ORIGINAL ARTICLE

Predictors of Hand Hygiene Behavior among Nurses: A Theoretical Cross-Sectional Study

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Background and Aims of the Study: Given the effectiveness of handwashing in preventing nosocomial infections and key role of nurses as a care provider in ensuring the well-being of individuals and society, this study aimed to determine the predictive power of BASNEF model constructs on this behavior. **Materials and Methods:** This descriptive analytical study was conducted on a total of 498 nurses working at hospitals based in Ardabil and Khalkhal during 2018. The participants were selected through a multistage sampling method. The data were collected by a valid and reliable questionnaire based on the BASNEF model constructs and analyzed through the SPSS 18, using statistical tests including t-test, ANOVA, Pearson's correlation, and multiple linear regressions, considering the significant level lower than 5%. **Results:** There was a significantly negative correlation between age/work experiences with hand hygiene (HH) behavior. Moreover, the attitude toward behavior showed a significantly positive correlation with the enabling factors and a significantly negative correlation with the subjective norms. The results of multiple linear regression indicated that the BASNEF model components had a predictive power of 3%, which was raised to 21.8% as age and work experience were added to the regression model. Hence, age and work experience were two important factors in predicting the hygiene behavior. **Conclusions:** The BASNEF model components cannot predict HH behavior among nurses, but age and work experience were two important factors in predicting the hygiene behavior.

Key words: Behavior, hygiene, BASNEF model, hand

INTRODUCTION

Hand hygiene (HH) is a very simple and important way of reducing nosocomial infections, preventing the spread of antimicrobial resistance, enhancing patient safety,[1] and preventing the transmission of pathogens from patient to patient through the hands of nurses.[2] Furthermore, HH has been recommended as the first step taken for control and prevention of infection.[3,4] According to the World Health Organization, more than 1.5 million people at any second in the world suffer from complications of nosocomial infections[5] and the health burden of healthcare-acquired infections is estimated up to 15% of patients admitted to hospitals in developing countries.[6]

Accounting for 30% of deaths,[7,8] nosocomial infections are most commonly transmitted through contaminated hands.[9] The results of studies by Zhao et al.,[10] Bakhshi et al.,[11] Bhagawati,[12] and Baghaei et al.[13] however, indicated that hygiene level is not so optimal, i.e., there is poor adherence to guidelines among healthcare workers.[12] In contrast, some studies showed dramatic increases in HH compliance with using the WHO guidelines.[6,14-16]

There are several factors contributing to poor recognition of HH such as personal and organizational factors, wearing gloves, skin irritation from repeated handwashes about the importance of HH, cultural and religious beliefs,[17] enabling factors,[18] and lack of knowledge.[13]

Poor HH compliance among Iranian nurses necessitates urgent interventions to improve both hospital infrastructure

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and staff knowledge.[13] Hence, this study was designed to assess this behavior among targeted nurses and considering the key role of nurses working as a medical and healthcare unit in ensuring the well-being of individuals and society, several studies have been carried out worldwide and in Iran about HH. In the latter, however, little study has been carried out in a systematic approach using behavioral models, whereas it is essential to devise strategies to change public behavior through understanding how people care about HH and what factors contribute to such behavior.[19]

In this regard, the application of well-established theories can help explain the predictors of behavior. According to the reported studies concerning the reasons of poor HH, it seems that the BASNEF model can be suitable for investigation of such behavior.

Aims of the study

Moreover, few studies attempted to identify predictors of HH knowledge and compliance and the lack of similar studies in Iran, especially among people with Azeri culture, provides an opportunity for this study to determine the predictive power of BASNEF model constructs on this behavior.

MATERIALS AND METHODS

This descriptive analytical study was conducted on a total of 498 nurses working at hospitals based in Ardabil and Khalkhal cities during 2018. Sample size calculation was done using $P = 0.3$ and $d = 0.04$, and hence that the sample size was 504 (98.8% response rate).

The participants were selected through a multistage sampling method, i.e., a suitable number of participants were first selected by random sampling from among enlisted nurses working at each hospital. Inclusion criteria includes; employment as a nurse in education hospitals in Ardabil and Khalkhal cities for at least 40 h per week, and age between 20 and 60 years of age. Exclusion criteria include the refusal to voluntarily attend in the study and the absence on the day of data collection.

The sample population was then briefed on the study objectives and details and asked for their oral consent if they were willing to participate.

The data were collected through a structured questionnaire comprising two sections. The first section consisted of demographic items and the second section includes questions related to constructs of BASNEF model. The second section of questionnaire was standard instrument validated in Baghaee et al study.[13] This second section comprised from 4 parts include subjective norm, enabling factors, behavior intention and behavior. The first was the subjective norm

that consisted from nine questions based on the Likert scale: strongly agree, agree, neutral, disagree, or strongly disagree. The answers scored 1–5, showing different values for each statement. The scores of this part ranged from 9 to 45. The Enabling factors part included seven questions designed based on the Likert scale and the scores ranged from 7 to 35, the behavior intention part included seven questions with two options (Yes or No), and the behavior part included eight items concerning the acceptance of washing hands before and after the training (performance) program, which was determined by observation.

The last section was attitude toward behavior with 15 items (on a Likert scale ranging from strongly agree to strongly disagree), and answers scored 1–5, showing different values for each statement. The scores of this part ranged from 15 to 75. In scoring Likert scale, both positive and negative questions were taken into account. The keys to questions were prepared accordingly, i.e., if a sentence was positive, the highest score was given to strongly agree, otherwise the highest score was given to strongly disagree. The maximum acquirable scores were 35, 45, 7, 75, and 18 for enabling factors, subjective norm, behavioral intention, attitude, and behavior, respectively.

The collected data were analyzed through the SPSS version 18.0 (SPSS Inc., Chicago, IL, USA) and using statistical measures which include t-test, ANOVA, Pearson's correlation, and multiple linear regressions, considering the significant level lower than 5%.

RESULTS

Results in the sociodemographic characteristics of the study participants showed that 321 persons (64.4%) were female and more than two-thirds of the respondents (88.7%, 442 persons) were married, 282 persons (56.6%) had regular in employment status, and finally the mean age and years of work experiences were 39.5 and 12.6 years, respectively.

The findings demonstrated that there was a significant difference between mean scores of behavior intention ($P = 0.01$), attitude toward behavior ($P = 0.06$), and behavior based on the employment status of nurses ($P < 0.01$). The participants who were recruited on a contract basis scored significantly higher mean for behavioral intention, while individuals working on a project-contract basis scored higher mean for attitude and behavior as compared to others. There was, however, no significant difference in the subjective norm and enabling factors based on this variable. The maximum acquirable score in behavior variable was 18 and the mean score was 9.1 ± 2.4 [Table 1].

Furthermore, there was no significant difference between males and females in terms of the mean score for attitude

Table 1: Mean of scores for BASNEF model constructs sorted by employment status

	Employment	Mean±SD	*P*
Enabling factors	Regular	18.3±6.0	0.144
	Contract	17.3±6.3	
	Project agreement	19.7±6.7	
	Total	18.5±6.2	
Subjective norm	Regular	25.0±8.9	0.456
	Contract	26.7±7.9	
	Project agreement	24.3±7.0	
	Total	25.0±8.4	
Behavioral intention	Regular	7.8±1.0	0.01
	Contract	8.4±0.9	
	Project agreement	7.9±1.0	
	Total	7.9±1.03	
Attitude toward behavior	Regular	39.5±12.1	0.06
	Contract	34.4±11.4	
	Project agreement	40.9±13.1	
	Total	39.3±12.4	
Behavior	Regular	8.4±1.7	<0.001
	Contract	9.5±1.7	
	Project agreement	11.2±3.1	
	Total	9.1±2.4	

SD=Standard deviation

toward behavior. However, women scored significantly higher means for the enabling factors, subjective norms, behavioral intention, and HH behavior [Table 2].

The results of this study indicated there was a significantly negative correlation between age/work experiences with HH behavior. Moreover, the attitude toward behavior showed a significantly positive correlation with the enabling factors and a significantly negative correlation with the subjective norm [Table 3].

The results of multiple linear regression indicated that the BASNEF model components solely had a predictive power of 3%, which it raised to 21.8% as age and work experience were added to the regression model. Hence, age and work experience were two important factors in predicting the hygiene behavior [Table 4].

DISCUSSION

However, HH importance is well accepted for reducing healthcare-associated infections, but HH compliance is often low.[17] The results of the present study revealed that the mean score of behavior and the model constructs were moderate, taking into account the maximum obtainable scores, which

was consistent with results concerning the behavior in a similar recent study.[13] In a study by Zandiyeh and Borzou(2012) the HH rate was reported to be at 61.3%,[20] whereas Alshehari *et al.*[1] found out that recognition of HH at 13 hospitals in Ontario, Canada, was 31.2%. In their research, Gwarzo reported that HH following contact with the surrounding was very low.[21] In another study, handwashing among nurses working in areas covered by Shahid Beheshti University of Medical Sciences was estimated to be 21.9%.[11]

In this theoretical research, the percentage of situations where nurses decided to wash their hands turned out to be less than expected. To maintain good HH, the hospitals must be equipped with adequate bathrooms, soap and skin-compatible solutions, holding regular and periodic retraining programs for all the personnel, taking appropriate monitoring and control measures, and putting into practice strategies to create a positive attitude toward washing hands.[20,22]

The results of this study showed that HH practices were statistically same between male and female nurses, which is similar to other studies in Iran,[17,23] but inconsistent with other studies that reported female nurses practiced more HH than male nurses.[24]

The findings showed that individuals employed on a contract basis scored a significantly higher mean for behavioral intention, while those working on a project-agreement basis scored a higher mean for attitude and behavior as compared to others. It seems that findings can be associated with the fact that individuals on project-agreement employment tend to adhere to university teachings acquired at academic environments since they have been graduated only recently. Moreover, it can be assumed that they care about laws and professional regulations far more than those employed regularly. Another reason for scoring greater scores in HH behavior might be the lower occupational security margin of this group as compared to other subjects. The results obtained from other correlation tests, however, indicated a significantly inverse relationship between age and work experience. Furthermore, the results of multiple linear regression analysis also demonstrated the great predictive power of age and work experience concerning the HH behavior, thereby confirming the assumption that as age and work experience increase, the positive HH diminishes.

The results also revealed that there was a significantly negative correlation between subjective norm and behavioral intention, which can highlight the fact that the behavioral intention toward HH increases over time by individual experience, thus confirming the role of age and work experience in behavior. Unfortunately, there were little similar findings available to be compared with the present study. Therefore, it is suggested that future research be focused on the importance of

Table 2: Mean of scores for BASNEF model constructs sorted by gender

	n	Mean±SD	P
Enabling factors			
Male	177	17.1±5.5	0.001
Female	321	19.6±6.6	
Total	498	18.3±6.7	
Subjective norms			
Male	177	22.3±7.8	0.000
Female	321	27.0±8.4	
Total	498	25.06±8.4	
Intention to behavior			
Male	177	7.0±1.02	0.029
Female	321	8.07±1.04	
Total	498	7.9±1.03	
Attitude			
Male	177	39.3±10.4	0.981
Female	321	39.3±13.7	
Total	498	39.3±12.4	
Behavior			
Male	177	8.4±1.66	0.000
Female	321	9.7±2.3	
Total	498	9.1±2.4	

SD=Standard deviation

Table 3: Correlation of BASNEF model constructs with hand hygiene behavior, age, and work experience

	1	2	3	4	5	6	7
Behavior	1						
Attitude	−0.112	1					
Subjective norms	−0.030	−0.284**	1				
Intention to behavior	−0.027	−0.001	−0.177**	1			
Enabling factors	0.018	0.392**	0.305**	0.104	1		
Work history	−0.423**	−0.030	−0.103	−0.029	−0.142*	1	
Age	−0.449**	−0.027	−0.037	−0.012	−0.106	0.945**	1

**Correlation is significant at the 0.01 level (two-tailed). *Correlation is significant at the 0.05 level (2-tailed)

HH in the prevention of nosocomial infections, where age and type of employment can influence the behavior of the nurses. Moreover, it is recommended that causes be identified to improve the recognition of HH among nurses with an emphasis on those with higher work experience since prevention and control over infections require the responsibility of every

Table 4: Multiple linear regression for BASNEF model constructs in prediction of hand hygiene behavior

Variable	P	β	t	Adjusted R^2
Enabling factors	0.032	0.157	2.151	0.03
Subjective norms	0.033	−0.152	−2.148	
Intention to behavior	0.241	−0.071	−1.174	
Attitude	0.003	−0.216	−3.027	
Enabling factors	0.109	0.105	1.606	0.218
Subjective norms	0.017	−0.155	−2.406	
Intention to behavior	0.182	−0.072	−1.337	
Attitude	0.001	−0.209	−3.272	
Age	0.015	−0.393	−2.451	
Work history	0.710	−0.060	−0.373	

single individual involved in the healthcare team. Finally, the top priority ought to be given at all levels to the management and training systems.

Our study has several limitations. First, the study used cross-sectional method which cannot explain causal associations. Second, our study used self-reported survey data which may introduce response and measurement biases.

CONCLUSIONS

The results indicated that the BASNEF model components cannot predict HH behavior among nurses, but age and work experience were two important factors in predicting the hygiene behavior. The results of the present study revealed that the mean score of behavior and the model constructs were moderate, taking into account the maximum obtainable scores. Furthermore, significant differences were found regarding employment status between nurses, and individuals employed on a contract basis scored a significantly higher mean for behavioral intention.

Limitations

One limitation of this study involved temporariness, which made it difficult to identify causal relationships. It is recommended that a combination of behavioral change theories be employed to investigate HH, which has also been suggested in a few studies for enhancing the predictive power of theories.[25] On the other hand, the regression analysis through a fitting number of samples was a major strength to this study. Strength involves the application of theories in the examination of HH behavior for the first time on an Azeri nursing community in Iran. Furthermore, the data collection process was based on self-reporting method by nurses, which is another limitation for the present study.

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Conflicts of interest

There are no conflicts of interest.

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