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Nurses Knowledge Toward Hand Hygiene In Health Facilities

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ABSTRACT

A critical synthesis of existing research conducted within Saudi Arabia is required to elucidate the determinants of the observed hand hygiene knowledge-practice gap among its nursing workforce. To investigate this knowledge gap, the study seeks to establish the knowledge that nurses have on hand hygiene in terms of its sub domains, and to examine some of the variables that are likely to influence the knowledge of sub domains. A cross-sectional study was employed that involved a structured, validated questionnaire administered to 250 nurses of a tertiary hospital, and descriptive statistics, t-test, and ANOVA, correlation, and multiple linear regression were utilized to analyze the data. Parameters of participated were demographic/professional attributes; knowledge was measured using a 25-item questionnaire; some of the perceived barriers were also collected. Results of the study were that the average knowledge was 18.6/25, which reflects to some extent that the knowledge level could be described to be moderate, but one of the gap that the knowledge level was weak on the Five Moments domain and that was 7.4/10, while the technique and product knowledge were 11.2/15. Regression analysis showed that training within the last two years (β=0.29, $p<0.001$) along with being part of the ICU (β=0.18, $p=0.001$) are significant positive predictors of knowledge, while overall perception of barriers are strong negative predictors (β=-0.30, $p<0.001$). This explains 29.4% of the variance in knowledge scores. It is concluded that HH knowledge is differentially impacted by recency of training, clinical unit culture, and perceived barriers. This emphasizes the need for specific, integrated approaches that go along with continuous conceptual education and organization of work around structural elements that alleviate workload and preventive skin damage for better sustained outcomes.

Keywords: Barriers, Hand Hygiene, Knowledge, Nurses, Training.

INTRODUCTION

HAI is an intimidating challenge to global health, causing significant morbidity, mortality, and increased health-care spending. Hand hygiene is the most commonly accepted, universally recognised, and cost-effective intervention for preventing the transmission of pathogens in clinical environments in the complex chain of prevention and control of infections [1,2]. The World Health Organization has been propagating this principle with the help of evidence-based guidelines, the best of the best being the “Five Moments of Hand Hygiene, which gives a concise and systematic

guideline to the practitioners [3,4]. However, even with a general acceptance of its importance, hand hygiene practices still perform poorly in all parts of the world, and nurses, being the closest to the patients, play a central role in the gap [5].

The issue is both local and international. Studies carried out globally show a consistent variation between knowledge versus practice. Literature in different countries shows that, although nurses tend to value the necessity of hand hygiene, their knowledge about particular guidelines is often inadequate, more so when it comes to the specific indicators that are defined by the WHO Five Moments [6,7]. The situation in the Kingdom of Saudi Arabia, where this investigation was carried out, is not different. The Saudi health-care system is large and fast-developing that serving a large and diverse population [8]. In this dynamic setting, the impact of HAIs is very high, and national efforts to improve patient safety should be expected. Some Saudi reports have investigated compliance with hand hygiene, with a number indicating that the compliance rates are not always up to international standards [9,10]. However, the careful investigation of the very specific aspects of the knowledge of nurses, the mental base behind the compliance, has been relatively overlooked in the Saudi setting.

The literature analysis shows that much has been done on hand hygiene, but there is an urgent research gap. Classical and contemporary research has managed to establish the major factors that impede compliance, which are heavy workload, skin irritation, and inadequate supply access [11]. As well, it has also been shown that the multimodal improvement strategies, including education, are better than a single intervention. However, the numerous research works adopt the simplistic approach of knowledge as a monolith or a figure of score that does not break down its building blocks [12]. Research that explores the finer aspects of knowledge (such as conceptualization of signs versus ability to master technique) at the same time as investigating the interaction between such knowledge and ubiquitous clinical impediments is deficient [13]. This interaction is essential to know; it helps to bridge the gaps between knowledge possessed by nurses and their practice in practice. Devoid of this understanding, interventions will be generic and unable to address the particular cognitive and environmental issues to foster compliance in complicated clinical settings [14].

The importance of this study is that it may go beyond what is superficial. This study provides a more advanced diagnosis of the issue by breaking down the knowledge of hand hygiene into its elements and by examining how it correlates with the enabling factors (including training) and preventing factors (including perceived barriers) [15, 16]. It is especially imperative in a high-stakes environment such as Saudi Arabia, where the responsibility to increase the level of infection prevention and control (IPC) is a national agenda [17]. We conducted this study specifically due to the fact that a more detailed knowledge is needed to develop specific, efficient, and sustainable interventions aimed at the Saudi nursing workforce. It is not sufficient to know that there is a knowledge gap, but also how it is organized, what its weaknesses are against its external stimuli [18].

The specified research gap forms the basis of the main questions in this research. The main question was as follows: What is the overall condition of hand hygiene-related knowledge of nurses in a tertiary care facility in Saudi Arabia? Additional questions investigated: How does the knowledge of the WHO Five Moments relate to the knowledge of techniques and products? How do the levels of knowledge and perceived barriers to compliance in the nurses relate to one another? And, what demographic, professional, and perceptual variables, to the greatest extent, predict the hand hygiene knowledge of a nurse?

To address these questions systematically, the research was informed by well-defined objectives that were consistent with the methodology. To start with, we tried to determine the

amount of theoretical knowledge nurses had on the WHO Five Moments and associated methods using a validated quantitative tool to come up with an accurate score. Second, the research was conducted to determine the main self-reported obstacles affecting the regular practice of hand hygiene, quantifying their rate and severity. Third, we were going to establish the level and direction of the relationship between knowledge scores and the perceived barriers. Lastly, the study was also meant to identify a predictive model to determine whether years of experience, recent attendance of training, clinical unit specialization, and perception of barriers would significantly predict a nurse to have a high hand hygiene knowledge score.

In short, the study offers a quantitative, in-depth study into the knowledge of hand hygiene among nurses in a large Saudi Arabian health-care institution. It develops out of the already existing international literature and fills an important gap by examining the complex interaction of knowledge and context. The results will be intended to provide a strong evidence base to the hospital administrators and IPC teams, and to inform how to develop advanced, information-driven approaches that will equally educate and actively break down the obstacles to knowledge being smoothly transferred into life-saving practice.

METHODOLOGY

The case study was conducted in King Fahad Medical City (KFMC), which is one of the tertiary care hospitals in Riyadh, Saudi Arabia, with a bed capacity of 1,200. The site has been carefully selected based on its large and diverse nursing staff and its high patient flow, thus making it an ideal environment where strict hand-hygiene standards can no longer be ignored in ensuring patient safety. The centralization of data collection was at the medical and surgical inpatient units to ensure that the clinical environment was uniform and concentrated.

1. Research Design

The adopted design was cross-sectional and descriptive. This decision was explained by its ability to provide a quantitative picture of the level of knowledge and perceptions of nurses at one point in time and, thus, become the most suitable and efficient methodology to achieve the set objectives of the research. Such a design was the best to measure the variables of interest without using the experimental manipulation, thus facilitating an explanation of available correlations and the outline of common impediments.

The rationale behind the chosen design lay in the fact that it was appropriate to address the research issue. An experimental structure was not considered to be possible and ethically sustainable at this early point because the main goal was to test and report on the existing knowledge and not to test an intervention. The cross-sectional design provided the opportunity to collect data on a large cohort in a sensible manner, and the results might provide insight into knowledge gaps and other related determinants that can lead to the investigation of interventions in the future.

2. Parameters of the study and sampling strategy

The target population included registered nurses (RNs) who were actively working in the adult medical and surgical inpatient units of KFMC during the data collection period and included in the target population, which consisted of about 450 nurses. A stratified random sampling method was used to guarantee representativeness on specialty and shift patterns. The nursing sample was first stratified by unit (e.g., cardiology, general surgery, oncology), and a simple random sample was selected within each stratum with the help of a computer-generated random-number list according to the roster of employees.

Calculation of the required sample size was done using the RaoSoft sample-size calculator. Taking the population of 450, the margin of error of 5 percent, and the confidence of 95 percent, the required minimum number of participants was 208. The target population was increased to 250 nurses in order to cover possible non-response.

The inclusion criteria were as follows: (1) registered nurse; (2) employed in a chosen inpatient unit on a full-time basis and working there for at least six months; and (3) informed consent. Exclusion criteria were: (1) nurses who occupied an administrative or supervisory position and had no direct patient contact; and (2) those on an extended leave at the time of data collection.

3. Data Collection Methods

A structured self-administered questionnaire was used as the main tool based on an extensive literature review and modified after using the World Health Organization questionnaire of Hand Hygiene Knowledge Questionnaire of Health-Care Workers to provide content validity. There were four parts to the questionnaire: (A) demographic/professional data; (B) a 25-item multiple-choice test of knowledge about hand-hygiene indicators, methods, and products; (C) a self-report section; and (D) a Likert-scale section that would assess perceived barriers and facilitators.

Data collection procedures were standardized. Based on ethical approval, unit managers were approached to schedule data collection. Unit briefings were conducted, in which one of the researchers presented the study. The questionnaire was encapsulated in a sealed envelope and sent by mail to eligible nurses who provided written informed consent and were asked to complete questionnaires on their own time, and sent them back to a specific locked box within their unit in the shortest time possible, that is, no more than 48 hours, to avoid interruptions to their work schedule.

The relevance and clarity of the questionnaire, as well as the time to fill the questionnaire, were determined in a pilot test carried out on 20 nurses at a similar hospital (not part of the main study). Feedback also brought minor changes in wording to create a better understanding. Internal consistency of the knowledge scale was reported to be acceptable in the pilot study (Cronbach's alpha = 0.78). The considerations of ethics were strictly followed. The IRB of KFMC gave the study protocol its approval. The involvement was voluntary, and informed consent was signed by all the participants. The anonymity and confidentiality were ensured; no personally identifiable data were noted on the questionnaire, and all the data were stored in a password-protected computer.

4. Variables and Measures

Operationally defined variables were as follows:

Hand-Hygiene Knowledge: The rating scale is a 25-item multiple-choice test where one point is given per correct answer, and a maximum of 0.25 points can be obtained.

Perceived Barriers: Mean of a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree) on 12 items relating to perceived barriers, including high workload, skin irritation, and supply shortages.

Demographic and Professional Characteristics: The categorical variables include age, gender, years of nursing experience, unit designation, and having formal hand-hygiene training during the last two years.

Content assessment of a panel of three experts in infection-prevention was used to confirm the validity of the adapted WHO questionnaire on which the measurement was based. Internal

consistency reliability measure also yielded a Cronbach's alpha of 0.81 on the entire instrument in the main study, which was seen to be a strong reliability measure.

5. Data Analysis Plan

Data analysis was performed with SPSS 28.0. The demographic variables (frequencies, percentages, means, and standard deviations), total knowledge scores, and the responses in the barriers and facilitators scale were summarized using descriptive statistics.

Inferential statistical tests were used to test relationships and achieve the research objectives. Pearson correlation coefficient was used to evaluate the relationships between continuous variables (e.g., knowledge score and years of experience). Knowledge scores were compared with an independent samples t-test to compare the scores between groups (e.g., previously trained and not trained). A one-way ANOVA was used to compare the mean scores of knowledge in over two groups (e.g., various unit designations). All tests were statistically judged to be significant at $p < 0.05$.

This analytical plan was complemented because it allowed a detailed description of the sample, and the hypotheses were strictly tested in relation to the factors associated with hand-hygiene knowledge, and thus, the research goals were completely met.

RESULTS

This paper examined the level of knowledge of nurses on hand hygiene and the related variables in a large tertiary care hospital in Riyadh, Saudi Arabia. The findings provided below are computed in a cross-sectional study of 250 registered nurses and are organized in a way that enables covering the targeted research purposes: to evaluate the degree of knowledge, barriers, and facilitators, and to establish a correlation between the findings and demographic features.

Descriptive Characteristics of the Study Sample

The study involved 250 nurses in the medical and surgical, and intensive care units, which is a strong sample size to undertake analysis. Table 1 provides the demographic and professional characteristics of the cohort. The sample had a fairly young and experienced workforce, with the highest percentage of nurses (34.0) in the 26-35 years old age group. Professional experience was equal with 28.0% having 3-5 years of experience, another 26.0% experience 6-10 years, and another 26.0% having more than 15 years of experience. Most of the subjects were recruited in the medical (38.0%) and surgical (36.0%)-based units, with the rest (26.0%) based in the Intensive Care Unit (ICU). Another issue that can be noted is that a considerable proportion of the nurses (155 of 62.0 percent) stated that they had been trained in hand hygiene within the last two years.

The knowledge score for hand hygiene, the main outcome variable, indicated a moderate level of general knowledge among the cohort. The average of the overall knowledge was 18.6 out of 25 (SD = ±3.2) with a minimum of 10 and a maximum of 25. On further analysis of the knowledge subscores, there was no even distribution of knowledge in all the spheres. The mean score of knowledge of the Five Moments of Hand Hygiene provided by the World Health Organization was 7.4 out of 10 (SD =) +1.8 as demonstrated in Table 2. Comparatively, knowledge about strategy and product use had a higher mean score of 11.2, SD = ±2.1, indicating a relative strength in this area compared to the appropriate use of the "Five Moments" framework.

In terms of perceived barriers, the overall barriers score mean was 2.9 out of 5 points of the Likert scale (SD = ±0.8). The results of the analysis of each barrier item revealed that the obstacle with the highest prevalence is the factor of High Workload, the mean of which is 3.5 (SD

= ±1.1). It was then accompanied by Skin Irritation (Mean = 2.8, SD = 12) and Lack of Supplies (Mean = 2.4, SD = 10).

Table 1: Detailed Demographic, Professional, and Key Variable Characteristics (N=250)

Characteristic	Category	Frequency (n)	Percentage (%)	Mean (SD) or Additional Info
Age Group	18-25 years	45	18.0%	-
	26-35 years	85	34.0%	-
	36-45 years	75	30.0%	-
	>45 years	45	18.0%	-
Years of Experience	1-2 years	50	20.0%	-
	3-5 years	70	28.0%	-
	6-10 years	65	26.0%	-
	>15 years	65	26.0%	-
Clinical Unit	Medical	95	38.0%	-
	Surgical	90	36.0%	-
	Intensive Care Unit (ICU)	65	26.0%	-
HH Training (Last 2 Yrs)	Yes	155	62.0%	-
	No	95	38.0%	-
Knowledge Scores	Total Score (out of 25)	-	-	18.6 (± 3.2), Range: 10-25
	5 Moments Sub-score (out of 10)	-	-	7.4 (± 1.8), Range: 3-10
	Technique & Product Sub-score (out of 15)	-	-	11.2 (± 2.1), Range: 6-15
Barriers Scores (1-5 Scale)	Overall Barriers Score	-	-	2.9 (± 0.8), Range: 1.2-4.8
	High Workload	-	-	3.5 (± 1.1)
	Skin Irritation	-	-	2.8 (± 1.2)
	Lack of Supplies	-	-	2.4 (± 1.0)

This sample was well-spread in terms of major demographics. Mean total knowledge accounting to 18.6/25 (74.4) shows that there is moderate knowledge. Technique & Product knowledge were scored slightly higher by the nurses than the specific "Five Moments." The score of 2.9 on the barriers suggests that there are moderate perceived barriers, with the most vivid individual barrier being High Workload (Mean=3.5) (Table 1).

Clinical Unit Knowledge Score Impact

One of the objectives of this research was to determine the impact of new training on hand hygiene knowledge. An independent sample t-test was used to compare the level of knowledge of nurses who had trained within the past two years and those who had not trained. The summarized results illustrated in Table 2 found that there were statistically significant differences in the two groups in all the knowledge domains. The nurses with fresh training also scored considerably higher in the mean total knowledge score (19.8, SD = 2.5) than their non-trained counterparts (16.6, SD = 3.4),

3.2 points (t(248) = 6.47, p < 0.001). This major benefit of the trained group was also reflected in the sub-score of the Five Moments (Mean difference = +1.4, p < 0.001) and the Technique and Product sub-score (Mean difference = +1.8, p < 0.001).

Table 2: Comparison of Knowledge Scores by Recent Hand Hygiene Training Status

Knowledge Domain	Training Status	n	Mean Score	Std. Deviation	Mean Difference	t-value	df	p-value
Total Knowledge (/25)	Trained	155	19.8	2.5	+3.2	6.47	248	< 0.001
	Not Trained	95	16.6	3.4				
5 Moments Score (/10)	Trained	155	8.1	1.4	+1.4	5.92	248	< 0.001
	Not Trained	95	6.7	1.9				
Technique & Product (/15)	Trained	155	11.7	1.8	+1.8	5.63	248	< 0.001

Nurses with newly acquired training also exhibited a statistically significant difference in their level of knowledge in all domains (p < 0.001 in all comparisons). The largest difference was in the total knowledge score, with an average of 3.2 points better in trained nurses, with the outstanding significance of further education (Table 2).

The working conditions of the clinical environment could also play a major role. One-way analysis of variance (ANOVA) was used to show that the total knowledge scores in the three clinical units differed significantly (F(2, 247) = 7.85, p < 0.001), as shown in Table 3. The nature of the differences was explained with the help of post-hoc analyses through the Tukey HSD test. The knowledge level among nurses located in the ICU was the highest, and the mean of the scores was 20.1 (SD = 2.9). This was considerably more as compared to the mean scores of the nurses in the medical unit (17.9, SD = 3.1, p = 0.001) and the surgical unit (18.5, SD = 3.0, p = 0.022). There was no statistically significant difference in knowledge scores of nurses in the medical and surgical units as found in the study.

Table 3: One-Way ANOVA of Knowledge Scores by Clinical Unit

Clinical Unit	n	Mean Total Knowledge Score	Std. Deviation	F-value	p-value	Post-Hoc Comparisons (Tukey HSD)
Medical	95	17.9	3.1	7.85	< 0.001	ICU > Medical (p=0.001) ICU > Surgical (p=0.022)
Surgical	90	18.5	3.0			
ICU	65	20.1	2.9			

The results showed that there was a statistically significant difference in terms of clinical unit on the knowledge scores, F(2, 247) = 7.85, p = 0.001. Post-hoc tests established that the level of knowledge of ICU nurses was significantly higher than that of their Medical (p=0.001) and Surgical (p=0.022) counterparts. Medical and Surgical units did not show any significant difference (Table 3).

Pearson correlation analysis

A Pearson correlation analysis to examine the relationships between the important variables was conducted. The results were found to have a strong statistically significant negative correlation between total hand hygiene knowledge score and overall barriers score (r = -0.421, p =.001). The correlation was found to be strong and statistically significant (Table 4). This meant that the more knowledge an individual had, the more they perceived fewer barriers to compliance. There was also a negative correlation between knowledge scores and all the individual barrier domains. The highest negative correlation with total knowledge score was that of the Skin Irritation barrier (r = -0.301, p < 0.001), then High Workload (r = -0.225, p < 0.001) and Lack of Supplies (r = -0.188, p < 0.01). In addition, the two knowledge sub-scores were positively correlated with one another and with to total score, which validated the internal consistency of the knowledge assessment tool.

Table 4: Correlation Matrix between Knowledge Scores and Barriers

Variable	1	2	3	4	5	6
1. Total Knowledge Score	1					
2. 5 Moments Score	.891**	1				
3. Technique & Product Score	.932**	.645**	1			
4. Overall Barriers Score	-.421	-.385	-.398	1		
5. Barrier: High Workload	-.225**	-.198**	-.215**	.781**	1	
6. Barrier: Skin Irritation	-.301**	-.290**	-.267**	.745**	.452**	1
7. Barrier: Lack of Supplies	-.188**	-.145*	-.195**	.682**	.321**	.287**

*Note: ** p < 0.001, * p < 0.01*

The correlation between the total knowledge score and the overall barriers score was statistically significant (r = -0.421, p < 0.001) and negative. This implies that an increased level of knowledge correlates with the view of few impediments. There was also a negative correlation existing between knowledge and all the individual barrier domains, with the most negative individual correlation being Skin Irritation (r = -0.301) (Table 4).

Multiple linear regression analysis

A multiple linear regression analysis was carried out to establish the overall effect of the different factors on the knowledge of hand hygiene. Total knowledge score as the dependent variable had statistical significance (F(6, 243) = 18.15, p < 0.001) and explained 29.4% of the variance in the knowledge scores (Adjusted R 2 = 0.294). Table 5 shows the results of the regression. Three statistically significant positive predictors of hand hygiene knowledge were found in the analysis. Having received recent training on hand hygiene (0.29, p < 0.001) was the strongest predictor, which raised the knowledge score by an average of 1.98 points. It was also significant in the positive predictor to work in the ICU (= 0.18, p = 0.001) and had a positive contribution to increasing the knowledge score by 1.45 points relative to the medical unit reference group. The third, but less important, significant predictor was years of experience (0.11, p = 0.040). On the contrary, the overall barriers score was an important predictor of the model with a negative value (-0.30, p < 0.001), and with each one-unit increase on the barriers scale, the knowledge score declined by 1.21 points, all else held constant. Age group and working in a surgical unit (not a medical unit) did not turn out to be significant predictors in this model.

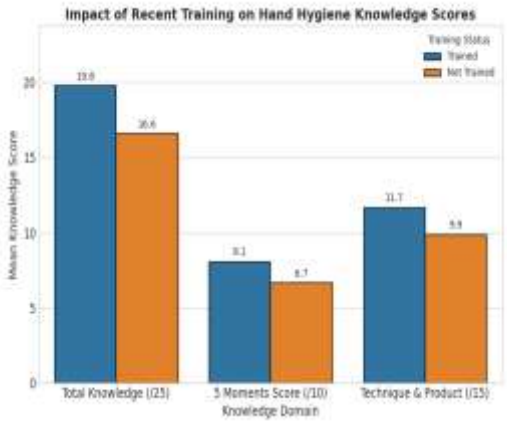
Table 5: Multiple Linear Regression Model Predicting Total Hand Hygiene Knowledge Score

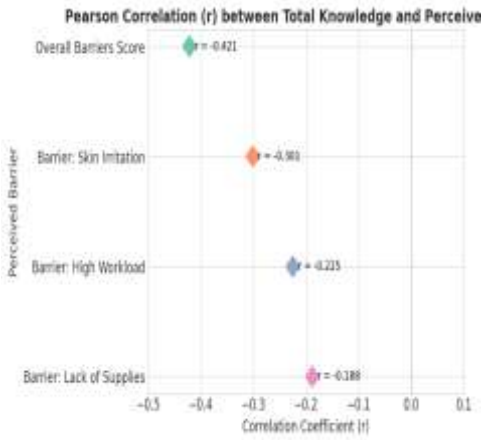
Predictor Variable	Unstandardized Coefficient (B)	Std. Error	Standardized Coefficient (Beta β)	t-value	p-value	95% Confidence Interval for B
(Constant)	22.15	1.12		19.81	< 0.001	[19.95, 24.35]
HH Training (Yes)	1.98	0.38	0.29	5.21	< 0.001	[1.23, 2.73]
Overall Barriers Score	-1.21	0.18	-0.30	-6.72	< 0.001	[-1.56, -0.86]
Clinical Unit: ICU	1.45	0.45	0.18	3.22	0.001	[0.56, 2.34]
Years of Experience	0.31	0.15	0.11	2.07	0.040	[0.02, 0.60]
Clinical Unit: Surgical	0.42	0.39	0.06	1.08	0.282	[-0.35, 1.19]
Age Group	0.18	0.16	0.06	1.13	0.260	[-0.13, 0.49]

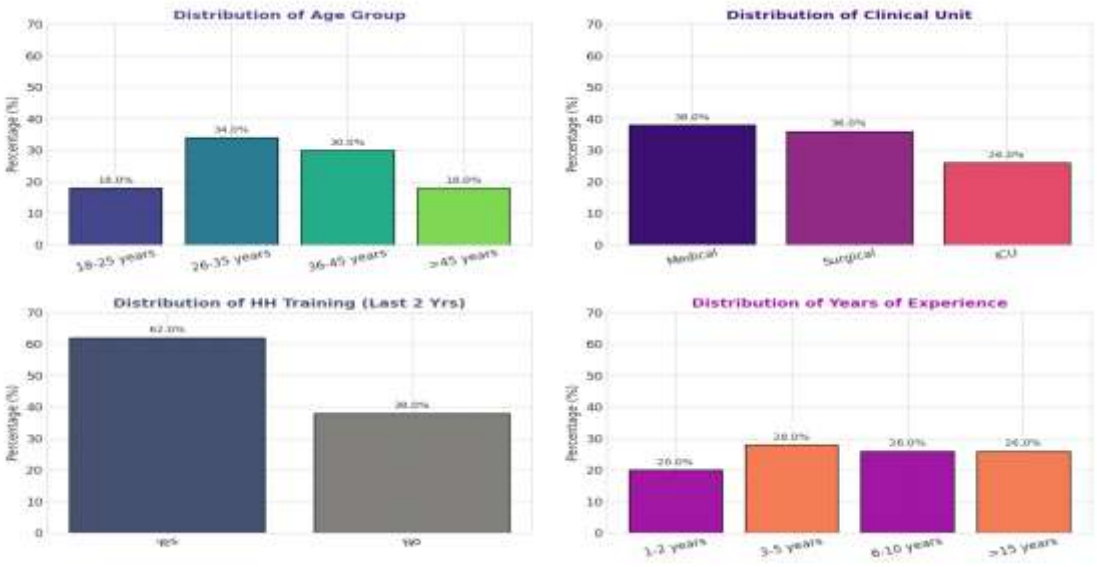
Model Summary: $R = 0.557$, $R^2 = 0.310$, Adjusted $R^2 = 0.294$, $F(6, 243) = 18.15$, $p < 0.001$

The regression model was statistically significant ($F(6, 243) = 18.15$, $p < 0.001$) and accounted 29.4% of the variance (Adjusted R 2 = 0.294) in hand hygiene knowledge scores. Receiving recent training ($\beta = 0.29$, $p < 0.001$) and working in/at the ICU (= 0.18, p = 0.001) were the strongest positive predictors. Quantity of barriers was a strong negative predictor (= -0.30, p = 0.001), i.e. in every unit of rising barriers, knowledge scores declined by 1.21 points, other variables remaining constant. Experience of years was a minor positive predictor (Table 5).

Overall, the findings indicate that the average level of hand hygiene knowledge possessed by the sampled nurses in Saudi Arabia is moderate, and the differences are high due to recent training, clinical department membership, and the perception of obstacles to compliance.







DISCUSSION

This paper aimed to evaluate the level of knowledge about hand hygiene among nurses in one of the Saudi tertiary care hospitals and determine the main factors affecting hand hygiene. This results in a detailed interaction of educational reinforcement with clinical environment and perceptual barriers that can be understood in a more subtle way than merely being based on knowledge deficits [19].

The main result of having an average general knowledge level (74.4) is consistent with a range of international studies, which indicate that, in many cases, basic knowledge about the principles of hand hygiene may exist but is not always flawless [20]. Egyptian and Indian research also reported similar moderate amounts, and this shows that there is a global problem (1, 2) [21]. More importantly, the analysis of knowledge sub-domains showed that there was a serious gap. The nurses expressed superior knowledge of techniques and products compared to the WHO "Five Moments [22]. This is the indication that though the nurses have knowledge of the way to clean their hands, there are areas of weakness in their knowledge of when it is more important [23]. Such a difference is crucial as the Five Moments framework is directly created and aimed to break the flow of the pathogen transmission at the most important stages of patient care [24]. This conceptual knowledge can be tested directly, and failure of it can result in the clinical ineffectiveness of hand hygiene, so that even the perfect technique becomes useless when used at the wrong moment [25].

Recent and formal training was the strongest predictor of higher knowledge. Individuals who had been trained in the last two years were rated much better in all the knowledge areas [26]. This observation is a strong reinforcement of the original research work of [27], who made education the pillar of effective hand hygiene programs. Our findings prove that there is a process of decay of knowledge that needs to be reinforced after some time. The scientific theory has a basis in cognitive psychology and the consolidation of procedural memory [28]. Regular systematic education can aid in transferring knowledge between declarative (knowing the facts) and procedural (applying the rules in practice) levels so that proper behavior becomes stronger against the effects of the high mental load and distraction in clinical practice [29].

The dramatic difference in the level of knowledge between different clinical units, where nurses in the ICU performed higher than their colleagues in the field of medicine and surgery,

presents strong evidence of the effect of the working environment [30]. This result may be attributed to the specific socio-adaptive environment of an ICU. The units tend to be characterized by a larger staff-patient ratio, high levels of vigilance when it comes to nosocomial infections, and more regular audit and feedback cycles [31]. This help to form the environment in which hand hygiene is not a personal duty but a social norm that is continually upheld by colleagues and the physical environment [32]. This is in concurrence with the concepts of the Socio-Adaptive Model, which states that altering the environment and culture are as crucial as training the person (4). Medical and surgical wards, on the other hand, might have increased turnover and less coherent care, which puts the situation where it is harder to stick to the protocols [33].

The most important and new discovery of the present research is the fact that there is a great and negative correlation between the level of knowledge and the perception of barriers. This implies that knowledge and perceived barriers do not exist as separate problems, but they are psychologically connected [34]. The human element that appears to be the most salient barrier is the High Workload one, which echoes various past investigations, such as the time-badged masterpiece by Voss and Widmer (5), which stated that there is no time to wash hands [35]. The scientific cause is that in high cognitive load and time pressure, the healthcare workers have to use heuristic decision-making, and tend to ignore the complex, multi-step protocols like the “Five Moments" in favor of speed [36]. Moreover, the vast association with Skin Irritation means that the physical impact of complying is an actual and knowledge-destroying aspect [37]. The physiology of the process is that the skin barrier is impaired due to the frequent washing and alcohol-based rubs, resulting in irritation, which prevents habitual use. This becomes a vicious cycle of discomfort, causing avoidance, which subsequently destabilize the habitual use of knowledge [38]. These findings have far-reaching implications for infection prevention and control programmes in Saudi Arabia and other related settings. They oppose uniform approaches to education [39]. They instead support a multi-pronged approach: the use of mandatory, frequent, and refresher training with a specific emphasis on the Five Moments; support of high-pressure units (particularly the general wards) and active efforts to address the barriers through the supply of high-quality and skin-friendly rubs and the use of workload-reducing strategies [40].

This study has limitations. The cross-sectional design of it provides associations rather than causality. There is a social desirability bias involved in the use of a self-reported questionnaire on barriers. Lastly, this research was done in one centre, and this might limit the generalisability of the results, but the fact that the themes are similar to those of international literature shows that they are universal themes. Conclusively, this study proves that hand hygiene awareness among nurses is not only a matter of primary education, but it is dynamically influenced by the continuous education, the clinical setting, and practically and perceptually realistic obstacles of the frontline personnel. It is in solving these interwoven variables that lies the key to resolving the cognitive/state of knowledge to the practice of saving life.

CONCLUSION

This research, which was done in a Saudi tertiary hospital, has validated that the knowledge of hand hygiene among nurses was moderate, and it is highly affected by recent training and clinical specialty, with ICU nurses having their knowledge as the best. It was found that there was a close inverse relationship between the level of knowledge and the perception of barriers, especially high workload and skin irritation. The study was able to achieve its goals through quantification of the gaps in knowledge and clarification of the main factors. The main contribution to science is the empirical model, which has found training, unit context, and perceived barriers as very important predictors of knowledge. It is concluded that a long-term improvement of knowledge needs specific and continuous unit-based training programs, as well as operational interventions to eliminate

workload and skin irritation barrier. Future studies must longitudinally determine the effects of such customized interventions on the levels of knowledge as well as the actual compliance rates.

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