Yemeni Nurses' Knowledge and Practices of Nosocomial Infection Control Measures at Baseline: An Intervention Study

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Abstract

Background: Nurses play an important role in reducing nosocomial infection. Assessing their knowledge and practices in infection prevention and control measures is the starting point in planning and developing an effective educational need-based intervention.Aim: To assess nurses' knowledge and practices of infection prevention and control measures at baseline. Methods:This was part of an intervention study conducted from May 1th to 31 October 2016 in Aza'al Region, Yemen. It was carried out prior to the educational intervention of infection prevention and control among Yemeni nurses.Results: A total of 540 nurses were recruited. Baseline results showed that most participants (94.6

Index terms— nurses, knowledge, practices, nosocomial infections, yemen

1 Introduction

osocomial infections (NIs) are one of the most common problems faced by healthcare institutions worldwide (Sarani, Balouchi, Masinaeinezhad, & Ebrahimitabs, 2016). Although NIs have a significant impact on both developed and developing countries, its impact in the developing countries constitutes a major challenge due to the lack of resources, training chances and knowledge in such context (Amin & Al Wehedy, 2009;Askarian, Memish, & Khan, 2007). The World Health Organization (WHO) and other related studies defined NIs as an infection acquired by Patients after 48 hours of their admission to a given hospital or any other health care facility. This infection neither exists nor it is incubated at the admission time. It also includes infection acquired by health care workers at the health facilities and those acquired in hospitals and appears after patient discharge ?? According to the WHO, at least seven patients from developed countries to ten from developing countries out of each 100 patients admitted to hospitals gain at least one kind of NIs at any given time ??WHO, 2014). However, such infections can be avoided or reduced by applying basic infection control measures when providing daily nursing care to patients (Endalafer, Gebre-Selassie, & Kotiso, 2011; Shinde & Mohite, 2014). Although it is the responsibility of all health care workers (HCWs) to apply NIs control measures, nurses who represent the majority and the first-line health care providers are most responsible for this because of their long time contact with patients (Sarani et al., 2016). Furthermore, many previous studies reported the key role that nurses play in transmitting NIs among hospitalized patients while providing nursing care. Therefore, updating knowledge and enhancing practices in infection control measures is a crucial need for nurses (Feng et al., 2013).

Nursing education and an in-service training play an important role in improving nurses' knowledge and practices in infection prevention and control measures. Therefore, it is important to, ensure nurses' compliance with these infection control measures, which subsequently leads to reducing the NIs rate (Fashafsheh, Ayed, Eqtait, & Harazneh, 2015;Yeung, 2007). However, evaluating the existing level of knowledge and practices represents a prerequisite for planning and developing any new educational program in nursing education. This is because such evaluation provides a useful database to guide the development and implementation of future educational programs on infection prevention and control with the aim of reducing NIs (Dramowski, Whitelaw, & Cotton, 2016).

Although many efforts have been undertaken to assess the level of knowledge and practices among nurses in different countries (Abdulraheem, Amodu, Saka, Bolarinwa, & Uthman, 2012; Alwutaib, Abdulghafour, Alfadhli, Makboul, & El-Shazly, 2012; Shamaa & Talaat, 2010), to the researcher's best of knowledge, so far, no practical attempts in the Yemeni context have been reported. Therefore, this study aimed to evaluate the level of knowledge and practices of infection control measures among Yemeni nurses. It also attempted to identify the factors associated with such knowledge and practices in order to provide guidance for future NIs education interventions among Yemeni nurses.

Providing information on the level of nurses' knowledge and practice at baseline will enable planning and developing a need-based intervention to improve nurses' knowledge and practices in NIs control measures, which in turn, will improve patients' safety and the quality of care provided to them.

2 II.

3 Methods

4 a) Study Design

This study was part of a single blinded community randomized trial study which was conducted for the purpose of evaluating the effectiveness of a developed module in improving Yemeni nurses' knowledge and practices in a nosocomial infection control.

5 b) Study Setting

The study was conducted in eight public hospitals in the Aza'al Region which is located in the north of Yemen. The study covered a period from May 1th to May 31th 2016.

6 c) Study Population

Probability proportionate to the size sampling technique was used to select the required nurses from each hospital. All nurses who were working in the public hospitals in the Aza'al Region were invited to participate in this study. A two-sample group proportion formula was used to estimate the sample size for this study. The design effect for cluster randomized trial was also taken into consideration during sample size calculation.

7 d) Research Instrument

A 45-item self-administered questionnaire was used to assess the nurses' knowledge and practices in infection prevention and control at baseline. The questionnaire was developed by the researcher based on the WHO infection control guidelines (Ducel et al., 2002). It comprises three sections: (1) participants' demographic information (age, gender, level of education, current position and duration of working and course training), (2) Nurses' knowledge which consists of 30 items covering hand hygiene (5 items), personal protective equipment (5 items), and safe injection practices (4 items), routine hospital cleaning (4 items), safe waste handling and disposal (4 items), reprocessing of patient care equipment (4 items) and safe linen handling (4 items) as well as (3) nurses' practices which consist of 15 items covering precautions to prevent NIs (9 items) and actual actions to prevent NIs (6 items). The questionnaire was pretested before use at another public hospital among nurses with similar characteristics but those nurses were not involved in the study reported in this paper.

The items of the questionnaire which are closed-ended items with "Correct", "Incorrect" and "I don't know" options were used to assess nurses' knowledge, whilst those scenario-based items with "Yes", and "No" and " I don't know" options were used to assess their practices. A 0 score was given for each "incorrect" or "I don't know" response and 1 score was given for each correct response after correction of the reverse statement. Correct answers were calculated to obtain total scores for each section. Based on this calculation, knowledge obtained maximum and minimum scores from 1 to 30, while practices scored between 1 and 15. Bloom's cut off point was also used to determine the knowledge and practice levels. A score of less than 59 % was considered poor and 60 % and above was considered as good (Bloom, 1956).

8 e) Validity and Reliability

Three experts in infection prevention and control at academic institutions and hospitals were requested to verify the content validity. The experts' comments regarding the instrument layout, format, relevance, accuracy, consistency and scoring system were taken by the researchers into consideration. Based on the results obtained from the pre-test of the questionnaire as previously mentioned, the reliability using alpha Cronbach (?) test was=0.81 for knowledge section and =0.79 for practice section, which is acceptable.

9 f) Data Collection

This study lasted from May 1th to October 30th 2016. The baseline data were collected at the first month prior to conducting the intervention. A 45-item selfadministered questionnaire was used for the purpose of this study. One of the researchers and the coordinators in each hospital distributed the questionnaires to the participants to

collect the data. A total of 540 questionnaires were distributed at the baseline phase among nurses working in eight public hospitals in the Aza'al Region in Yemen. However, a total of 540 questionnaires were returned back with a response rate of 100%.

10 g) Data Analysis

The responses were recorded and analysed using the statistical software (IBMSPSS), version 22.0. Descriptive statistics was used (per cent and number). Statistical significance was reported at a P value of less than 0.05 level with 95% confidence interval. Logistic regression was conducted to determine the association between the outcomes and the selected variables.

11 h) Ethics

The ethical approval for this study was obtained from the Ethics Committee for Research involving Human Subjects of University Putra Malaysia (JKEUPM) and the Ministry of Public Health and Population in Yemen. Permission was also obtained from the Ethics Committee of all involved public hospitals. A written consent from all participated nurses was obtained prior to conducting the study.

12 III.

13 Result a) Response Rate

A total number of 540 questionnaires were distributed and completed at the baseline assessment (T1), with a response rate of 100%. However, 510 questionnaires were received from the immediate post-intervention (T2) with return rate of 94%. For the followup survey (T3), the response rate dropped to 493 participants. Therefore, the return rate was 91% at Time 3.

14 b) Participants' Demographic Details

The results of the study showed that the participants' age ranged from 22 to 55 years, with a mean age of 28.2. There were 280 (51.9%) males and 260 (48.1%) females. The majority of the nurses (74.8%) had no in-service training courses regarding infection control measures. More than half of them (52.2%) had attended training courses one year and less before participating in the current study. For the experience, while 74.8% of the participating nurses had working experience with patient having NIs, 58.9% of them had working experience as a nurse for five years or more. The participants' demographic information is presented in Table 1.

15 c) Level of nurses' knowledge of different NIs control measures at baseline

Regarding the level of nurses' knowledge on prevention of person-to-person infection transmission, the study results showed that the majority of the nurses had a poor level of knowledge on hand hygiene, personal protective equipment, and safe injection practices (67.2%, 77.2% and 88.5%, respectively). The level of nurses' knowledge on prevention of infection transmission from hospital environment was relatively good in reprocessing patient care equipment (66.9%) and safe linen handling practices (55.7%). However, the level was poor especially in routine hospital cleaning (72.4%) and safe hospital waste handling and disposal (90.9%). The overall levels of nurses' knowledge on the different NIs control measures at baseline were (94.6%) poor and (5.4%) good. The detailed results are presented in Table 2.

16 d) Level of nurses' practices of different NIs control measures at baseline

Concerning the level of nurses' practices on the different NIs control measures, the current study revealed that the majority (94.6%) of the participating nurses had a poor level of practices on precautions applied to prevent NIs, whereas above half (59.3%) of them had a poor level of practices on actual actions used to prevent NIs. In general, the overall level of different NIs practices, above half (53.9%) was poor and (46.1%) of them had a good level of practices on different NIs practices (Table 3).

17 e) Association between previous in-service training and working experience with the level of nurses' knowledge

The results of this study demonstrated that there was a significant association between the degree of previous in-service training and the level of nurses' knowledge of NIs control measures (P=0.004). However, there was no significant association between previous working experience and the level of nurses' knowledge of NIs control measures (P=0.68). The detailed results are presented in Table 4.

18 f) Association between previous in-service training and working experience with the level of nurses' practices

Regarding the association between previous inservice training and working experience with the level of nurses' practices, the results of this study revealed that there was no significant association between previous in-service training and the level of nurses' practices of NIs control measures (P=0.27). Furthermore, the results indicated that there was no association between the nurses' practices and their previous working experience in the NIs control measures (P=0.92). The overall results of the association between the variables are presented in Table 5.

19 Discussion

Nosocomial infection is one of the most common problems and difficulties faced by health institutions in developing and developed countries as well. Protecting patients from acquiring NIs is one of the main professional responsibilities for nurses. Therefore, updating nurses' knowledge and practices in infection control measures would play an important role in reducing such infections among both HCWs and hospitalized patients. For this purpose, the present study was conducted.

Our study revealed that the participating nurses' age ranged from 22 to 55 years with a mean age of 28.2. This result is relatively higher than the mean age of 23.9±3.7 reported by Ahmed, Khamis, and Younis (2012). However, it was slightly less than what was reported in a previous study by Ghezeljeh, Abbasnejad, Rafii, and Haghani (2015) which was (32.55±6.23 years), respectively. Furthermore, the results showed that the proportion of males (51.9%) to females (48.1%) were nearly equal. This result contradicts the findings reported by Nour-Eldein and Mohamed (2016) who found that the number of males (17.1%) was lower than that of females (82.9%). Over 74.8% of the participants had working experience with patient having NIs and about (52.2%) of them had attended training course about infection control before one year or less. This result is consistent with the result by Wu, Gardner, and Chang (2009) who found that about 70% had no working experience in caring for patients infected with NIs. This result could be an indicator for high prevalence of NIs and the urgent need for engaging nurses in training courses in infection control measures. Also, the result revealed that above half of the nurses (58.9%) were five-year employees in the hospitals. Such result seems combatable with the result by Maheswari and Muthamilselvi (2014) who found that most of the participants had previous working experience in NIs. The contrast in results might be due to the differences in the policy of in-service training, study settings and the targeted groups of nurses in these studies.

According to our results, nurses' knowledge on prevention of person-to-person infection transmission involves hand hygiene, personal protective equipment, and safe injection practices.

In this regard, our study revealed that the majority of the nurses had a poor level of knowledge about these various infection control measures (67.2%, 77.2% and 88.5%, respectively). While the level of nurses' knowledge on prevention of infection transmission from hospital environment was relatively good in reprocessing of patient care equipment (66.9%) and safe linen handling practices (55.7%), it was poor in routine hospital cleaning (72.4%) and safe hospital waste handling and disposal (90.9%). The overall level of nurses' knowledge on the different NIs control measures at baseline was poor for (94.6%) and good for (5.4%) of the participants. Such finding was lower than what was found by Abdulraheem et al. (2012) and Isara and Ofili (2010) in Nigeria and by Shamaa and Talaat (2010) in Egypt. The level of knowledge in these studies was (12.9%, 37.7% &10%), respectively. The inconsistency in the findings in these studies might be due to the inadequate training and education provided to nurses during their study or during their work in the hospitals. In relation to this issue, Eskander, Morsy, and Elfeky (2013) stated that nurses who received in-service education achieved a high knowledge scores. The result of this study indicates the urgent need to implement an in-service training course in order to improve nurses' knowledge on infection prevention and control.

Regarding the level of nurses' practices on infection control measures, the current study revealed that the majority (94.6%) of the nurses had a poor level of practices concerning precautions to prevent NIs, whereas above half of them had a poor level of practices on actual actions used to prevent NIs. In general, the overall level of practices among Yemeni nurses was poor for 53.9% and good for 46.1% of the participants in the different NIs control measures. This result was much lower than what was found by Fashafsheh et al. (2015) and Eskander et al. (2013) which indicated that the level of good practice was more than (91.14% &75%), respectively. However, the finding was relatively close to what was found in other studies (Johnson, Asuzu, & Adebiyi, 2013;Taneja et al., 2008;Teshager, Engeda, & Worku, 2015) which reported that the good level of knowledge was 48.7%, 55.3% and 57.5%, respectively. Such contradictory findings could be due to the differences in the participating nurses' knowledge about infection prevention and control. It might be also due to the nurses' attitudes towards using infection prevention and control methods in these studies. Furthermore, although almost half (46.1%) of the Yemeni nurses had a good level of practices of infection prevention and control, only 5.4% of them had a good level of knowledge regarding infection prevention and control. This particular result demonstrates the existing gap between theory and practice, which indicates the necessity for linking between theoretical and practical aspects in nursing curriculum addressing infection prevention and control. Moreover, the result could be a further indication of the need for implementing an education program to improve the Yemeni nurses' knowledge and their practices of infection prevention and control.

The second aim of the current study was to determine the factors associated with the Yemeni nurses' knowledge

and practices in NIs control measures. In this regard, the result revealed that there was a significant association between the degree of previous in-service training and the level of nurses' knowledge of NIs control measures (P=0.004). However, there was no significant association between previous working experience and the level of nurses' knowledge about NIs control measures (P=0.68). This result is in line with the result of a study by Gizaw, Alemu, and Kibret (2015) in relation to the previous inservice training, but it is in disagreement with the same study regarding the association between previous working experience and the level of nurses' knowledge of NIs control measures. Moreover, the result of this study was incompatible with what was reported by Fashafsheh et al. (2015) and Ally Tatu (2012)as those researchers found no statistically significant association between knowledge about infection control and previous training courses of the participants. The discrepancy could be due to the differences in the methods and settings of the studies as well as the type of sampled health facilities.

Concerning the association between previous in-service training, working experience and the level of nurses' practices, the results of this study revealed that there was no significant association between the level of nurses' practices of NIs control measures and such variables (P=0.27 & P=0.92), respectively. This is inconsistent with the result by Gizaw et al. (2015) who found that HCWs with previous experience and infection related training were significantly associated with good practices. However, it is consistent with the findings by Fashafsheh et al. (2015) and (Ally Tatu (2012)) who reported that no statistically significant association was found between the level of nurses' practice and the previous in-service training of infection control measures. Such contrast in the findings might be attributed to the different policies of in-service training, study settings and targeted groups.

Based on the study findings, it could be concluded that the majority of the Yemeni nurses had a poor level of knowledge but almost half of them had a good level of practices about NIs prevention and control. Therefore, it is necessary to implement an inservice training course in infection prevention and control among Yemeni nurses in order to improve their knowledge and practices of infection prevention and control. Health institutes are recommended to consider the link between theoretical and practical aspects in planning and developing the curriculum and programs in healthcare education in general and, particularly in nursing education.

V.

20 Limitations

The current study has several limitations, which should be considered in future research. The study was exclusive to public hospitals, and it focused only on nurses. Therefore, the findings might not provide adequate representation of all hospitals and health care providers. Furthermore, this study was exclusive to nurses in one region in the north of the Republic of Yemen. So, the findings of the present study can be only generalized to populations which share the same characteristics

Figure 1:

1

Demographic details	Total n (%)
Age (in years)	
<25	117 (21.7)
25+	423 (78.3)
Gender	
Male	280 (51.9)
Female	260 (48.1)
In-service training courses	
Yes	136 (25.2)
No	404 (74.8)
Date of last training course	
One year or less	71 (52.2)
More than one year	65 (47.8)
Working experience with pt. having NIs	
Yes	404 (74.8)
No	136 (25.2)
Working experience as a nurse	
< 5 yrs.	222 (41.1)
? 5 yrs.	318 (58.9)

Figure 2: Table 1 :

2

Practices	Poor (?59% score)	Good (?60% score)
Knowledge on Prevention of Person-to-Person Transmission		
HH	363 (67.2)	177 (32.8)
PPE	417 (77.2)	123(22.8)
Safe injection practices	478 (88.5)	62 (11.5)
Knowledge on Prevention of Hospital Environment Transmission		
Routine hospital cleaning	391 (72.4)	149 (27.6)
Safe hospital waste handling & disposal	491 (90.9)	49 (9.1)
Reprocessing of patient care equipment	179 (33.1)	361(66.9)
Safe linen handling	239 (44.3)	301(55.7)
Overall level of knowledge	511 (94.6)	29 (5.4)

Figure 3: Table 2 :

3

Practices	Poor (?59% score)	Good (?60% score)
Level of Practices Regarding Nis Control Measures		
Precautions to prevent NIs	511(94.6)	29 (5.4)
Actual action to prevent NIs	320(59.3)	220 (40.7)
Overall level of practices	291(53.9)	249 (46.1)

Figure 4: Table 3 :

4

Variables	B	Std. Error	Wald test	P	Crude OR	95% CI	
			Level of knowledge at baseline				
						Lower	Upper
Prior in-service training							
Less than one year	1.00						
One year and more	-1.92	0.66	8.45	0.004	0.15	0.040	0.535
Prior working experiences							
? 5 yrs.	1.00						
? 5 yrs.	0.160	0.384	0.175	0.68	0.85	0.55	2.49

Figure 5: Table 4 :

5

Variables	B	Std. Error	Wald test	P	Crude OR	95% CI	
			Level of practice at baseline				
						Lower	Upper
Prior in-Service Training							
Less than one year	1.00						
One year and more	-0.36	0.35	1.22	0.27	0.68	0.34	1.35
Prior Working Experiences							
? 5 yrs.	1.00						
? 5 yrs.	0.08	0.18	0.21	0.92	0.77	1.53	0.64
IV.							

Figure 6: Table 5 :

20 LIMITATIONS

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.2 Declaration of conflicting interests

There are no potential conflicts of interest with respect to the study, authorship, and/or publication of this manuscript.

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