



## RESEARCH ARTICLE

### IMPROVING KNOWLEDGE AND COMPLIANCE OF HAND HYGIENE: AN INTERVENTION TRIAL AMONG NURSES IN SOUTHERN REGION OF SAUDI ARABIA

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#### ABSTRACT

**Back ground:** Hand hygiene is an important component of infection control, which is critical to ensuring patients' safety in hospitals. Nurses are regarded as healthcare workers could also be vehicles of cross-contamination within the hospital. Thus study aimed to evaluate multimodal interventional health education program in improving knowledge and practicing toward correct hand hygiene manoeuvres at armed forces hospital southern region, in khamis Mushait, Saudi Arabia. **Method:** This was a before and after study of a hand hygiene interventional design (lectures, brochures ,video demonstration, group discussion etc ,data on Knowledge and practices was assessed by A 37-item hand hygiene Beliefs Scale designed to determine Nurses' hand hygiene beliefs on a 5-point Likert scale. The study was conducted at the beginning of (first of March –2017) and after (30 of May 2017), the intervention conducted by well-trained, infection-control and preventive medicine physician. The study included 118 subject, data on knowledge and practices collected before and after the intervention. **Result:** The improvement in knowledge and practices in the studied group by mean of 13.9 % and 7.2% respectively. **Conclusion:** knowledge and practices improved after health educational intervention program. **Recommendation:** generalization of this program on all hospital department and More researches to be done in the future to ensure the nurses sticking to universal precaution guideline

#### INTRODUCTION

Hand hygiene is the single most effective measure to prevent the transmission of healthcare-associated pathogens. Several studies have shown that ensuring sustained compliance with this very simple task is a constant challenge for healthcare workers (HCWs), even in settings without any resource constraints. The attitude and behaviour of different professional groups significantly affect hand hygiene compliance [Whitby *et al.*, 2006; Sax *et al.*, 2007; Whitby *et al.*, 2007]. Interventions to motivate behavioural changes are of critical importance in bringing about improvement. Appropriately, most successful hand hygiene promotional strategies in health care have been multimodal and focused primarily on activities that facilitate behavioural change [Jarvie *et al.*, 2008; Whitby *et al.*, 2008].

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A key factor is to ensure that HCWs have an adequate knowledge of the role their hands play in the spread of healthcare-associated infection (HCAI) during different patient care activities that can result in hand contamination. This awareness is necessary to help them understand their capacity to contribute to prevent (HCAI) through effective and sustained behavior change (self-efficacy). Knowledge influences behaviour directly and is essential for the individual to be able to evaluate the extent of the threat and to understand that a given behaviour can counteract or increase that threat. Conversely, lack of knowledge about the need for hand hygiene, the appropriateness and efficacy of agents used as well as a lack of awareness of the very low adherence rates to hand hygiene protocols among HCWs can contribute to poor hand hygiene compliance [Whitby *et al.*, 2006]. Lack of [Whitby *et al.*, 2006] knowledge of guidelines for hand hygiene, [Sax, 2007] recognition of hand-hygiene opportunities during patient care, and [Whitby *et al.*, 2007] awareness of the risk of cross-transmission of pathogens are barriers to good hand-hygiene practices.

Furthermore, certain HCWs believe they have washed their hands when necessary, even when observations indicate they have not. The most accurate form for observation of HCWs while delivering routine care using standardized WHO method: “Five moments for hand hygiene approach”. Knowledge, practicing and commitment to hand hygiene standards are very important domains in infection control program at any health care setting. However, the successful implementation of recommendations requires some strategies, including educational interventions. Based on these considerations, the World Health Organization (WHO) recommends that education be an integral part of any strategy aimed at implementing its recently published Guidelines on Hand Hygiene in Health Care [Pittet, 2009]. Other major Health organizations also recommend that education be used as a strategy for improving hand hygiene in health care [Mathai *et al.*, 2010; Boyce *et al.*, 2002]. No previous studies were done at armed force hospitals southern region [AFHSR] or in Aseer region about these domains.

**MATERIALS AND METHODS**

**Objectives:** To evaluate importance of separate interventional health education model in improving knowledge and practicing toward correct hand hygiene manoeuvres at AFHSR, five months trial starting January 2017[from Pre contemplation to contemplation(3:6 months) Trans theoretical Model], .

**Subjects and methodology:** The study Type was Interventional Pre-Post study, the intervention Model was Multi modal Health education trial, the study done at armed forces hospitals southern region [AFHSR] at KhamisMushait city Aseer Region (under the auspices of Medical service department of Ministry of Defence, Saudi Arabia) it was established 1964 AD covering all medical specialties revolutionized the health care services provided to Armed Force personnel and their relatives with capacity of 600 beds. The study population were the nursing staff in AFHSR with total number 3400 . The sample size was calculated By using G power software 1,03 for determination the sample size with effect size 0.3 from similar previous study, with power 95% and alpha error 0.05 total sample was 122 . Nurses are asked to participate and response rate calculated, extra sample of 10 taken to avoid dropped out when re-evaluated.[9] The sample was drawn by cluster sample technique. Simple random was drawn in each department level till reach required sample, the total departments included in the study were 10 . Same sample were required to participate at post evaluation assessment, total available sample filled pre & post questionnaire. After finishing data collection total responders in pre and post test were 118(male 13 and female 105 ).

Base line knowledge and compliance toward hand hygiene were assessed .Knowledge was assessed by A 37-item HH Beliefs Scale (HBS) designed to determine Nurses’ HH beliefs on a 5-point Likert scale. The scale was developed using Social Cognitive Theory (SCT) (Bandura 1986)[10]as a framework and contained four items modified from Karaffa (1989)[11] and one developed by Larson *et al* (1997) details in the questioner [12]. Data about compliance collected by direct observation (anonymously and confidentially) of nurses while delivering routine care (in direct contact with patients) using a standardized WHO method for direct observation: “Five moments for hand hygiene approach” [Larson *et al.*, 1997]. questionnaire regarding knowledge and practice to hand

hygiene with Cronbach Alfa factor from 0.7-0.8 [Sax *et al.*, 2009]. To overcome the Hawthorne effect (the observer effect where behaviours are not always normal when being observed) and ensure the process improvements were accurate, observations were discrete and anonymous. Observation done by the infection control team to fill the checklist. Observers training involved a three-day workshop comprising a daily two-hour hands-on session that included how to monitor HH adherence according to the World Health Organization’s (WHO) “indication moments” for hand hygiene .The training made by consultants from infection control unite and Preventive department.

The study group exposed to multimodal health education cession intervention by different modalities in 3 hours duration [Three lectures given to each group, Posters distributed in the hospital, leaflets given to all participant, roll play distributed in the hospital, movies demonstrated to each group, group discussion ] .all participant divided to 7 groups ,then each group given sessions 3 hours in a period of one month .Also these material designed and given by consultants from infection control unites and preventive medicine department and researcher. All sample re-evaluated three months after the end of the health education model and improvement in knowledge and compliance toward hand hygiene assessed [from Pre contemplation to contemplation[3:6 months] Trans theoretical Model], there are a significant change of the knowledge and compliance level and a detailed program recommended to the administration to be generalized to all armed force hospitals department.

**Statistical analysis:** The data Checked for completeness and accuracy then handled data were stored in my personal computer. Edited, entered and coded on SPSS for IBM version 22. The description of data is done as Mean ± SD for quantitative variables and number& percentage for qualitative one. Based on the result of Shapiro-wilk test and histogram the data are not normally distributed. Non parametric tests used mann-whitney U test used to compare the differences in median between groups, Wilcoxon sign rank test used to compare pre and post differences in the same group.

**RESULTS**

Table 1: This table shows socio demographic data for studied group that involve 118 nurse from 10 departments, their age ranging 23-52 years and median of 35y, experience also from 0.5 – 23years median of 6 ,most of them female gender(89%) and non-Saudi (97.5%) .

**Table 1. Socio demographic character of studied group**

|             |              | No          | %        |
|-------------|--------------|-------------|----------|
| Gender      | male         | 13          | 11       |
|             | female       | 105         | 89       |
| Nationality | Saudi        | 3           | 2.5      |
|             | Non Saudi    | 115         | 97.5     |
| Age         | Mean± SD     | 32.28±6.146 | 23-52    |
|             | [ Min – max] |             |          |
| Experience  | Mean± SD     | 6.59 ±4.07  | 0.5 - 23 |
|             | [ Min – max] |             |          |

SD: Standard deviation & Min-Max : minimum maximum

Table 2: Represents the level of knowledge before and after intervention program toward hand hygiene and practice before and after intervention program toward hand hygiene.

**Table 2. Comparison between pre and post (practice& knowledge)**

|           | Pre<br>(mean ± SD) | Median<br>[min-max] | Post<br>(mean ± SD) | Median<br>[min-max] | Z     | P          |
|-----------|--------------------|---------------------|---------------------|---------------------|-------|------------|
| knowledge | 12.245±2.69        | 12 [4-19]           | 13.288±1.92         | 13 [10-19]          | -2.94 | 0.003**    |
| practice  | 13.966±0.72        | 14 [12-16]          | 14.983±0.39         | 15 [14-16]          | -9.25 | *** <0.001 |

Wilcoxon Signed rank test  
P significant if ≤0.05

There is highly significant difference as regard the difference in knowledge and practice level. Table 3 - The demonstrates percentage of improvement in knowledge in the studied group ranging from -3.25 – 275 with mean and median of 13.96 and 7.69 respectively calculated by  $[(\text{post} - \text{pre}) * 100 / \text{pre}]$ . “INSERT TABLE 3 HERE”

**Table 3. Percentage improvement in knowledge level among participant**

| Percentage of knowledge improvement |        |
|-------------------------------------|--------|
| Mean                                | 13.96  |
| Median                              | 7.69   |
| Std. Deviation                      | 38.56  |
| Minimum                             | -3.25- |
| Maximum                             | 275.00 |

**Table 4. This table shows improvement in practice among participant**

| Percentage of practice improvement |       |
|------------------------------------|-------|
| Mean                               | 7.29  |
| Median                             | 7.14  |
| Std. Deviation                     | 1.09  |
| Minimum                            | 7.14  |
| Maximum                            | 16.67 |

Table 4 - Shows improvement in practice ranging from 7.14:16.67 and mean percentage of 7.2±1.09 and a median of 7.14 calculated by  $[(\text{post} - \text{pre}) * 100 / \text{pre}]$ . “INSERT TABLE 4 HERE”.

**Table 5. Comparison between knowledge pre and post & practice pre and post in males and females**

|         |           | pre        | Median<br>[min-max] | post       | Median<br>[min-max] | Z     | p         |
|---------|-----------|------------|---------------------|------------|---------------------|-------|-----------|
| males   | practice  | 13.84±.55  | 14[13-15]           | 15±0.4     | 15[14-16]           | -3.4  | 0.001**   |
|         | knowledge | 12.69±1.97 | 12[10-16]           | 12.61±1.66 | 13[11-16]           | -0.05 | 0.96      |
| females | practice  | 13.98±0.74 | 14[12-16]           | 14.96±0.39 | 15[14-16]           | -8.61 | <0.001*** |
|         | knowledge | 12.3±2.77  | 12[4-19]            | 13.37±1.94 | 13[10-19]           | -3.07 | 0.002**   |

Wilcoxon Signed rank test  
P significant if ≤0.05

Table 5 - Comparison between knowledge pre and post & practice pre and post in males and females, shows significant improvement in male& female practice ,Significant improvement in female knowledge, there is no significant change in male knowledge . “INSERT TABLE 5 HERE”

**DISCUSSION**

The significant improvement of practice and knowledge level in this study may be explained by well-designed educational program and good commitment between participants, This with agreement with vector EM et al. who detected Significant improvement in hand hygiene practice among the health care worker following the hand hygiene awareness program ( p < 0.001) (Victor *et al.*, 2015).

Table 2 showed the knowledge Improvement level had mean of 13%and range from 3-275 this may because of well-structured educational program composed of lecture, brochures, booklet, rollup, video demonstration, This study result matched with Payudel et al.[2008] who mentioned that there is significant improvement in attitude and knowledge of HCP after health education program. Table 3 Discussed improvement in practice in the studded group by 7.2% and range from 7-16and this may because they are active, competent, they participate in the intervention program, willing to learn, this result in agreement with Chen JK et al study mentioned that there is Significant improvement in hand hygiene commitment was observed among the professionals health care after receiving the hand hygiene awareness program [Chen *et al.*, 2016]. Findings from some previous studies said hand hygiene compliance improves following the health education interventions [Doron *et al.*, 2011; Allegranzi *et al.*, 2010] Also this study in agreement with study done among HCWs in Sweden ,Baltic countries and in Russia that reported an increase in compliance with hand hygiene after the intervention [Lytsy *et al.*, 2016]. Table 5, this table discussed the comparison between knowledge & practice in pre and post in male and pre and post in female shows significant improvement in male& female practice ,Significant improvement in female knowledge, there is no significant change in male knowledge . The practice improved in both male and female, knowledge improved in female only may be due to small number of male, female more eager to learn, also female more committed to educational session.

**Conclusion**

Application of well-designed health education program for hand hygiene manoeuvres at medical setting (AFHSR) leading to improvement of knowledge and practice

**Limitations**

- Difficult to collect the participant for intervention
- Administration legislations: delay in nursing administration approval
- Self funded study not allowing generalization of study to all departments

**Declarations:** Ethics approval and consent to participate: The Researcher fulfilled all the required official approvals as ethical committee approval. Ethical approval for the study was

obtained from the research ethical committee of Armed Forces Hospitals Southern Region, with the Kingdom of Saudi Arabia registration number H-06-KM-001 code #095. Before interviewing, Informed Consent asked from all participants then ,all participants had the right not to participate in the study or to withdraw from the study prior to completion of this study. The researcher explained the purpose of this study to all respondents. Confidentiality and privacy guaranteed for all participant.

**Availability of data and materials:** Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

**Competing interests:** The authors have declared that they have no competing interests.

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#### Authors' contributions

- **K. H :** Main author- Data collection – Data coding-paper writing
- **R.A :** Co-Supervisor
- **S.R.A:** Data entry
- **S. A.M :** Data collection
- **S.A.S :** Data analysis and interpretation
- **A. Y. A.:** Supervisor & Paper writing
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#### REFERENCES

- Allegranzi B, Sax H, Bengaly L, Riebet H, Minta DK, Chraiti MN, Sokona FM, Gayet-Ageron A, Bonnabry P, Pittet D. Successful implementation of the World Health Organization hand hygiene improvement strategy in a referral hospital in Mali, Africa. *Infection Control & Hospital Epidemiology*. 2010 Feb;31(2):133-41.
- Bandura A. Health promotion from the perspective of social cognitive theory. *Psychology and health*. 1998 Jul 1;13(4):623-49.
- Biran A, Schmidt WP, Varadharajan KS, Rajaraman D, Kumar R, Greenland K, Gopalan B, Aunger R, Curtis V. Effect of a behaviour-change intervention on hand washing with soap in India (SuperAmma): a cluster-randomised trial. *The Lancet Global Health*. 2014 Mar 1;2(3):e145-54.
- Boyce JM, Pittet D. Guideline for hand hygiene in health-care settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *Infection Control & Hospital Epidemiology*. 2002 Dec;23(S12):S3-40.
- Chen JK, Wu KS, Lee SS, Lin HS, Tsai HC, Li CH, Chao HL, Chou HC, Chen YJ, Huang YH, Ke CM. Impact of implementation of the World Health Organization multimodal hand hygiene improvement strategy in a teaching hospital in Taiwan. *American journal of infection control*. 2016 Feb 1;44(2):222-7.
- Doron SI, Kifuji K, Hynes BT, Dunlop D, Lemon T, Hansjosten K, Cheng T, Curley B, Snyderman DR, Fairchild DG. A multifaceted approach to education, observation, and feedback in a successful hand hygiene campaign. *The Joint Commission Journal on Quality and Patient Safety*. 2011 Jan 1;37(1):3-AP3.
- Jarvie LJ, Martin R, Johnson PD, Jodoin ME, McMullan C, Gregory RH, Bellis K, Cunningham K, Wilson FL, Quin D, Kelly AM. Significant reductions in methicillin-resistant *Staphylococcus aureus* bacteraemia and clinical isolates associated with a multisite, hand hygiene culture-change program and subsequent successful statewide roll-out. *Medical journal of Australia*. 2008 Jun 2;188(11):633.
- Karaffa MJ. Hand washing practices of university students: Development of an instrument to test the health belief model. Diss. Southern Illinois University at Carbondale, 1989. 2802.
- Larson EL, Bryan JL, Adler LM, Blane C. A multifaceted approach to changing hand washing behavior. *American journal of infection control*. 1997 Feb 1;25(1):3-10.
- Lytsy B, Melbarde-Kelmere A, Hambræus A, Liubimova A, Aspevall O. A joint, multilateral approach to improve compliance with hand hygiene in 4 countries within the Baltic region using the World Health Organization's SAVE LIVES: Clean Your Hands model. *American journal of infection control*. 2016 Nov 1;44(11):1208-13.
- Mathai E, Allegranzi B, Seto WH, Chraiti MN, Sax H, Larson E, Pittet D. Educating healthcare workers to optimal hand hygiene practices: addressing the need. *Infection*. 2010 Oct 1;38(5):349-56.
- Paudyal P, Simkhada P, Bruce J. Infection control knowledge, attitude, and practice among Nepalese health care workers. *American journal of infection control*. 2008 Oct 1;36(8):595-7.
- Pittet D, Allegranzi B, Boyce J, World Health Organization World Alliance for Patient Safety First Global Patient Safety Challenge Core Group of Experts. The World Health Organization guidelines on hand hygiene in health care and their consensus recommendations. *Infection Control & Hospital Epidemiology*. 2009 Jul;30(7):611-22.
- Sax H, Allegranzi B, Chraiti MN, Boyce J, Larson E, Pittet D. The World Health Organization hand hygiene observation method. *American journal of infection control*. 2009 Dec 1;37(10):827-34.
- Sax H, Uçkay I, Richet H, Allegranzi B, Pittet D. Determinants of good adherence to hand hygiene among healthcare workers who have extensive exposure to hand hygiene campaigns. *Infection Control & Hospital Epidemiology*. 2007 Nov;28(11):1267-74.
- van de Mortel TF. Development of a questionnaire to assess health care students' hand hygiene knowledge, beliefs and practices. *Australian Journal of Advanced Nursing*. 2009;26(3):9.
- Victor EM, Vasanth EM, Thankappan M, Raghavan S, Dadhich A, Joshi P, Lodha R, Arya S, Kapil A. The impact of hand hygiene awareness programme on health care professionals' compliance with hand hygiene in a tertiary care hospital: A clinical audit. *Journal of Patient Safety & Infection Control*. 2015 Jan 1;3(1):17-20.
- Whitby M, McLaws ML, Ross MW. Why healthcare workers don't wash their hands: a behavioral explanation. *Infection Control & Hospital Epidemiology*. 2006 May;27(5):484-92.
- Whitby M, McLaws ML, Slater K, Tong E, Johnson B. Three successful interventions in health care workers that improve compliance with hand hygiene: is sustained replication possible?. *American journal of infection control*. 2008 Jun 1;36(5):349-55.
- Whitby M, Pessoa-Silva CL, McLaws ML, Allegranzi B, Sax H, Larson E, Seto WH, Donaldson L, Pittet D. Behavioural considerations for hand hygiene practices: the basic building blocks. *Journal of Hospital Infection*. 2007 Jan 1;65(1):1-8.