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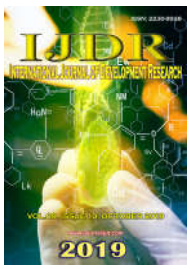

RESEARCH ARTICLE OPEN ACCESS

# INSUFFICIENT TRANSLATION OF KNOWLEDGE AMONG NURSES TOWARDS MANAGEMENT OF NOSOCOMIAL INFECTIONS AT VIHIGA COUNTY REFERRAL HOSPITAL, WESTERN KENYA

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**ABSTRACT**

***Introduction:*** The nosocomial infections are responsible for long hospital stays, morbidity, and mortality and are costly to manage. While episodes of NIs are recognized in hospitalized patients worldwide, and in all age groups, higher incidences are found in resource-limited settings, especially in Africa. The healthcare workers, particularly nurses, play a critical role in the spread, prevention and control of NIs. However, in poor resource settings, limited studies have been conducted to ascertain this. ***Aim:*** To assess the knowledge, attitude and practice of nurses on NIs at Vihiga County Referral Hospital (VCRH). ***Methods:*** This was a cross-sectional survey using semi-structured self-administered questionnaires to collect data from 90 of 100 nurses at VCRH. Further, interview guide was conducted on 2 nurses in charge. ***Analysis:*** Descriptive statistics was used to summarize participant characteristics. Chi-Square test was used to test for associations between various participant attributes and practices related to nosocomial infections. Qualitative data was summarized and themes derived, then related to nurse practices and knowledge. All analyses of quantitative data were done using SPSS version 20 ($\alpha = 0.05$, where applicable). ***Results:*** This study reports that while the nurses had sufficient knowledge (97.8%) and positive attitude towards nosocomial infections, their knowledge was lacking in certain areas, and their practice towards nosocomial infection was not sufficient to prevent or control nosocomial infections. The nurses were a risk for the transmission of NIs (55.7%), and were equally at risk of being infected. There was however an Infection Prevention and Control Team, which met on a monthly basis. ***Recommendation:*** Routine trainings on nosocomial infections should be done for nurses, especially targeting areas where knowledge is limited, or variable between healthcare worker cadres. In addition, nurses and other healthcare staff should be provided with necessary resources that help prevent and control nosocomial infections. Furthermore, there is need to review guidelines on prevention and control of NIs among healthcare workers in Vihiga County Referral Hospital and other similar settings within the county.



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## INTRODUCTION

Nosocomial infections usually occur after the patient has stayed in the hospital for two days and presents itself after the patient has been discharged from the hospital (Mythri and Kashinath, 2014). Research shows that patients in the intensive care unit are the greatest culprits to nosocomial infections (Moody *et al*., 2013). Nosocomial infections are of public health importance has they contribute to the healthcare burden by increasing hospitalization time and leading to morbidity and mortality (Brown *et al*., 2014). In addition, they are a burden economically because of the long stay of the patient in the health facility as they await to undergo advanced diagnosis and treatment (Wilcox and Dave, 2013). A variety of pathogens have been associated with nosocomial infections including parasites, bacteria, fungi and viruses. Infection of the respiratory system and those acquired through intravascular devices are the two most common nosocomial infection reported in the hospital settings (Khan *et al*., 2017). Epidemiologically, most nosocomial infections are transmitted through person to person contact mediated through improper hand hygiene of the healthcare professionals (Tripathi *et al*., 2014). The risk factors to nosocomial infections include age above seventy years, diabetes mellitus, persistent sounding, poor health status, surgical drains, lack of use of gloves and inappropriate wound bandage (Ulu-Kilic *et al*., 2013). There is

evidence that poor compliance with the approved infection control guidelines by health care providers during medical procedures; age; poor hygiene practices and long stay at the facility could be responsible for the spread of the pathogens (Mythri and Kashinath, 2014). Research studies reveal that patients undergoing surgical procedures are at the greatest risk of developing nosocomial infections as compared to those who do not (Zhou *et al*., 2018). Nosocomial infections are worldwide phenomenon, occurring in both the developed and the developing countries. The prevalence of nosocomial infections in developed countries is 7% and 10% in developing countries. This has been reported to affect people of all ages especially the infants and the elderly (Khan *et al*., 2017). The greatest culprits are infants under eight weeks compared to older children. The most common infection in infants and older children are blood stream infections (Mythri and Kashinath, 2014). Hospital staffs such as the nurses have been reported to be responsible for the most of the nosocomial infections. Nurses are involved in a number of activities which include providing medication, sterilization, dressing and disinfection. Therefore, elevating their level of exposure to nosocomial infections (Shinde and Mohite, 2014). Nurses should practice hand washing which is the most efficient method of prevention of nosocomial infections. However, there is a common belief in most hospital staff that they wash their hand more than the acceptable level. Nurses' knowledge on the transmission and prevention of nosocomial infection has been reported as the best method of lowering the incidence of hospital acquired infections (Sarani *et al*., 2016). Further, no country has been able to prevent the spread of nosocomial infections (Mehta *et al*., 2014). The prevalence of nosocomial infection has been reported to be 4.4 per 100 patient admissions (Ndegwa, 2015). However, limited studies have investigated on the knowledge, attitudes and practices of the nurses on the nosocomial infections in Kenya.

## MATERIALS AND METHODS

**Study area and population:** This study was carried out at Vihiga County Referral Hospital in Vihiga County. The county has a population of 647,968 and an area of 563 km². The study participants were 90 nurses and 2 nurse in charge working at Vihiga County Referral Hospital. The purpose of the study was explained to the study participants before they provided they consent to take part in the study. The study was approved by the Board of Postgraduate Studies of Jaramogi Oginga Odinga University of Science and Technology. Further, ethical clearance was obtained from Jaramogi Oginga Odinga Teaching and Referral Hospital Ethics and Research Committee (ERC.1B/VOL.1/289)and authorized by Vihiga County Referral H Administration. Clearance was also sought from the hospital administration.

**Study design:** This study adopted a cross sectional study design and a purposive sampling approach. Data was collected by using both a semi structured questionnaire and the interview guide. Quantitative data was collected by administering questionnaires to 90 nurses while qualitative data was collected by conducting key informant interviews on 2 nurses in charge. Data analysis was achieved by using descriptive statistics in the form of frequencies, tables, charts and graphs. Chi square test was used to test for associations between various participant attributes and practices related to nosocomial infections. Qualitative data obtained through the key informant interviews was analyzed thematically.

## RESULTS

**Demographic characteristics of study participants:** A total of 90 nurses completed the questionnaire, giving a response rate of 90%. There were more female respondents (54.4%) than male respondents (45.6%) with the majority of the respondents between the ages of 20 to 30 years (79.5%). Only 1 nurse (1.1%) had postgraduate training and majority of them were diploma holders (71, 79.8%).

**Knowledge on nosocomial infections:** Nearly all of the nurses (97.8%) could give a proper definition of nosocomial infection, although 2 (2.2%) female nurses could not define it. Majority (68; 75.6%) of nurses agreed that prolonged hospital stay increased the risk of contracting nosocomial infections. Hospital waste and patients were the main sources of nosocomial infections (64.4% and 55.6%, respectively). All the two key informants agreed that nurses were a risk for the transmission of NIs, and were equally at risk of being infected. The main agent of nosocomial infections transmission was contaminated environmental surfaces (64.4%) and the least was contaminated needles (12.2%). Up to 65.6% of the nurses indicated that infections associated with respiratory tract were the most frequent, while the least frequent was urinary tract infections (8.9%). Most (91.1%) of the nurses had been trained on infection and prevention control, and, of those trained, a substantial number (59, 65.6%) had been taken through formal training. While all the male nurses (41) had been trained on infection and prevention control, only 41 (83.67%) of the 49 female nurses had undergone such training. Only 82.0% of the nurses had read the national guideline on infection prevention and control. Up to 94.3% of the nurses said that there were laws governing infection prevention and control in Kenya: females (44; 53.7%) versus males (38; 46.3%), p=0.663. Table 2 is a summary Chi Square test of independence between the selected variables and gender.

**Practices by nurses that influence the spread of nosocomial infections:** All nurses (100.0%) agreed that the practice of infection prevention and control was important, so as to protect hospital clients, to protect patients and to protect healthcare workers from nosocomial infections (65.6%, 50.0% and 47.8%, respectively). The attainment of this was said to depend on different activities, including hand hygiene, where 93.3% of the nurses said that they cleaned their hands with running water and soap. Other detergents used by the nurses were alcohol hand rub (18.9%) and water alone (5.6%). About 77.8% of the nurses cleaned their hands after attending to every patient. The 22.2% of the nurses that had failed to clean their hands after attending to every patient was as a result of lack of hand cleaning facilities (60.0%), no need to clean their hands (35.0%) and being too busy to clean (15.0%). Correspondingly, 78.9% of the nurses cleaned their hands before and after putting on gloves. For the few (21.1%) who did not do this practice, some said that they were too busy to clean (44.4%); 38.9% mentioned lack of hand cleaning facilities and two other nurses felt the need not to do it. A few nurses (11; 12.2%) did not clean their hands before preparing medications for patients or clients. Reasons being; too busy to clean (5, 50.0%), lack of hand cleaning facilities (4; 40.0%) and no need to (1;10.0%). One nurse refrained from answering the question. On the use of personal protective equipment, 92.2% of the nurses put on gloves while 7 (7.8%) did not put on gloves when performing procedures to patients. Importantly, majority of them said that there were no gloves

(5; 71.4%). Up to 62.2% of the nurses never put on gowns, caps, scrub suits or aprons when performing procedures to patients. Furthermore, 58.4% never put on masks when handling clients or patients with air borne infection. Their main reason not to do as required was because of scarcity of gowns, caps scrub suits or aprons (90.4%) and scarcity of masks (93.9%). This was supported by the key informant who felt that sometimes the supplies, especially hand hygiene equipment were always present but not adequately used. Cleaning hand by healthcare workers after every contact with patients was seen by the KIs as a way to help prevention, both to self and others. Further analysis revealed a statistically significant difference between male and female nurses with regard to putting on gowns, caps, scrub suits or aprons when performing procedures to patients (p=0.017). On the other hand, putting on masks when handling clients or patients with air borne infection was independent to gender of the nurse (p=0.081). On waste management, most nurses (85, 96.6%) used color-coded separate containers to segregate wastes. There were two missing responses on this question. Still, 1 (33.33%) out of the 3 nurses that did not use colour-coded separate containers did not know why.

**Attitude of nurses towards the management of the nosocomial infections:** Nearly all (97.8%) of the nurses believed that someone could contract nosocomial infection in the course of seeking treatment. Only 55.7% of the nurses indicated that they were at high risk of contracting nosocomial infections, as the remaining 44.3% said that they were at low risk. Most of the nurses that said that they were at low risk were males (61.5%). On the contrary, majority of females (67.3%) said that they were at high risk of contracting nosocomial infections. The difference between male and female nurses with regard to their judgment on the risk of contracting nosocomial infections were found to be statistically significant (p=0.007). Whereas 48.3% of the nurses felt that nosocomial infections were more severe compared to other forms of infections, 31.5% and 20.2% said that nosocomial infections were less severe or similar to other infections, respectively. Up to 84.3% of the nurses indicated that there was a good chance for preventing nosocomial infections while only 15.7% indicated little chance for preventing it. Of the 84.3% that said that there was a good chance of preventing nosocomial infections, majority were males (52.0%) compared to 48.0% of the females.

**Table 4.2. General participant characteristics by gender**

| Variables | Male | | Female | | p-value |
|---|---|---|---|---|---|
| | N | % | N | % | |
| **Marital Status** | | | | | |
| Single | 24 | 61.5 | 15 | 38.5 | 0.150 |
| Married | 12 | 30.8 | 27 | 69.2 | |
| Divorced | 3 | 30.0 | 7 | 70.0 | |
| **Duration in service** | | | | | |
| 1-10 Years | 35 | 48.6 | 37 | 51.4 | 0.257 |
| 11-20 Years | 5 | 35.7 | 9 | 64.3 | |
| 21-30 Years | 0 | 0.0 | 3 | 100.0 | |
| **Definition of nosocomial infection** | | | | | |
| Correct | 41 | 46.6 | 47 | 53.4 | 0.498 |
| Didn't know | 0 | 0.0 | 2 | 100.0 | |
| **Training on Infection Prevention and Control** | | | | | |
| Yes | 41 | 5.0 | 41 | 50.0 | 0.007 |
| No | 0 | 0.0 | 8 | 100.0 | |
| **Read the National guideline on IPC** | | | | | |
| Yes | 34 | 46.6 | 39 | 53.4 | 0.837 |
| No | 7 | 43.8 | 9 | 56.2 | |
| **Existence of other laws governing IPC in Kenya** | | | | | |
| Yes | 38 | 46.3 | 44 | 53.7 | 0.663 |
| No | 3 | 60.0 | 2 | 40.0 | |

*Chi Square Test of Independence between the Selected Variables and Gender (α=0.05)*

**Table 4. 3. Use of Personal protective gear**

| Variables | Male | | Female | | p-value |
|---|---|---|---|---|---|
| | n | % | N | % | |
| Use of gowns, caps, scrub suits or aprons when performing procedures to patients | | | | | |
| Yes | 10 | 29.4 | 24 | 70.6 | **0.017** |
| No | 31 | 55.4 | 25 | 44.6 | |
| Use of masks when handling patients with air-borne infection | | | | | |
| Yes | 13 | 35.1 | 24 | 64.9 | 0.081 |
| No | 28 | 53.8 | 24 | 46.2 | |

*Chi Square Test of Independence between the Selected Variables and Gender (α=0.05)*

The KIs further agreed on the need to train all non-compliant staff on the importance of patient safety, emphasizing the requirements and protocols for the infection control guidelines in the continuing medical education program. On the other hand, those who comply with these guidelines should be recognized and appreciated, and motivated through issuance of certificates. Findings on the use of protective gear are summarized on Table 3.

A nurse's opinion on the prevention of nosocomial infections and his or her gender were found to be significantly dependent (p=0.009). About half (52.8%) of the nurses indicated that they disagreed with the notion that it is difficult to prevent nosocomial infections. Of these, the majority of them being males (58.3%). Only 32.5 % of the nurses either strongly agreed or agreed with the notion, most of them being females (79.3%). There was a significant difference (p=0.004) between male and female nurses with regard to the notion that it is difficult to prevent nosocomial infections.

**Table 4.4. Opinion on contracting and preventing Nosocomial infections**

| Variables | Male | | Female | | p-value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Risk of contracting nosocomial infection | | | | | |
| High risk | 16 | 32.7 | 33 | 67.3 | 0.007 |
| Low risk | 24 | 61.5 | 15 | 38.5 | |
| Opinion about the prevention of nosocomial infections | | | | | |
| Good chance | 39 | 52.0 | 36 | 48.0 | 0.009 |
| Little chance | 2 | 14.3 | 12 | 85.7 | |
| It is difficult to prevent nosocomial infections | | | | | |
| Strongly Agree | 0 | 0.0 | 6 | 100.0 | 0.004 |
| Agree | 6 | 26.1 | 17 | 73.9 | |
| Disagree | 27 | 57.4 | 20 | 42.6 | |
| Strongly Disagree | **8** | **61.5** | 5 | 38.5 | |

*Chi Square Test of Independence between the Selected Variables and Gender (α=0.05)*

Generally, most of nurses who either disagreed or strongly disagreed were males (57.4% and 61.5%, respectively) compared to their female counterparts that either disagreed or strongly disagreed (42.6% and 38.5%, respectively). Table 4 presents some key findings on the opinion of nurses on the risk of contracting, and difficulty in preventing nosocomial infections.

## DISCUSSION

**Knowledge level on the nosocomial infections:** Nosocomial infection are a public health concern as they diminish the quality of the healthcare delivered to patients. The risk of nosocomial infection has been reported to be the highest in developing countries including Kenya (Biberaj *et al*., 2014). The present study found out the participants had sufficient knowledge and attitude towards nosocomial infections despite them having acquire diploma level of education. However, their knowledge was lacking on certain areas, especially on nosocomial infection control. This was confirmed by the key informant interviews which revealed an uneven level of understanding of NIs among healthcare workers, particularly due to differences in predominant areas of deployment within the health facility, as well as the duration of service. The findings in this study are similar to that reported in a study carried out in University Clinical Center of Kosovo reported good knowledge and practice on the prevention of nosocomial infection (Gruda and Sopjani, 2017). Some research studies have reported nurses' and physicians' knowledge of the standard and isolation precautions to be insufficient, and impaired the control and prevention of nosocomial infections.

A research study carried out in Yemen reported fair knowledge and good practice on the nosocomial infections and its preventive techniques ((Shinde and Muhite, 2014). Further, a research study carried out in Iran reported poor knowledge about hospital acquired infections (Sarani *et al*., 2016). The respondents in this study believed that both the patients and the health care staffs were at risk of contracting nosocomial infections. This is consistent with other research studies which report that nurses to act as vectors in the transmission of nosocomial infections (Berhe *et al,* 2005). The hospital acts as a potential environment that favours the transmission of pathogens as a result of poor adherence of the health care workers to infection control practices (Bello *et al*., 2011). The nosocomial infections have been reported to lead to long hospital stays, morbidity, and mortality and are costly to manage (Biberaj *et al,* 2014). There are exposures to nosocomial infections. The study participants reported environmental surfaces, surgical instruments, direct contact and contaminated needles as sources of nosocomial infections. Research studies report unhygienic hospital environment as a major contributor to nosocomial infections. Further, contaminated surgical equipment used on patients in theatre or during treatment and has not been sterilised or disinfected increases the risk of transmission of infections to other hospitalised patients (Joshi, 2019). The good knowledge of the study participants on the nosocomial infection was acquired through the training, seminars, workshops and continuing medical education seminars organised within the facility. Further, majority of the respondents had read the National Guidelines on Infection Prevention and Control, and were generally aware of other laws governing infection prevention and control in Kenya. This is in agreement with other research studies that report that health care professionals gain knowledge on the nosocomial infections through training (Bello *et al*., 2011). This served as a step towards better management, although studies have shown that other factors, notably staff attitude.

**Practices by nurses on prevention of nosocomial infections:** All the participants understood that it was necessary to practice prevention and control of nosocomial infection for different reasons, in order to protect hospital clients, patients, and health care workers, thereby reducing morbidities and improving efficiency, especially among the hospital staff. The nurses are believed to have acquired this knowledge by reading the National Guidelines on Infection Prevention and Control, and were generally aware of other laws governing infection prevention and control in Kenya. Despite the knowledge, it was revealed that their practice towards nosocomial infection was not sufficient as nearly one-quarter of the respondents did not clean their hands after attending to every patient, raising the chances of spread of nosocomial infections, as nurses have been known to harbour micro-organisms that may potentially be harmful to patients if they find a route of entry. The results from this study are similar to those reported in a study carried out in Iran which revealed poor practices of the nurses on the methods of preventing spread of hospital acquired infections (Sarani *et al*., 2016). The reasons for the poor practice of hand washing in this study included failure of the health facility to provide the required facilities, such as lack of hand cleaning facilities. These findings are similar to those reported in previous studies which found out that institutional factors such as unavailability of the hand washing supply contributed to poor hand washing practices among the nurses (Gruda and Sopjani, 2017). Further, the nurses practiced wearing personal protective equipment such as gloves and masks although this practice was hindered by the unstable supply of these equipment. This is in agreement with other research studies

which report that adherence to nosocomial infection reduction practices is hindered by the unavailability of the protective equipment (Ojong *et al*, 2014). Knowledge and practice of hand washing and aseptic technique are very important in preventing the transfer of pathogen micro-organisms by nurses to their patients in the course of rendering care. Poor compliance is associated with lack of awareness among personnel (Ojong *et al*., 2014).

**Attitude of nurses on nosocomial infections:** There are personal and organizational attitudes towards interventions which may influence health outcomes (Ojong *et al*, 2014). Almost all the participants believed they could contract nosocomial infections, with the majority perceiving themselves at high risk. The bad attitudes of the nurses towards infection control reported in this study include being busy and the nurse not feeling the need to wash hands contributing to the spread of nosocomial infections. They were as such likely to develop an attitude geared towards protection. Research studies report bad nurses attitudes towards hand washing such as being busy to increase the incidence of nosocomial infections (Jayasinghe and Weerakoon, 2014; Ojong *et al*, 2014).

**Conclusion and recommendations:** In the present study, it was found that although the participants had sufficient knowledge and positive attitude towards nosocomial infections, their knowledge was lacking in certain areas, and their practice towards nosocomial infection was not sufficient to prevent or control nosocomial infections.

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

**Author contributions:** MO designed the study, collected the data, analyzed the data and drafted the manuscript; GA guided proposal writing; DO supervised data collection and manuscript drafting; FA read the first draft and also oversaw the writing of the final draft; DO edited final draft. All authors read and approved the final version of the paper.

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