

ORIGINAL ARTICLE

The Era of Coronavirus: Assess the Impact of Distance Learning Course on the Levels of Hand Hygiene Knowledge, Attitude and Practice of Students in Low Resources Country

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ABSTRACT

Introduction: Hand Hygiene is an essential method to preclude infections in all healthcare environments. Education is essential to advance hand hygiene performance amongst nurses and nursing students. The aim is to find out the usefulness of a self-paced online hand hygiene course on the knowledge, attitude and practice of nursing students by evaluating student performance in post-tests. **Methods:** The study employed a quasi-experimental design in which data were collected using two questionnaires from undergraduate nursing students and they were exposed to interactive lectures and online activities related to risks, benefits, and key recommendations for hand hygiene. The following two surveys were used, Hand Hygiene Knowledge Questionnaire for Health-Care Workers; and Handwashing Assessment Inventory. Data were collected through pre-post tests. **Results:** Nurses reported a significant change for the better in hand hygiene comprehension, attitude, and performance of hand hygiene behaviours. The present study revealed a significant increase in hand hygiene knowledge belief, attitude, and outcomes among university students after participating in the training intervention. The majority of participants in the pretest rated their knowledge level as poor. **Conclusion:** Interactive training and online learning courses on hand hygiene could be used to influence the beliefs, attitudes and behaviours of students to bring about the desired change in hand hygiene practice. *Malaysian Journal of Medicine and Health Sciences* (2023) 19(3):123-129. doi:10.47836/mjmhs19.3.16

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INTRODUCTION

Hand Hygiene (HH) is an easy behaviour and the utmost important method to inhibit spreading infections that result from virulent germs present in all healthcare situations (1). Hospital-acquired infections (HAIs) may cost millions of dollars in expenses to the healthcare institutions (2). Increasing numerous research investigations confirmed that the transmission of infective disorders can be reduced by lowering the hazard of HAIs (1). A research study operated by Kwok et al. (3) found that medical students had habituated face-touching behaviour they touched their faces 23 times per hour, which increase the risk for HAIs.

Effective HH practice is an important method to prevent HAIs and cross infections and subsequently reduce

antimicrobial resistance (4). The safety and health of patients can be assured by practising HH as an inexpensive and effective method to prevent the spread of infections (5). Awareness and attention to HH were raised during the Coronavirus pandemic (4). Effective and good HH in general is effective in preventing and controlling infectious diseases (6).

Nurses compose the greatest proportion of the health care workers (HCWs) (7), and they are the "centre of the health care system" (8). Nurses expend further time with clients than any other HCWs, so their performance of HH procedures remains essential in preventing infections among patients. In 2009, the World Health Organization (WHO) distributed its parameters on HH in health care as a portion of the 'First Global Patient Safety Challenge, Clean Care Is Safer Care program' (1). Education is essential and required for success and stands for one of the foundations for an increase in HH practices (9). A review completed by (10) indicated the need for researchers to pay attention to the tutoring of nursing students related to precluding infection (10).

The study of Nazarko (11) indicated that most nurses said they were busy and could not find time for HH practices. Sax et al., (12) reported in the published study that HH indications such as (why, when, and how) to perform HH throughout everyday care had not been addressed in the training that was given to nurses. A study from Saudi Arabia (13) found that adherence to HH was perceived in 70% of medical students, and only 18.8% among nurses. Lacking knowledge about good HH has been related to non-compliance of HCWs (14). During the Era of COVID-19, mobile devices and computers were widespread and used by educators.

Education about HH for HCWs and students can be dispensed through employing several academic methods consisting of traditional lecture, e-learning, demonstration, interaction and discussion (15). Self-paced online learning (SPOL) permits people to approach course constituents at their quickness, which means that they can emphasise items that they find demanding and draught previous things that they previously know. This reduces missed time and fosters better effectiveness (16,17).

Self-paced online learning helps students actively in the learning progression; they may encompass a definite or several pages that can include any mixture of transcripts, pictures, audio, video-embracing screencasts, moving pictures, self-exam questions, and other cooperating deeds (16,17). Ruty et al. (18) used distance learning to teach anatomy in a nursing school, this strategy reported significant outcomes in terms of students' education, comprehension, and self-assurance for the anatomy course.

Many published studies stated that Jordanian nurses were discovered to owe a low level of information regarding HH rules, and a moderate hand-washing compliance rate, education programs are recommended (19–22). Improving nursing students' HH practices before entering proficient clinical practice can decrease the spread of HAIs, leading to a declined duration of stay in the hospital and lower health care expenses and HAI-related morbidity and mortality. Studies have revealed that students' knowledge of HH was low (23), so there is a necessity for more highlighting on HH while being undergraduate (3). The objectives of this study were to identify the student's knowledge and attitudes toward HH before and after SPOL as well as to assess the impact of SPOL on the means of practice level of HH among undergraduate nurses.

MATERIALS AND METHODS

Study Design

The research design implemented for the present study was a quasi-pretest-post-test educational online intervention design.

Study's Sample and setting

The study was operated at a school of nursing in one governmental university which has more than 1100 nursing students. Assuming an alpha of 0.05 with a medium effect size, a sample magnitude of 237 participants was required to operate data analyses.

Criteria for inclusion included being a nursing student involved in the Bachelor's program. Graduate nursing students were excluded as they had entered the clinical practice in the hospitals.

Ethical Considerations

Participants were provided with a declaration that involvement or non-involvement in this study would not affect their academic records and their participation was voluntary. Information confidentiality and privacy were preserved throughout the study. The data for this study was attained after getting approval from Institutional Review Board (IRB) in the Hashemite University (approval number: 3/9/2019/2020). No incentives were offered for participation.

Instruments

The assessment tool used in this study has consisted of four sections. Section one is a demographics section; section two contains items that assess HH knowledge; the third section is the attitude, and the section fourth assesses the practices of HH.

The second section assessed the knowledge level, by using WHO's Hand Hygiene Knowledge Questionnaire for Health-Care Workers (24). This survey consists of 21 questions; another four questions were added, so the total number of questions in this section was 25 and included multiple-choice questions, "true" or "false" questions. One point was granted for each right answer so the highest grade for knowledge was 25. A grade of above 75% (18–25) was deemed a good level, 50–74% (12–17) moderate level, and less than 50% (0–11) was taken as poor.

The third section assessed the attitude of nurses' toward HH (e.g., necessary /optional), and feelings toward HH (e.g., frustrating/ nonfrustrating). Attitude concerning HH amongst nurses was evaluated through employing semantic variance 7-point bipolar measures, with dissimilar endpoints such as rational-irrational, suitable-unsuitable, and compulsory - non-compulsory. Scores were reversed so that a higher score (25–49) corresponded to a more favourable attitude and a score from 1–24 was considered a non-favourable attitude (25).

In the last section, section four assessed the practices of HH, the students were asked to complete a HH self-assessment sheet based on "My five moments for handwashing" by WHO. Different scenarios were

developed based on the “hand hygiene guide practice” which was developed by WHO (15). The five moments that appeal to the employment of handwashing comprise the moment beforehand tapping a client, beforehand executing the aseptic and clean technique, afterward being at threat of contact with body fluids, afterward tapping a client, and after tapping the client’s surroundings. This notion has been fittingly employed to enhance comprehension, working out, scrutinizing, and conveying handwashing amongst healthcare workers (26).

In this section, students estimate their levels of HH implementation by the proportion of time (from 0% to 100%) in 5 patient circumstances that harmonize HH indications. For instance, the students were asked to approximate that you wash your hands beforehand starting to offer care to the client: 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%. Students were enquired to choose the value that best expressed their whole HH adherence rates.

Appropriate HH adherence was outlined by a student signifying on the study participation form that they executed HH both beforehand and afterward client tapping at a minimum of 90% of the time. Even though the employment of 90% as a cut-off standard for adherence is more than the 80% cut-off point employed in the prevailing literature (27), it is more tolerant than a firm 100% adherence level, which has been proposed to be impractical (28).

Pilot study

To ensure instrument reliability and validity, a pilot test of the whole survey was handled before definite data collection. A sample of 40 students achieving the inclusion criteria was used. The sample was examined, and elements were changed as required for clearness, sensitivity, and inclusiveness. Internal constancy was defined for the pilot testing by employing Cronbach’s coefficient, which produced $\alpha = 0.82$.

Data Collection

In the 2020-2021 academic years, students received an online questionnaire, which was purposely developed and made available through Google Forms. Interactive Training HH Module applied in the current study by using Microsoft Teams and Microsoft forms. Students were encouraged to log on to the online system and register to complete the program. The following information was announced to the students: a) any student with an internet connection can access the HH learning modules; b) when the student registered, log-in details will be emailed to the student; c) HH modules can be completed an unlimited number of times, and d) the access is free.

The topics that were covered in the training session were the following: a) the definition, impact and burden

of healthcare-associated infection; b) major patterns of transmission of healthcare-associated pathogens; c) prevention of HAIs and the critical role of HH; and d) indications for HH established by World Health Organization (15) ‘my 5 Moments for Hand Hygiene’ (p. 100). These topics were made available from WHO, 2009 First Global Client Safety Challenge.

The procedure for data collection was as follows: 1) participation in the HH program was announced by e-mail, 2) students who were interested in the training sent an email to the main investigator, showing that he or she wishes to take part in this research study, and 3) the main investigator decided whether the student met or not the inclusion criteria for the study, and sent an email confirming the participation in the study.

The current study was run into the following three phases: in Phase I, the session included the study objectives, procedure, required time, potential risks or benefits, and contact information for the investigators. Each student was provided with a randomized study number to use during the study to support privacy. A baseline assessment by pretest of HH knowledge, attitude and practice was conducted at the end of this phase.

Phase II: the investigator uploaded and shared Microsoft PowerPoint slides, documents, video files, and posters about HH, using the material developed by WHO (24) using Microsoft Teams, by this, the investigator used a mix and match of modules. A tracking system was used to monitor students’ participation in online learning activities. As the course proceeded, the primary investigator observed the number of students who watched the online videos. The students utilized the conversation room to communicate information about challenging concepts in the training sessions. The length of this stage was 15 days to allow students adequate time to complete the independent study training.

Phase III included the assessment of HH knowledge, attitude, and practice by completion of the tool post-training. The data from the Microsoft forms website was exported to Microsoft Excel and, subsequently, the SPSS (Statistical Package for Social Sciences) for statistical analysis.

Data Analysis

Data was entered in SPSS software package version 25.0. Dummy-coded variables were created for every one of the numerous-choice queries in the tool, with zero standing for a wrong answer and one standing for a correct answer. Descriptive statistics, mean, and standard deviation were employed to compute the total rates for every one of the scales. Cross tabulations to compare diverse variables were done within which Chi-square, Mann-Whitney and Kruskal-Wallis tests were computed to obtain the relationships of numerous study factors. The relationship was computed based on the

p-value which was assigned as 0.05.

RESULTS

Demographics

Table I illustrates the demographic characteristics of the sample such as study year and gender. In all, 237 students were recruited, the majority of them were from the second studying year (n = 81; 34.2%), followed by the fourth studying year (n = 68; 28.7%). The first studying year and third studying year represented less than two-fifths of the participants (19.8% and 17.3%, respectively). Those students in the four studying years equated an 85% response rate. Around two-thirds (65.4%) of the sample were female students, and the other third (34.6%) were male students.

Table I : Demographic characteristics of students (N=237)

Variable		n (%)
Studying Year	First Year	47 (19.8%)
	Second Year	81 (34.2%)
	Third Year	41 (17.3%)
	Fourth Year	68 (28.7%)
Gender	Male	82 (34.6%)
	Female	155 (65.4%)
Received clinical/lab practice on proper HH procedures while in nursing program	Yes	168 (70.9%)
	No	69 (29.1%)

Table II reveals the levels of HH knowledge, beliefs about outcomes, and attitudes, pretest post-test intervention. The majority of participants in the pretest rated their knowledge level as poor (85.7%; n = 203), with 12.2% (n= 29) rating their knowledge as moderate, and only 2.1% (n = 5) rating their knowledge as good. In the post-test, around half of the participants in the study (47%; n = 110) rated their knowledge level as good, with one-third (47%; n = 110) rating their knowledge as moderate and (6%; n = 14) rating their knowledge as poor.

Table II: Students’ beliefs about outcomes, attitudes, and knowledge levels toward HH before and after SPOL and correlations between results of pretest and post-test (N=237)

Levels	Scores	Pre	Post	p-value
Knowledge Level (25 items)				
Good Level	18-25	5 (2.1%)	110 (47%)	0.296
Moderate level	12-17	29 (12.2%)	110 (47%)	
Poor Level	0-11	203 (85.7%)	14 (6%)	
Beliefs about outcomes (9 items)				
Positive Beliefs	32-63	5 (2.1%)	230(97%)	0.023*
Negative Beliefs	1-31	230 (97.9%)	7 (3%)	
Attitude (7 items)				
Positive attitude	25-49	35(14.8%)	236 (99.6%)	0.677
Negative attitude	1-24	201 (84.8%)	1(0.4%)	

* correlation is significant at α = 0.05

Table II shows the levels of beliefs about outcomes of HH, attitudes, and knowledge levels; the outcomes of the present study denoted that most of the participating students in the post-test had positive beliefs about outcomes of HH, and most students had a moderate and high level of knowledge about HH. Almost all of the participants in the study rated their attitude as positive

after the post-test. However, a significant correlation between pretest and post-test results was only found in beliefs about outcomes of HH (p<0.05). This can indicate the usefulness of the SPOL program applied in this study in changing participants’ beliefs about outcomes of HH from negative to positive.

Impact of employing SPOL

Table III shows the significant differences in the means of the knowledge, beliefs about outcomes, and attitude scores in pretest and post-test. A paired-samples t-test denoted that the knowledge scores were considerably greater in the post-test (M = 17.16) than in the pretest (M = 7.46). Beliefs about the outcomes in the post-test (M = 46.18) were also higher than in the pretest (M = 18.11), and attitude in the post-test (M = 37.82) was higher than in the pretest (M = 18.5).

Table III: The means of knowledge, beliefs about outcomes, attitudes, and intention toward HH before and after SPOL using t-test (N=237)

Variable	Mean	SD	Mean	SD	p
Knowledge	7.46	3.66	17.16	3.45	0.00
Beliefs about outcomes	18.11	5.91	46.18	6.23	0.00
Attitudes	18.35	6.34	37.82	4.68	0.00

While trying to find associations between demographic variables and knowledge, beliefs about outcomes, and attitudes toward HH after the SPOL program, the results in table IV indicated no significant associations between demographic variables and knowledge, beliefs about outcomes, and attitudes toward HH (p >0.05), which means that gender, studying year, and receiving clinical lab practice on proper HH had no effect of the post-test results after the SPOL program.

DISCUSSION

The current study revealed that the majority of students reported their level of knowledge was poor. The results were in harmony with a study conducted in Turkey; which showed that the nursing education program did not encourage the students to practice what they had to be taught or give adequate attention to the subject of HH (24).

It is probable that after a definite time, students missed attention to HH and no longer occupy what was educated, mainly if the equivalent information was repetitively in an analogous way. For this reason, changing the learning strategy with nursing students can enhance their knowledge about HH. In our study, we used the SPOL as a new learning strategy and the outcome was hopeful with a great impact as it will be discussed below.

Knowledge of Hand Hygiene

Knowledge requires improvement and change to increase compliance (29). A study conducted in Singapore indicated that nursing students acknowledge the importance of HH, and realize clinical training and

Table IV: Relationships between demographic variables and knowledge, beliefs about outcomes, and attitudes toward HH after the SPOL program (N = 237)

Variable		Knowledge Level <i>n</i> (%)			<i>p</i> -value
		Good Level	Moderate Level	Poor Level	
Studying Year	First Year	28 (59.6)	16 (34)	3 (6.4)	0.588
	Second Year	36 (44.4)	40 (49.4)	4 (4.9)	
	Third Year	19 (46.3)	18 (43.9)	3 (7.3)	
	Fourth Year	27 (39.7)	36 (52.9)	4 (5.9)	
Gender	Male	71(45.8)	73 (47.1)	9 (5.8)	0.834
	Female	39 (47.6)	37 (45.1)	5 (6.1)	
Received clinical/lab practice on proper HH procedures while in nursing program	Yes	76 (45.2)	80 (47.6)	10 (6)	0.586
	No	34 (49.3)	30 (43.5)	4 (5.8)	

Variable		Beliefs about outcomes <i>n</i> (%)		<i>p</i> -value
		Positive beliefs	Negative beliefs	
Studying Year	First Year	46 (97.9)	1 (2.1)	0.959
	Second Year	78 (96.3)	3 (3.7)	
	Third Year	40 (97.6)	1 (2.4)	
	Fourth Year	66 (97.1)	2 (2.9)	
Gender	Male	152 (98.1)	3 (1.9)	0.204
	Female	78 (95.1)	4 (4.9)	
Received clinical/lab practice on proper HH procedures while in nursing program	Yes	163 (97)	5 (3)	0.974
	No	67 (97.1)	2 (2.9)	

Variable		Attitude <i>n</i> (%)		<i>p</i> -value
		Positive attitude	Negative attitude	
Studying Year	First Year	47 (100)		0.328
	Second Year	80 (98.8)	1 (1.2)	
	Third Year	41 (100)		
	Fourth Year	68 (100)		
Gender	Male	154 (99.4)	1 (0.6)	0.467
	Female	82 (100)	0 (0)	
Received clinical/lab practice on proper HH procedures while in nursing program	Yes	167 (99.4)	1 (0.6)	0.522
	No	69 (100)		

practical laboratory sessions to be effective ways to educate about HH (30).

The results of the current study in post-test show improvement in the level of knowledge from poor to moderate which is certainly a positive outcome. These outcomes were congruent with a similar study conducted in Saudi Arabia, which reported that nurses had moderate knowledge about HH (31). Self-directed learning motivates learners and increased their confidence and autonomy and can sustain lifelong learning by improving learners' skills for learning (32). From this point, we encourage the use of SPOL with adult learners, particularly nursing university students so that they can empower themselves while in clinical practice with the necessary knowledge and skills regarding emergent issues while providing nursing care for their clients. For example, the outbreak of the Coronavirus pandemic and its special considerations.

Attitudes and beliefs toward Hand Hygiene

The findings of the current study disprove a study that was done in Saudi Arabia, which shows that the majority displayed a moderate attitude toward HH (31). Attitudes

about HH guide students' practising of HH, illustrating the necessity to encourage the teaching staff and medical training area to reflect HH in the undergraduate curriculum and clinical practice. The outcomes of the existing study found that students had a negative attitude toward HH in the pretest this result contradicted a study which shows that the nurses have a positive approach toward HH (33).

Post-test results of the current study exposed that most nursing students (90%) have an affirmative manner toward HH which was evidenced by the usefulness of the SPOL program applied in this study in changing participants' beliefs about outcomes of HH from negative to positive. Therefore, the improvement of student nurses' HH attitudes and beliefs is an essential role in the procedure of teaching HH practice. Furthermore, it has been shown in our results that gender, studying year, and receiving clinical/lab practice on proper HH procedures did not affect the post-test results, a point that also supports the impact of SPOL in changing nursing students' attitudes and beliefs about outcomes of HH regardless of their gender, studying year and prior preparation for HH procedures.

Self-paced online learning

Our study results revealed that the SPOL method is effective among undergraduate students in developing countries such as Jordan. A study assessed the usefulness of a computer-built education platform on infection control measures for medical undergraduates and revealed that medical undergraduates' information boosted considerably from 63.5% to 83.4% afterwards gaining access to the platform (34). From this point, we encourage the use of an online learning approach in improving attitudes and beliefs of students regarding vital issues in clinical practice such as HH while employing the appropriate computer-based learning package that supports the topic to be acquired through SPOL. Learning programs that are self-directed are effective in enhancing learning competency and in producing satisfaction in clinical practice amongst nursing students (17). As a result, employing SPOL is a useful learning strategy for nursing students regarding fostering knowledge, attitudes and beliefs about the outcomes of HH.

Relevance to nursing practice

There are several interactive training and education courses on HH that could be used to influence the beliefs, attitudes and behaviours of students to bring about the desired change in HH practice. What verification is existent concerning the kind and layout of e-learning technology appropriate for medical specialities and medical settings is still needed in future studies.

Limitations

One of the highly considerable shortcomings of SPOL is the nonexistence of a mediator. This indicates that there is no chance of response or support from a qualified mentor. The questions that were used in the pre-post survey in the knowledge section were only of the True/False style. This type of question permitted the respondents to have a 50% chance of guessing the correct answer if they did not know to answer the questions.

CONCLUSION

The findings of this research paper revealed that considerable improvements were found in university students' knowledge, attitudes, and beliefs about outcomes of HH after participating in the SPOL program.

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