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Investigating the knowledge, attitude, and performance of the staff of the therapeutic educational center in Gorgan city about the factors related to hand hygiene according to the PRECEDE Model: A cross-sectional study

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Abstract

Introduction: Hospital-acquired infections pose a significant risk to patients who are hospitalized and have become a major global concern. These infections are associated with an increasing number of complications, morbidity, and mortality rates, and result in considerable costs for patients during their hospital stay.

Objectives: This study aimed to investigate the knowledge, attitude, and practice of the staff of Shahid Sayad Shirazi Hospital in Gorgan regarding the factors related to hand hygiene based on the PRECEDE model, 2020. To improve the observance of hand hygiene in personnel, it is necessary to study the factors related to their behaviors.

Patients and Methods: This was a cross-sectional study with a descriptive-analytical approach. The statistical population was the administrative and medical personnel working in Shahid Sayad Shirazi Hospital, who were selected by random sampling. An author-made questionnaire was used, which included questions on knowledge, attitude, and performance. The questionnaire was based on Najafi Ghezalje et al's study questionnaire and had 6 sections: demographic, knowledge, attitude, and enabling, where content validity was confirmed by determining CVR=0.78 and CVI=0.84. The questionnaire's reliability was Cronbach's alpha=0.84. The data collected were analyzed using SPSS version 16, and descriptive statistics and inferential statistics parametric tests ANOVA, t test, and Pearson's correlation coefficient were used at the error level (0.05).

Results: The results showed that the score of all areas was above average. The domain of enabling factors was affected by four variables: gender, degree of education, grade of education, and type of employment. The knowledge was affected by three demographic variables: age, work experience, and marital status. The performance is affected by the variable of work experience.

Conclusion: To observe hand hygiene according to the instructions, it is required to create resources on a proper basis and provide basic knowledge, attitude, and practice training to the staff based on the PRECEDE model.

Introduction

Hospital-acquired infections pose a significant risk to patients who are hospitalized and have become a major global concern. These infections are associated with an increasing number of complications, morbidity, and mortality rates, and result in considerable costs for patients during their hospital stay (1). Improving healthcare

quality while reducing costs is a crucial goal for the healthcare industry. One way to achieve this is by decreasing the occurrence of hospital-acquired infections. This not only enhances the quality of healthcare facilities but also lowers the cost of healthcare services (2). Hand hygiene is the most important method for preventing healthcare-associated infections. Semmelweis was the

Key point

The study found that the staff at the Shahid Sayyad Shirazi educational-medical center had above-average knowledge, attitude, and performance regarding hand hygiene and infection control. However, to further improve this, it is essential to provide continuous training and workshops on hand hygiene and infection control, encourage active participation of medical and administrative personnel, and ensure that necessary equipment for implementing hand hygiene standards is readily available.

first to identify the association between hand hygiene and nosocomial infections in healthcare settings in 1847 (3). The World Health Organization conducted a study in 55 hospitals located in 14 countries, including the Eastern Mediterranean region. The study revealed that healthcare-associated infections in hospital inpatient units had an average prevalence of 8.7% (1). Iran took serious and systematic measures to control hospital infections in the year 1350 (1971) (4). Improving adherence to hand hygiene is crucial in reducing healthcare facility infections. Despite compelling evidence, healthcare professionals' compliance with hand hygiene remains low (5). According to reports, the hand hygiene of healthcare workers is not up to the mark. (3). Healthcare workers and hospital administrative staff who are infected can spread pathogens through their hands, making hand washing a crucial preventive measure in hospital environments. Several studies have identified hand hygiene as the most critical preventive measure. However, research conducted in different countries has shown that the compliance rate of healthcare personnel regarding hand hygiene is below 50% (1). A review of the existing literature suggests that hand hygiene studies in Iran have been limited and have utilized different methodologies. (6). A study by Edalatdoust et al found that despite holding positive attitudes, staff working in special care units have inadequate knowledge of optimal and desirable hygiene practices (1). It is crucial to assess the knowledge and attitudes of healthcare workers in hospital units towards promoting healthcare goals. Neglecting hand hygiene can put patients' safety and well-being at risk. Several factors such as personal and educational characteristics, training programs, managerial and motivational factors influence healthcare workers' understanding of hospital infections (1). In order to achieve useful and effective outcomes, health education must rely on theories and models that explain behavior change. Behavioral theories and models offer a structured approach to evaluating successful and failed outcomes. The PRECEDE model provides a framework in which predisposing factors such as knowledge, attitudes, and perceptions, and enabling factors such as access to resources and skills, are considered effective factors for assessing educational requirements. The most practical application of this model is to identify the factors that contribute to behavior. Research conducted demonstrates the efficacy

of this model in promoting preventive behaviors (7). The PRECEDE model is a health education approach that integrates behavioral, social, epidemiological, and educational sciences to improve health outcomes. It helps to understand the needs, problems, and tendencies of individuals in society by analyzing social, epidemiological, and behavioral diagnoses. The model also identifies the fundamental causes of behavioral factors that significantly impact health. Based on the principles of the PRECEDE model, behaviors or factors that affect behavior are categorized into predisposing, enabling, and reinforcing factors for educational diagnosis (8).

Objectives

This study investigated the knowledge, attitude, and performance of staff at a therapeutic educational center in Gorgan regarding hand hygiene factors using the PRECEDE Model.

Patients and Methods**Study design**

This is a cross-sectional descriptive-analytical study that involves healthcare and administrative staff, including doctors, nurses, midwives, operating room staff, and administrative and service personnel from different floors of the Shahid Sayyad Shirazi Educational and Medical Center in Gorgan. The sample size of 280 was randomly and systematically chosen based on the proportion of administrative and healthcare personnel in each department. The researcher developed a questionnaire modeled after the one used in the study conducted by Najafi Ghezleji et al as the data collection tool for this study (2); The questionnaire is composed of six sections that include different types of questions. The first section is made up of nine demographic questions. The second section, 12 knowledge questions, has a scoring range from 0 to 48. The third section is made up of 8 attitude questions with a scoring range of 0 to 32. The fourth section consists of 9 performance questions with a scoring range of 0 to 36. The fifth section contains 4 enabling questions with a scoring range of 0 to 8. Finally, the sixth section includes 6 reinforcing questions, measured using a three-option response format (yes, no, and I have no opinion), with a scoring range of 0 to 12.

To assess the content validity of the questionnaire, CVR and CVI methods were utilized. The questionnaire was given to 11 experts to obtain their opinions. The scope of questions and their corresponding CVR and CVI values are presented (Table 1).

The reliability of the questionnaire was validated by 24 nurses with over 15 years of experience. The resulting Cronbach's alpha coefficient was 0.84.

Statistical analysis

The data that was collected was analyzed using both descriptive statistics (such as frequency and percentage)

Table 1. Assessment of the content validity of the questionnaire (CVR and CVI methods)

	CVR	CVI
Knowledge	0.9	0.97
Attitude	0.74	0.79
Enabling	0.76	0.83
Reinforcing	0.72	0.81
Performance	0.82	0.8
Total questionnaire	0.78	0.84

and inferential statistics (which included ANOVA, *t* test, and Pearson's correlation coefficient) on SPSS software. Great attention was given to the normality of the parametric tests, and the significance level was set at 0.05.

Table 2. Frequency distribution of demographic variables

Variable	No.	%	
Age	20-24	6	2.5
	25-29	29	12
	30-34	63	26.1
	35-39	14	19.1
	40-44	43	17.8
	45-49	23	9.5
	50-54	16	6.6
	55-59	4	1.7
Gender	Female	183	76.6
	Male	56	23.4
Work experience	Under 1 years	10	4.1
	1-5	40	16.6
	6-10	72	29.9
	11-15	61	25.3
	16-20	33	13.7
	21-25	12	5
	>26	11	4.6
Department	Ministerial	29	12
	Emergency	32	13.3
	Special departments (ICU; CCU; Dialysis)	63	26.1
	Internal (neurology, nephrology, pulmonology, endocrinology)	21	8.7
	Women (gynecological hospitalization, maternity, gynecological surgery, infertility)	27	11.2
	Operating Room	24	10
	The number of departments an employee	12	5
	Other	33	13.7
Degree of education	Doctor	28	11.6
	Nursing	123	51
	Midwifery	23	9.5
	Surgery room anesthesia technician	11	4.6
	Non-medical education	43	17.8
Grade of education	Diploma and others	16	6.6
	Post-Diploma	19	7.9
	Bachelor	158	65.6
	Master	22	9.1
	Doctor / PhD	24	10
Type of employment	Conscription law's	27	11.2
	Under-a-contract	37	15.4
	Temporary-to permanent	32	13.3
	Permanent	112	46.5
	Other	32	13.3
Marital status	Married	185	76.8
	Single	55	22.8
Have you passed the infection control workshop this year?	Yes	71	29.5
	No	166	68.9

Results

The study found that the highest response rate to the questionnaire was among participants who were between the ages of 30-34 years (1.26%), female (9.75%), had 6-10 years of experience (9.29%), worked in specialized departments (such as ICU, CCU, dialysis) (1.26%), held a bachelor's degree (6.65%), and were nurses (51%). It was also found that most participants (9.68%) did not attend the infection control workshop during the year the study was conducted (Table 2). Furthermore, 5.46% of the participants were official employees of the Shahid Sayyad Shirazi Medical and Educational Center, while 8.76% were affiliated with the Maternal Hospital.

The survey conducted at the Shahid Sayyad Shirazi Educational and Medical Center revealed that medical personnel had an average score of 9.39 for the knowledge section, 3.25 for the attitude section, 9.4 for the enabling factors section, 2.10 for the reinforcing factors section, and 3.33 for the performance section. On the other hand, administrative personnel had an average score of 9.39 for the knowledge section, 4.25 for the attitude section, 2.4 for the enabling factors section, 3.10 for the reinforcing factors section, and 1.35 for the performance section. The scores of the five areas were significantly different between the two groups, with the performance section showing the most significant difference ($P < 0.05$; Table 3).

The study found that the age group of 40-44 years had the highest average score for knowledge, enabling factors, and performance. On the other hand, the age group of 55-59 years had the highest average score for attitude and reinforcement factors. The results indicated that there is a significant difference in the distribution of knowledge between age groups ($P = 0.019$) with a 95% confidence level. In addition, if the first error level is considered as 0.1, attitude ($P = 0.08$) can also be affected by the age group. The study also found that men had the highest mean score in the enabling factors domain, while women had the highest mean score in the knowledge, attitude, reinforcement factors, and performance domains. Furthermore, the gender group was the only enabling area that significantly affected the studied domains ($P = 0.017$).

The study found that individuals with a master's degree had the highest average score in the knowledge domain. On the other hand, those with a high school diploma or other educational background had the highest average scores in the attitude, enabling factors, reinforcing factors, and performance domains. Furthermore, the hypothesis test conducted on the sample data indicated that academic level only affected the enabling factors domain ($P = 0.033$).

Based on the sample data and results, it can be inferred that the domain of Enabling Factors was the only one that was influenced by academic level ($P = 0.000$). The midwifery degree had the highest mean scores in the

Attitude and Reinforcing Factors domains, while the Operating Room and Anesthesia degree had the highest mean scores in the Knowledge and Performance domains. On the other hand, the highest mean score in the Enabling Factors domain was associated with non-medical education backgrounds. The highest average score in the Knowledge domain was associated with a master's degree level, while the highest average scores in the Attitude, Enabling Factors, Reinforcing Factors, and Performance domains were linked to the high school diploma level and other educational backgrounds. The hypothesis test conducted on the sample data showed that the educational level only impacted the enabling factors domain ($P = 0.033$).

The study found that personnel with official employment status had the highest average score of knowledge, attitude, reinforcing factors, and performance. On the other hand, personnel with other employment statuses had the highest average score of enabling factors. The hypothesis test conducted on the sample observations indicated that the employment status only had an impact on the enabling factors domain ($P = 0.006$).

Personnel who attended infection control workshops scored the highest in knowledge, attitude, enabling factors, reinforcing factors, and performance domains. However, based on the findings at a 95% confidence level, it can be concluded that participation in infection control workshops did not have a significant influence on any of these domains. Nevertheless, at a 90% confidence level, it was found that attendance in infection control workshops had a significant impact only on the performance domain ($P = 0.017$).

To summarize the study findings, it was discovered that the enabling factors domain was affected by gender, education level, education degree, and employment status at a 5% error level. On the other hand, the knowledge domain was influenced by age, work experience, and marital status. The performance domain was significantly impacted only by work experience. However, there was insufficient strong evidence to suggest that demographic variables had an impact on the attitude and reinforcing

Table 3. Comparison of mean scores for knowledge, attitude, enabling factors, reinforcing factors, and performance among medical and administrative personnel at Shahid Sayyad Shirazi Educational-Medical Center

Variable	Group	Mean score \pm SD	Minimum score	Maximum score	P value
Knowledge	Medical personnel	39.9 \pm 6.01	0	48	0.553
	Administrative personnel	39.9 \pm 3.8	31	45	
Attitude	Medical personnel	25.3 \pm 4.5	0	32	0.556
	Administrative personnel	25.4 \pm 2.3	21	30	
Enabling factors	Medical personnel	4.9 \pm 1.8	0	10	0.109
	Administrative personnel	4.2 \pm 1.8	0	7	
Reinforcing factors	Medical personnel	10.2 \pm 2.1	0	12	0.674
	Administrative personnel	1.8 \pm 10.3	6	13	
Performance	Medical personnel	4.2 \pm 33.3	0	36	0.009
	Administrative personnel	35.1 \pm 1.4	30	36	

factors domains.

There is a positive relationship between knowledge and attitude, reinforcing factors, and performance. However, the strength of these relationships is weak. Attitude has the strongest correlation at 0.52, while performance has the lowest correlation at 0.3. Furthermore, attitude has a weak correlation with both reinforcing factors and performance.

It was found that there is a meaningful negative connection between enabling factors and performance. This suggests that as the level of enabling factors increases, the level of performance slightly decreases. Additionally, the correlation table displays a weak positive connection between reinforcing elements and performance, which is also statistically significant (Table 4).

Dissuasion

It is essential to assess the knowledge, attitude, and performance of hospital personnel towards hand hygiene. According to a study by Edalatdoust et al, the healthcare and administrative personnel scored higher than average in the knowledge, attitude, enabling factors, reinforcing factors, and performance domains. Among the occupations included in the study, nurses had the highest scores in the knowledge domain, midwives scored highest in the attitude and reinforcing factors domains, non-medical educated personnel scored highest in the enabling factors field, and operating room and anesthesia personnel had the highest scores in the performance domain (1).

The samples under investigation demonstrated good attitude and knowledge scores. Nurses in the study by Sharif et al exhibited good knowledge, attitude, and performance (9).

Van De Mortel et al (10) conducted a study on two groups of Italian nursing and medical students. The results showed that nursing students had better knowledge, attitude, and performance than medical students. Furthermore, these skills improved with the increasing number of years of study. According to a survey conducted by Kouhi et al (11), the scores related to the perceived sensitivity, severity, benefits, and barriers were at a reasonable level. If we can apply the findings of this study to the enabling and reinforcing factors, we can conclude that they are

consistent with the investigation.

Abdi and colleagues' study (12) revealed a significant difference in performance between healthcare and administrative personnel. In a survey conducted by Jeong and Kim, it was found that nurses had an estimated overall hand hygiene compliance rate of 24%, while physicians had a rate of 16.6% (3). Out of 1500 opportunities, only 306 (22.57%) demonstrated hand hygiene compliance. The study showed that nurses adhered to hand hygiene guidelines more than physicians.

According to a study conducted by Abdi et al (12), the average compliance rate for hand hygiene in the wards studied was only 16.53% before the intervention, but it increased to 27.22% after the intervention, showing an improvement of 10.69%. Among the three groups of personnel who work with patients, nurses had the highest compliance rate (48.46%). In the current study, administrative personnel performed better than healthcare personnel, scoring 35.1 ± 1.4 . The questionnaire was conducted during the coronavirus outbreak, which may have influenced the results. Handwashing was particularly sensitive during the outbreak, and healthcare personnel had to use personal protective equipment, including gloves, which needed to be changed regularly. The high volume of patients and inadequate staffing inwards also meant that healthcare personnel did not have sufficient time for handwashing.

The present study has found that age can have an impact on the knowledge domain ($P=0.019$). Additionally, if we consider the significance level to be 0.1, age may also have an effect on the attitude domain ($P=0.08$). This is in line with a study conducted by Edalatkhah et al (1); There was no significant difference in knowledge and knowledge among genders, workplaces, ages, and work experiences. However, a study by Hossein Zakeri et al (13). A study conducted on medical students found a significant statistical correlation between age, knowledge level, and attitude towards hand hygiene. The study revealed that older age groups had better knowledge and attitude towards hand hygiene. Additionally, a survey conducted by Geraei et al (14), Age, work experience, personal interest, and belief in hand hygiene were less important factors from the participants' perspective.

The study revealed that men had the highest mean

Table 4. Correlation score of knowledge, attitude, enabling factors, reinforcing factors, and performance among medical and administrative personnel at Shahid Sayyad Shirazi Educational-Medical Center

Variable	Knowledge	Attitude	Enabling factors	Reinforcing factors	Performance
Knowledge	-	0.527 ($P<0.001$)	-0.069 ($P=0.333$)	0.340 ($P<0.001$)	0.302 ($P<0.001$)
Attitude	0.527 ($P<0.001$)	-	0.053 ($P=0.436$)	0.354 ($P<0.001$)	0.276 ($P<0.001$)
Enabling factors	-0.069 (0.333)	0.053 ($P=0.436$)	-	0.043 ($P=0.483$)	-0.231 ($P<0.001$)
Reinforcing factors	0.340 ($P<0.001$)	0.354 ($P<0.001$)	0.043 ($P=0.483$)	-	0.309 ($P<0.001$)
Performance	0.302 ($P<0.001$)	0.276 ($P<0.001$)	-0.231 ($P<0.001$)	0.309 ($P<0.001$)	-

score for enabling factors, while women had the highest mean scores for knowledge, attitude, reinforcing elements, and performance. Among the domains examined, only the enabling factor domain showed a gender difference ($P=0.017$).

According to a study conducted by Edalatkhah et al (1), there was no significant correlation between knowledge, attitude, and work experience, which contradicts the findings of the current study. It is generally expected that with more work experience, one would become more sensitive towards complying with hand hygiene guidelines and recognizing the importance of the issue.

Based on the sample evidence the midwifery degree had the highest mean score for attitude and reinforcing factors, while the operating room and anesthesia degree had the highest mean score for knowledge and performance. Non-medical education had the highest mean score for enabling factors. The results suggest that educational degree only affects the enabling factor domain ($P=0.000$). In a study by Van De Mortel et al (10), significant differences were observed in the scores of knowledge, attitude, and performance between nursing and medical students.

In a study conducted by Edalatkhah et al (1), it was found that there wasn't any significant correlation between knowledge, attitude, and educational level. However, this finding is not consistent with the results of the present study. In the current study, midwives were found to have the highest average score for attitude, while those with degrees in operating room and anesthesia had the highest average scores for knowledge and performance. The results suggest that hand hygiene compliance measures should be implemented for all personnel, not just these groups.

According to a study conducted by Kouhi et al (11), the participants' responses indicated that the perceived benefits, perceived barriers, and self-efficacy scores were reasonably high. The study also found that participants who held a diploma degree had higher scores in the enabling factor domain. It is worth noting that most diploma and sub-diploma academic levels are employed in positions such as receptionists, guards, and service staff, which may explain the significant relationship between the enabling factor domain and the educational level of the participants.

The results of the hypothesis test on the sample observations showed that the only domain that could be affected by employment type is the enabling factor domain ($P=0.006$). Other studies attribute the lack of proper hand hygiene compliance to busy work environments, crowded patient conditions, complacency, and lack of access to necessary equipment, if personnel continue to work in emergencies according to their usual habits, it can diminish its importance among them over time (15). In the present study, personnel with other employment statuses, such as corporate, contractual, mostly working in service and administrative positions, had a significant relationship with the enabling factor domain.

The highest mean scores for knowledge, attitude, and enabling factors were among the married group, and the highest mean score for performance was among the unmarried group in the present study. The only domain that had a significant difference between the two groups (married and unmarried) was knowledge ($P=0.017$). Kouhi and colleagues' study found that knowledge was a significant predictor of behavior (11), while Geraei and colleagues' study did not find knowledge to be a significant predictor of behavior. The mean score for equipment barriers to hand washing was higher among nurses who were not married than those who were married (14). In Najafi Ghezeljeh et al's study, no significant relationship was found between marital status and hand hygiene compliance (2), while in the present study, the highest mean score in the enabling factor domain was reported among married participants. The importance and compliance with hand hygiene in married individuals may be due to their concern for family health, in addition to personal reasons.

The results indicate that the personnel participating in the infection control workshop achieved the highest mean scores for knowledge, attitude, enabling factors, reinforcing factors, and performance. Participation in the infection control workshop did not affect any domains when a confidence level of 95% is taken into account. However, by reducing the confidence level to 90%, only the performance domain can be considered affected by participation in the seminar ($P=0.017$). This finding differs from Geraei and colleagues' study, where no significant relationship was found between participation in hand hygiene training and the mean score of barriers to compliance (14). Education and training have been of particular importance in increasing people's knowledge in all areas, especially in hand hygiene compliance, as shown in this study. In addition to the high score in the knowledge domain, personnel who participated in infection control workshops had high scores in attitude, performance, and enabling and reinforcing factors domains. It is recommended to continuously implement and provide training in healthcare centers.

The linear correlation between attitude and reinforcing factors and performance, is also statistically significant, with both correlations being positive and weak in strength. The linear correlation between enabling factors and performance is also statistically significant. Still, it is feeble and has an inverse direction, meaning that with an increase in promoting factors, performance decreases slowly. The correlation table results indicate that the reinforcing elements and performance are both weakly but significantly linearly related. According to Kouhi and colleagues' study, behavior was significantly influenced by perceived barriers and knowledge. Behavior was not significantly predicted by perceptions of sensitivity structures, perceived intensity, perceived benefits, action guides, and self-efficacy.

Conclusion

According to the study findings, the knowledge, attitude, and performance of staff at Shahid Sayyad Shirazi Educational-Medical Center were superior to average and excellent. However, continuous training and workshops on hand hygiene and infection control, active participation of medical and administrative personnel, and provision of necessary equipment for implementing hand hygiene standards are essential in improving hand hygiene among healthcare personnel.

Limitations of the study

One limitation of this study was self-report bias among personnel responding to the questionnaire, which can be addressed with other educational interventions. Additionally, the timing of this study coinciding with the outbreak of the coronavirus in the country and the emphasis on hand hygiene to prevent the disease may have caused some interference in the study results.

Authors' contribution

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Ethical issues

The research adhered to the ethical principles outlined in the Declaration of Helsinki. The Ethics Committee of Golestan University of Medical Sciences approved this study (Ethical code# IR.GOUMS.REC.1399.067). Accordingly, written informed consent was taken from all participants before any intervention. Additionally, ethical issues (including plagiarism, data fabrication, and double publication) were completely observed by the authors.

Conflicts of interest

The authors declare that they have no competing interests.

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