate risk of acquiring occupational infections.	1.81	84.0	13.6	2.5
Q10. Gloves and masks cannot be re-used after proper cleaning.	1.83	84.0	14.8	1.2
Q11. Sharps injuries should be managed with need of reporting.	1.86	88.9	8.6	2.5
Q12. Immediate management of sharps injuries includes wash thoroughly with running water.	1.80	86.4	7.4	6.2

Part C: Results related to Compliance to standard precautions

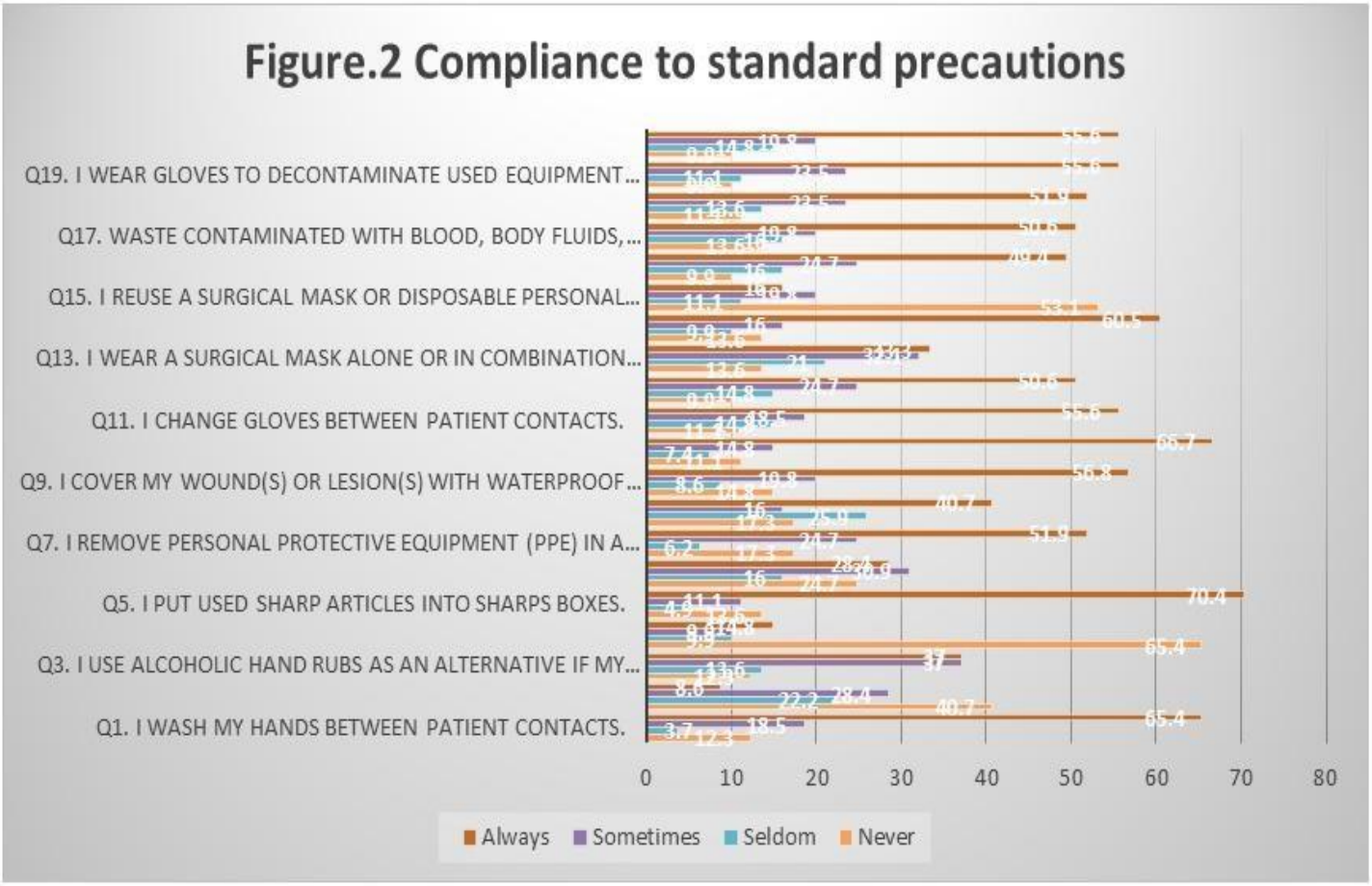

Figure.2 showed that compliance of nursing students of university of Nizwa is suboptimal according to the results (51.79%) (n= 3.1). Students are more comply with throwing the sharps in sharp container after using them (70.37%), also not recapping the needle after using them (66.66%), hand washing between patient contacts (65.43%), and wearing gloves when handling body fluids and blood (65.43%). The students are less compliance on disposing sharps box (25.95%), they disposing sharps box when it is full, also the are less compliance on wearing face mask or in combination with goggles, face shield and apron whenever there is a possibility of splashes or splatters (33.33%), taking shower in case of extensive splashing even after putting PPE (40.74%), and washing hand with water (41.97%).

Table.4: Compliance to standard precautions:

	Mean	**Percentage (%)**			
		Never	**Seldom**	**Some times**	**Always**
Q1. I wash my hands between patient contacts.	3.37	12.3	3.7	18.5	65.4
Q2. I only use water for hand washing.	2.95	40.7	22.2	28.4	8.6
Q3. I use alcoholic hand rubs as an alternative if my hands are not visibly soiled.	2.99	12.3	13.6	37	37

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Q4. I recap used needles after giving an injection.	3.26	65.4	9.9	9.9	14.8
Q5. I put used sharp articles into sharps boxes.	3.38	13.6	4.9	11.1	70.4
Q6. The sharps box is disposed only when it is full.	2.37	24.7	16	30.9	28.4
Q7. I remove Personal Protective Equipment (PPE) in a designated area.	3.11	17.3	6.2	24.7	51.9
Q8. I take a shower in case of extensive splashing even after I have put on Personal Protective Equipment (PPE).	2.80	17.3	25.9	16	40.7
Q9. I cover my wound(s) or lesion(s) with waterproof dressing before patient contacts.	3.19	14.8	8.6	19.8	56.8
Q10. I wear gloves when I am exposed to body fluids, blood products, and any excretion of patients.	3.37	11.1	7.4	14.8	66.7
Q11. I change gloves between patient contacts.	3.19	11.1	14.8	18.5	55.6
Q12. I decontaminate my hands immediately after removal of gloves.	3.16	9.9	14.8	24.7	50.6
Q13. I wear a surgical mask alone or in combination with goggles, face shield and apron whenever there is a possibility of a splash or splatter.	2.85	13.6	21	32.1	33.3
Q14. My mouth and nose are covered when I wear a mask.	3.23	13.6	9.9	16	60.5
Q15. I reuse a surgical mask or disposable Personal Protective Equipment (PPE).	3.01	53.1	11.1	19.8	16
Q16. I wear a gown or apron when exposed to blood, body fluids or any patient excretions.	3.14	9.9	16	24.7	49.4
Q17. Waste contaminated with blood, body fluids, secretion and excretion is placed in red plastic bags irrespective of the patient's infection status.	3.07	13.6	16	19.8	50.6
Q18. I decontaminate surfaces and equipment after use.	3.16	11.1	13.6	23.5	51.9
Q19. I wear gloves to decontaminate used equipment with visible soils.	3.25	9.9	11.1	23.5	55.6
Q20. I clean up spillage of blood or other body fluids immediately with disinfectants.	3.21	9.9	14.8	19.8	55.6
Overall mean	3.1				

DISCUSSION

In the study 81 students completed the questionnaire, most of them are single and 96.3% are female, 3.7% are male, most of them aged from 19-22 years, 92.7% studying bachelor, and 7.3% are studying diploma. 34.1% are second year of studying, 35.3% are third year of studying, 30.5% are fourth year of studying. For the clinical exposure, 26.8% they have less than 1year exposure, 36.6% have 1-2years exposure, and 36.6% have 3-4years exposure to the clinical, and 57.3% of them attended infection control seminars, they have been chosen via simple random method according to their availability at the day of the data collection.

According to the results of the data analysis; 74.07% of students got a good score in the knowledge questions, and this indicates that the students has a good level of knowledge on standard precautions, especially in "general concept of standard precautions", "personal protective equipment", and "sharps disposal and sharps injuries" domains. The students who has 3-4years exposure to clinical have more knowledge to standard precautions (28.39%), then students who has 1-2years exposure (27.16%), and students who has less than

1year exposure has (18.51%) knowledge. In compare to a similar study done by Khubrani. A, et, al in 2018 showed that the nursing students has satisfactory level of knowledge. In another study of "Knowledge, Attitude, Practice, and Perceived Barriers for the Compliance of Standard Precautions among Medical and Nursing Students in Central India" conducted by (Sharma. M, et. al. 2023) revealed that both of the groups have poor knowledge of standard precautions, also in a literature review of "Knowledge and practice of standard precautions by nursing student and teaching techniques used in training" conducted by (Bouget. S, and Landelle. C, 2023), the results revealed that the nursing student's knowledge and practice of standard precautions was moderate.

The compliance of Nursing students of university of Nizwa is suboptimal according to the results (51.79%). Students are more comply with throwing the sharps in sharp container after using them (70.37%), also hand washing between patient contacts (65.43%), and wearing gloves when handling body fluids and blood (65.43%). In comparison with a study similar to this study conducted by Colet. P, et al. 2016 revealed that nursing students showed only (60.1%) compliance to standard precautions which considered suboptimal according to the CSPS scale interpretation, in another study conducted by conducted by Getachew. D, et al. 2022, they have used the CSPS scale and it revealed that nursing students' compliance to standard precautions is suboptimal (51.4%), also there is another study conducted by Gulic. N, et.al, 2021 in Bangkok showed that the overall compliance to standard precautions were (68.5%), which is considered suboptimal compliance to standard precautions. In a study of "Turkish nursing students' compliance to standard precautions during the COVID-19 pandemic" conducted by Topcu. S and Emlik. Z, 2023, revealed that the compliance of nursing students during COVID-19 was (76.8%) which is optimal and it is the highest.

This level of compliance is suboptimal It is higher than the compliance of nursing students of Thai university of Bangkok, and the lowest comparing to other studies. The results of this study is more important to the school of nursing of University of Nizwa, it will help to investigate the gaps and how to improve knowledge and especially the compliance to standard precautions.

CONCLUSIONS AND RECOMMENDATIONS

A: Conclusions

In conclusion, Standard precautions of infection control are the most important practices that help to protect nursing students and health care providers from acquiring and transmission of communicable diseases. In this study a self-administered questionnaire of a single contact period used to collect data, and after the analysis it revealed that Nursing students of University of Nizwa has good knowledge (74.04%) on standard precautions, and have suboptimal compliance to standard precautions practices (51.79%) (n= 3.1). The topic of nursing students' compliance to standard precautions is an important topic for further and wider researches to be done. This will control the spread of infections and will protect nursing students and patients from acquiring diseases.

B: Recommendations

It is important to investigate the reasons of the suboptimal compliance of nursing students to standard precautions, this study will be helpful to improve the students' compliance to standard precautions. Also to follow the students' practices of standard precautions and to stress on strict compliance to standard precautions to make the students more aware about them. It is important to remind the students in the orientation classes before every clinical about the standard precautions.

Limitation of the study

The limitation of this study is that the participants who are willing to participate in the study are less than required, and it is only involved one university in Oman, so, the result not applicable to all nursing students in other universities in Oman.

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APPENDICES

Appendix.1: Ethical approval

University of Nizwa
College of Health Sciences
Assistant Dean for Graduate Studies and Research Office

جامعة نزوى
كلية العلوم الصحية
مكتب مساعد العميد للبحوث والدراسات العليا

Date: 28-03-2024 Ref: CHS/S/32/2023-24

To:

Baraah Saleem Saleem Al Batrani
School of Nursing
College of Health Sciences

Subject: Project Title: **Access knowledge, and compliance with standard precautions for infection control among Nursing students at University of Nizwa.**

Dear Baraah Saleem Saleem Al Batrani

The research committee of College of Health Sciences (CHS), University of Nizwa (UoN) has reviewed and discussed your application to conduct the above-mentioned research proposal. The committee has given its approval for the research to be carried out in that format that has been presented.

Yours Sincerely
Dr. Mohammed Sohail Akhtar
Assistant Dean for Graduate Studies and Research
College of Health Sciences
University of Nizwa

Initial campus at Birkat Al Mouz, P.O. Box 33, Postal Code 616,
Nizwa, Sultanate of Oman.
Tel. : 25446423

الحرم البدئي ص.ب : ٣٣ ، الرمز البريدي : ٦١٦
بركة الموز – نزوى – سلطنة عُمان
هاتف : ٢٥٤٤٦٤٢٣

Website : www.unizwa.edu.om

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Appendix. 2: Graduation project approval

Document Reference Number
UoN/AA-GUI-010/FORM-001/V3/2023

جامعة نزوى
University of Nizwa

APPENDIX A

GRADUATION PROJECT APPROVAL

College	College of Health and Sciences	Department	School of Nursing

Project title:

Assess knowledge, and compliance with standard precautions for infection control among Nursing students at University of Nizwa.

Suggested GP Supervisor (if any):

-Ms. Jaha Anand

Collaborator/s (If any):

-Non

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Abstract of the research project:

Problem statement:

Standard precautions are the most important practices that help to protect nursing students from acquiring and transmission of communicable diseases. Communicable and infectious diseases are still existed in hospitals in Oman especially in critical areas and medical wards. As a study of "Estimation of Prevalence of Hospital-Acquired Blood Infections among Patients Admitted at a Tertiary Hospital in Oman over a Period of Five Years" conducted by (El-Beeli, et al. 2023) revealed that 1,246 cases of hospital acquired blood-born infectious diseases out of 139,683 of total admissions was recorded for the past 5 years, which estimated 8.9 cases per 1000 admissions.

Since communicable diseases are existed in hospitals around the world as well as in Oman, it becomes a challenge for infection prevention and control to control spread of infectious diseases especially in clinical settings. One of the factors that lead to transmission of communicable diseases is improper practice of standard precautions

Nursing students' practice of standard precautions should be investigated to make sure of their compliance and to help protecting students, future healthcare workers as well as patients, and also to reduce the prevalence of healthcare associated infections.

This cross-sectional study in University of Nizwa will help to identify Nursing students' knowledge, and compliance to standard precautions which will contribute to address the issue.

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Objectives:

I. Assess the nursing students' knowledge in standard precautions.

II. Identify the compliance with standard precautions among nursing students.

Methodology:

This is a quantitative descriptive cross sectional study of knowledge, and compliance with standard precautions of 175 participants out of 318 nursing students at University of Nizwa, which will include all levels except students of 1st year, Fundamentals of nursing students, and bridging students, the students will be selected by simple random method according to their availability on the days of data collection using self-administered questionnaire of knowledge and compliance. Data will be statistically assessed using a statistical program (SPSS version 27) when data collection is completed. Written consent to join in the study will be gotten before conducting the study, and explain to the participant in the study about the study, process, and also to inform them that confidentiality of information is maintained in the study, and they have the right to withdraw at any time. The questionnaire is obtained after requesting permission and an application has been filled and the request had been accepted. The study will be started at 01/03/2024 until 30/05/2024

Expected project outcomes:

i.e., Publications, case studies, presentations, or conference presentation.

If given any opportunity to present in conference.

Tools/equipment required:

Self-administered questionnaire

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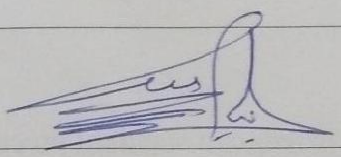
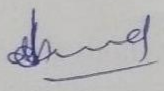
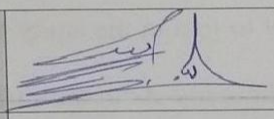
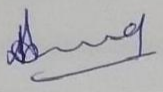
Student's signature		Date	29/02/24
Supervisor's signature		Date	29/02/2024

Student's signature		Date	29/02/24
Supervisor's signature		Date	29/02/2024

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Document Reference Number
UoN/AA-GUI-010/FORM-002/V3/2023

جامعة نزوى
University of Nizwa

GRADUATION PROJECT APPROVAL FORM

College	Health Sciences	Department	School of Nursing

Name(s) of the students	Bara'ah Saleem Salim Al Batrani
Students' ID	14458455
Title of the project	Assess knowledge, and compliance with standard precautions for infection control among Nursing students at University of Nizwa
Subject area	Nursing practice
Name of the GP Supervisor	Ms. Jaha Anand
Name of Co-Supervisor	None
Estimated cost of the Project	None
Expected date of completion	30/5/2024

Signature of the student		Date 29	/02/2024
Signature of GP Supervisor		Date 29	/02/2024

Please enclose a copy of the outline/synopsis of the project signed by the supervisor

FOR OFFICIAL USE ONLYT

The project has been ☑ APPROVED ☐ NOT APPROVED

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Appendix. 3: Graduation project approval form

Problem statement:

Standard precautions are the most important practices that help to protect Nursing students from acquiring and transmission of communicable diseases. Communicable and infectious diseases are still existed in hospitals in Oman especially in critical areas and medical wards. As a study of "Estimation of Prevalence of Hospital-Acquired Blood Infections among Patients Admitted at a Tertiary Hospital in Oman over a Period of Five Years" conducted by (El-Beeli, et al. 2023) revealed that 1,246 cases of hospital acquired blood-born infectious diseases out of 139,683 of total admissions was recorded for the past 5 years, which estimated 8.9 cases per 1000 admissions.

Since communicable diseases are existed in hospitals around the world as well as in Oman, it becomes a challenge for infection prevention and control to control spread of infectious diseases especially in clinical settings. One of the factors that lead to transmission of communicable diseases is improper practice of standard precautions.

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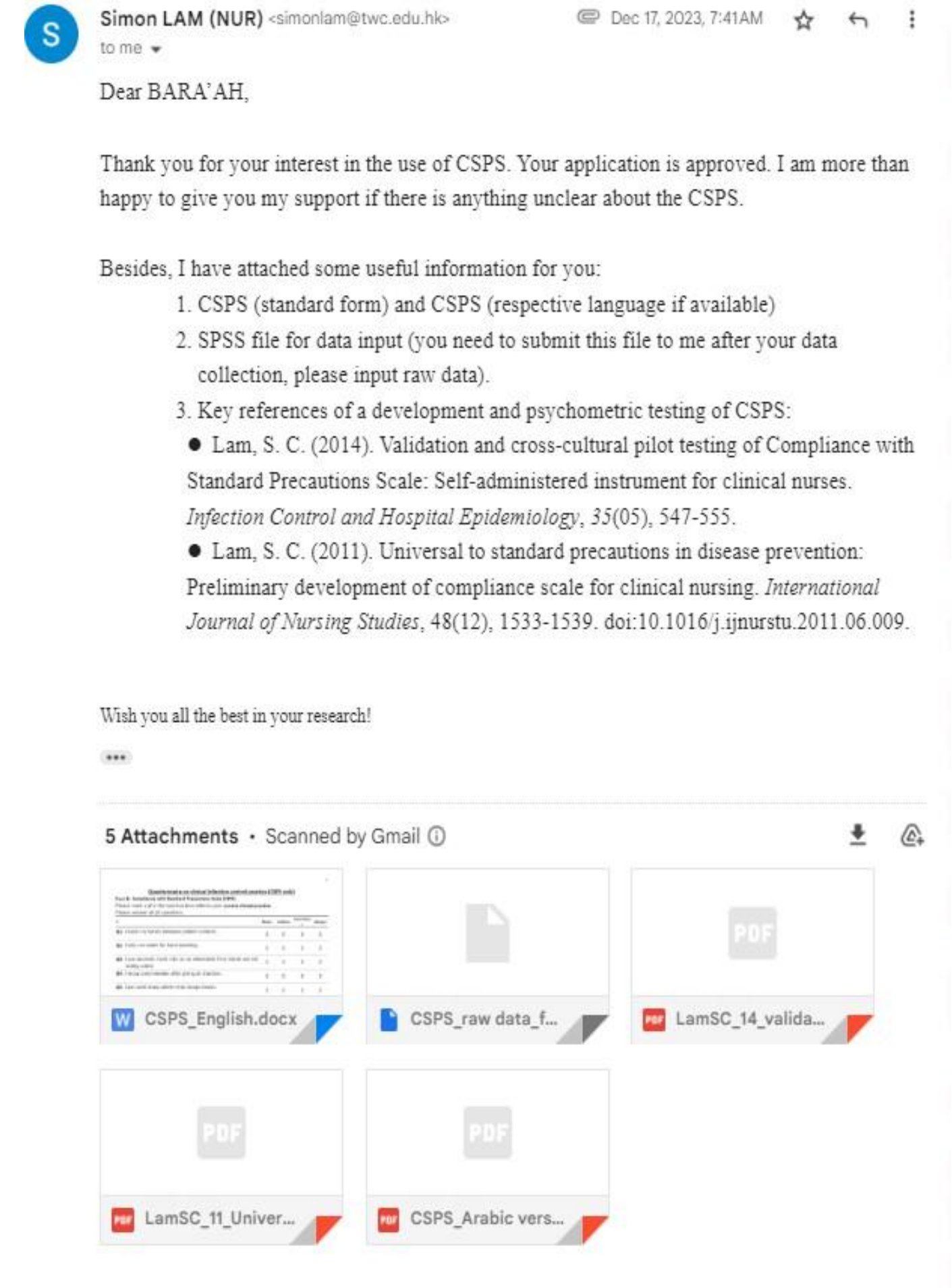
Remarks (if any):

School/Department/Section Graduation Project Coordinator (S/D/SGPC) Name & signature		Date	22/02/2024 29/2/24

Appendix. 4: SPSS scale approval letter



Simon LAM (NUR) <simonlam@twc.edu.hk> Dec 17, 2023, 7:41AM

to me

Dear BARA'AH,

Thank you for your interest in the use of CSPS. Your application is approved. I am more than happy to give you my support if there is anything unclear about the CSPS.

Besides, I have attached some useful information for you:

1. CSPS (standard form) and CSPS (respective language if available)
2. SPSS file for data input (you need to submit this file to me after your data collection, please input raw data).
3. Key references of a development and psychometric testing of CSPS:
   - Lam, S. C. (2014). Validation and cross-cultural pilot testing of Compliance with Standard Precautions Scale: Self-administered instrument for clinical nurses. *Infection Control and Hospital Epidemiology*, *35*(05), 547-555.
   - Lam, S. C. (2011). Universal to standard precautions in disease prevention: Preliminary development of compliance scale for clinical nursing. *International Journal of Nursing Studies*, 48(12), 1533-1539. doi:10.1016/j.ijnurstu.2011.06.009.

Wish you all the best in your research!

5 Attachments • Scanned by Gmail

CSPS_English.docx

CSPS_raw data_f...

LamSC_14_valida...

LamSC_11_Univer...

CSPS_Arabic vers...

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Appendix. 5: Knowledge questionnaire approval letter

Permission to use questionnaire for research proposal Inbox ×

BARA'AH SALEEM SALIM AL BATRANI <14458455@uofn.edu.om> Dec 24, 2023, 9:54 PM
to dr.aboOod99@gmail.com

Dear Dr. Abdullah Khubrani.

I hope this email finds you well. I am writing to seek your permission to use your self-questionnaire of your study titled " Knowledge and information sources on standard precautions and infection control of health sciences students at King Saud bin Abdulaziz University for Health Sciences, Saudi Arabia, Riyadh" in my research proposal titled "Assessing knowledge and compliancewith standard precautions among nursing students in University of Nizwa ."

I am a student at the University of Nizwa in the Sultanate of Oman and currently conducting research on the topic of adherence to standard precautions among nursing students. Your self-reported study aligns perfectly with one of my research objectives and will help me in achieving it, and I believe it would greatly contribute to the success and robustness of my study. Therefore, I kindly request your permission to use the self-questionnaire as a tool for data collection in my research.

Please be assured that I will strictly comply with ethical guidelines and regulations throughout my research process, including the appropriate referencing and citation of your work. Additionally, any personal information or data collected from the participants will be treated with utmost confidentiality and used exclusively for research purposes.

I understand that you hold the copyright for your research and self-questionnaire. Hence, I kindly request your written consent to include your self-questionnaire in my research proposal. If granted permission, I would be immensely grateful, and it would significantly enhance the validity and reliability of my research findings.

Thank you for considering my request. I look forward to receiving your affirmative response granting permission to utilize your self-questionnaire for my research. Should you have any questions or require further information send me your inquiry.

Thank you for your time and attention.
Yours sincerely

Name: BARA'AH SALEEM SALIM AL BATRANI.
Address: Sultanate of Oman - University of Nizwa - College of Health Sciences -Nursing School.
Contact- 14458455@uofn.edu.om.

Abdullah Mohammed <dr.aboOod99@gmail.com> Dec 24, 2023, 10:48 PM
to me

Yes, of course you can.

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Appendix. 6: Questionnaire of knowledge, and compliance with standard precautions of infection control among Nursing students

Questionnaire on knowledge, and compliance with standard precautions of infection control among Nursing students

Participants' written consent

Dear Potential Participants,

The self-administered Questionnaire categorized under three sections: It contains 3 sections: section I contains demographic data. section II contains 12 items about knowledge of the concept of standard precautions (true and false questions). section III contains CSPS scale to assess compliance with standard precautions' practices, which it contains 20 items, the response is 4-point Likert scale, such as: always, sometimes, seldom, and never. The findings of this study are solely reliant on the input you provide. As this implies, you must answer all of these questions. Your effort in attempting all questions honestly is highly appreciated. The data collection process involved presenting an anonymous, self-reporting questionnaire, based on available studies, the international guidelines. The questionnaire was pre-tested and used for data collection. The questionnaires were administered after obtaining KH consent.

By agreeing to answer these questions you have consented to take part in this study. It is your assurance that all information generated from this study will be treated as confidential and will be used for academic purpose only.

Part I: Participants' demographic data:

1- Age

a- 19-22

b- 23-25

c- 26-28

d- 29≤

2- Gender

a- Male

b- Female

3- Marital status

a- Single

b- Married

c- Others

Specify ……...

4- Stream of study

a- BSN regular program

b- DN program

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5- Year in the program

a- second year

b- third year

c- forth year

6- Clinical exposure

a- less than 1 year

b- 1-2 years

c- 3-4 years

7- Attended seminars of infection control

a- yes

b- No

Part II: Standard Precautions Knowledge

Please mark a ✔ in the box that best reflects your **knowledge of standard precautions**.

Please answer all 20 questions.

	True	False	I don't know
Q1. The main goal of infection control is to restrict the spread of infection.	❑	❑	❑
Q2. Definition of standard precautions is performing hand hygiene, use of Personal Protective Equipment (PPEs), appropriate handling of bodily fluids & patient wastes and prevention of needle stick/sharp injuries	❑	❑	❑
Q3. All patients are sources of infections regardless of their diagnoses.	❑	❑	❑
Q4. All body fluids except sweat should be viewed as sources of infection.	❑	❑	❑
Q5. All health providers are at risk of occupational infections.	❑	❑	❑
Q6. Hand washing minimizes microorganisms acquired on the hands if hands are soiled.	❑	❑	❑
Q7. In standard hand washing minimum duration should be 5-10 seconds.	❑	❑	❑
Q8. Alcohol hand rub cannot substitutes hand washing even if the hands are soiled.	❑	❑	❑
Q9. Use of PPEs eliminate risk of acquiring occupational infections.	❑	❑	❑
Q10. Gloves and masks cannot be re-used after proper cleaning.	❑	❑	❑
Q11. Sharps injuries should be managed with need of reporting.	❑	❑	❑
Q12. Immediate management of sharps injuries includes wash thoroughly with running water.	❑	❑	❑

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Part III: Compliance with Standard Precautions Scale (CSPS)

Please mark a ✔ in the box that best reflects your **current clinical practice**.

Please answer all 20 questions.

	Never	Seldom	Sometimes	Always
Q1. I wash my hands between patient contacts.	❑	❑	❑	❑
Q2. I only use water for hand washing.	❑	❑	❑	❑
Q3. I use alcoholic hand rubs as an alternative if my hands are not visibly soiled.	❑	❑	❑	❑
Q4. I recap used needles after giving an injection.	❑	❑	❑	❑
Q5. I put used sharp articles into sharps boxes.	❑	❑	❑	❑
Q6. The sharps box is disposed only when it is full.	❑	❑	❑	❑
Q7. I remove Personal Protective Equipment (PPE) in a designated area.	❑	❑	❑	❑
Q8. I take a shower in case of extensive splashing even after I have put on Personal Protective Equipment (PPE).	❑	❑	❑	❑
Q9. I cover my wound(s) or lesion(s) with waterproof dressing before patient contacts.	❑	❑	❑	❑
Q10. I wear gloves when I am exposed to body fluids, blood products, and any excretion of patients.	❑	❑	❑	❑
Q11. I change gloves between patient contacts.	❑	❑	❑	❑
Q12. I decontaminate my hands immediately after removal of gloves.	❑	❑	❑	❑
Q13. I wear a surgical mask alone or in combination with goggles, face shield and apron whenever there is a possibility of a splash or splatter.	❑	❑	❑	❑
Q14. My mouth and nose are covered when I wear a mask.	❑	❑	❑	❑
Q15. I reuse a surgical mask or disposable Personal Protective Equipment (PPE).	❑	❑	❑	❑
Q16. I wear a gown or apron when exposed to blood, body fluids or any patient excretions.	❑	❑	❑	❑
Q17. Waste contaminated with blood, body fluids, secretion and excretion is placed in red plastic bags irrespective of the patient's infection status.	❑	❑	❑	❑
Q18. I decontaminate surfaces and equipment after use.	❑	❑	❑	❑
Q19. I wear gloves to decontaminate used equipment with visible soils.	❑	❑	❑	❑
Q20. I clean up spillage of blood or other body fluids immediately with disinfectants.	❑	❑	❑	❑

That's the end of the questionnaire, thank you very much!

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Name of Supervisor: Ms. Jaha Anand

Document Reference Number
UoN/AA-POL-007/FORM-001/V3/2023

Student Statement Of Authorship

I understand that I am responsible for any academic work I submitted to the University of Nizwa. I declare that this assignment/project is my original work and any references and sources I have used were properly acknowledged. I claim the sole ownership of this academic work which was not done by any other person.

If the University of Nizwa discovers that the foregoing declaration is incorrect and/or that cheating or plagiarism has occurred, the University reserves the right to impose academic sanctions against me.

The copyright of this project report belongs to the University of Nizwa. The student should adhere to the University Authorship Policy [UoN/GSRER-DOR-POL/007/V1/2021].

Course Code: NURS491

Course Title: RESEARCH PROJECT

Title of Assignment/Project: Assess knowledge, and compliance with standard precautions for infection control among Nursing students at University of Nizwa.

Name of Student: Bara'ah Saleem Salim Al Batrani

Student ID: 14458455

Student Signature:

List of Symbols/Notations/Terminologies/Abbreviations/Acronyms	
Symbols/Notations/Terminologies/Abbreviations/Acronyms Used	**Meaning**
Hospital-acquired infections (HAI)	It is the infections that acquired in the hospital that is contracted from the staff themselves or from the patient himself during long time hospitalization, by contact, instrumentation or any other procedures that lead to infections.
Standard precautions (SPs)	Standard precautions are simple practices of infection prevention and control that healthcare providers must follow to prevent transmission of communicable diseases.