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Factors Associated with Prevention and Control of Hospital Acquired Infections within Nurses in Ngora Fredica Hospital Ngora District Eastern Uganda

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Abstract

Hospital Acquired Infections occur worldwide and affect hundreds and millions of people, and they are related to high rates of morbidity and mortality among patients who are admitted in hospitals or health facilities and are a major problem to patients' safety and in settings where health care is to be made safe, their close watch and avoidance should be the topmost priority. The purpose of the study was to determine the factors within the nurses that were associated to the prevention and control of Hospital-acquired infections. The study was conducted at Ngora Fredica Hospital Ngora district Eastern Uganda. Results: 63.6% and 77.3% of nurses were found to be knowledgeable on causes and transmission of HAIs, respectively, which reflected good practices on medical waste segregation (85.2%), washing hands (77.3%), and storing sharps in safety boxes (92%). Respondents demonstrated good practice on infection prevention and control. Gender (female with COR = 1.54), experience (less than four years with COR = 1.43), and cadre (COR = 1.41) were significantly associated with nurses' prevention and control abilities. Based on the key findings, the following were the conclusions: The study has demonstrated that the majority of the nurses who had adequate Knowledge about infection prevention and nearly above one-third of healthcare providers had poor practices towards infection prevention. Individual factors (gender, advanced age, educational status - cadre, serving year-experience, specialty, Knowledge, perceptions, and practice were significantly associated with nurses' infection prevention and control.

Keywords*: Control, Hospital acquired infections, Nurses, Prevention.*

Introduction

Hospital-acquired infections (HAIs), also called nosocomial infections are infections obtained by the patient 48 hours after admission at the hospital or a health facility for reasons which are not related to the infections or before admission to the facility, the patient was not previously infected [1].

HAIs occur worldwide and affect hundreds and millions of people, and they are related to high rates of morbidity and mortality among patients who are admitted in hospitals or health facility and are a major problem to patients' safety, and in settings where health care is to be made safe, their close watch and avoidance should be the topmost priority [2]. Health workers (HWs) are as well having an increased chance of getting these infections [3].

Globally, over 1.4 million people are affected by HCAIs [4]. The prevalence of patients affected by HAIs in developed countries ranges from 5% to 10%, and about 15% to 40% of the patients are in critical care units [5]. The prevalence of Hospital Acquired Infections in Africa varies from 2.5% to 14.8% in Algeria, Senegal, Burkina Faso, and Tanzania [6]. Bacteria, fungi, viruses, and parasites are the causative agents of HAIs [7].

The end results of HCAIs in accordance with [2] and the New York State Department of

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Health 2014, are prolonged stay in the hospital, functional disability or reduced quality of life, high resistance to antimicrobial agents, emotional stress, additional financial costs for both the patients and their families and finally unnecessary deaths.

HCAIs have drawn a lot of attention from patients, the government and other regulatory bodies including associations, because most of these HCAIs are preventable. According to [8] the spread of HCAIs like Human Immunodeficiency Virus, Hepatitis, and other blood microbes commonly occurs through unsafe injections, contaminated hands, sharps injuries, and other unsafe medical procedures.

Infection control measures reduce the spread of HAIs, and they involve immediate hand washing after exposure to lessen the danger of disease transmission, the utilization of personal protective equipment to reduce contact with infectious objects, as well as proper disposal of sharps reducing needle-stick injuries [5]. A violation of infection control customs assists in the spread of infections either from patient to patient, patient to health workers, and health worker to patient and attendants or even among staff; therefore, all the HWs, attendants, and patients should strictly stick to Infection Control instructions [5].

Knowledge, attitude, and practices of the nurses influence the prevention of Hospital Acquired Infections [9].

Globally, the Knowledge about prevention and control of Hospital Acquired Infections by nurses is rated high as compared to the Attitude, Practices, and compliance which are low as a result of a lack of resources and training opportunities and excessive workloads in Saudi Arabia and Italy as stated by [10, 11].

In Africa, a study conducted in Ethiopia employing a cross-sectional design found out that the Knowledge about hand washing was fair while practice was low [12]. In a study carried out in northern Nigeria, 421 Health Care Workers were interviewed. Among them, 77.9% described Universal precautions and infection control. about 70.1% always wear gloves before handling a patient or their property. 12.6% reportedly washed their hands before wearing gloves. 10.7% washed their hands after wearing gloves, and 72.4% changed their gloves after handling a patient [3].

Meanwhile, a survey conducted in Zambia revealed the inadequacy of Knowledge as well as low compliance as common among the nurses; therefore, need to step up educational programs to improve compliance with recommended infection control guidelines [13].

In Uganda, a study conducted in the surgical, medical, and obstetrics wards at Mulago National Referral Hospital in Kampala showed that almost all HCWs knew to wash their hands. Hand washing was valued more as a means of self-protection than as a means of preventing patient-to-patient transmission, consistent with the prevailing belief that infection control was important for occupational safety. Sinks were not readily accessible, and soap at sinks was uncommon throughout the medical and obstetrics wards but more commonly available in the surgical wards. Alcohol gel was rarely available [14].

In view of this background, this study will be conducted in Soroti Regional Referral Hospital with the purpose of assessing the Knowledge, attitude, and practices of nurses on the prevention and control of hospital-acquired infections.

To determine the factors among the nurses that were associated with the prevention and control of Hospital-acquired infections in Ngora Fredica Hospital Ngora district Eastern Uganda.

Methodology

Study Design

This study was a descriptive cross-sectional study and it involved quantitative data collection methods on the Knowledge, attitude, and practices of nurses on the prevention and control of Hospital-acquired infections.

Study Area

This study was carried out at Ngora Fredica hospital in Ngora district in eastern Uganda. The hospital is located in the town of Ngora, approximately 291 kilometers (181 miles) by road, northeast of Kampala. It offers general and specialized services to a population of approximately 2 million people from the districts of Ngora, Serere, Kumi, Bukedea, and Palisa.

This hospital was selected because it is among the well-known large hospitals, and the nurses who work in this hospital have qualifications and are registered by the nursing council of Uganda. Secondly, this hospital is also a teaching hospital with a nursing school.

Study Population

Target Population

The target population in this study included the nurses who care for patients.

Sample Size Calculation

Yamane's formula was used to estimate the sample size.

$$n = \frac{N}{1+N(e)2}$$

Where:

n - The sample size.

N - The population size.

e- The desired level of precision (0.05) at 95% confidence interval.

Therefore:

$$n = \frac{100}{1+100(0.0025)}$$

n=80.

In addition, 10% of the sample size will be added to account for non-response and damaged questionnaires and other tools = 8.

So, the sample size will be n **= 88.**

Sampling Procedure

A simple random sampling method was used to select participants for the study. The researcher approached the nurses who were accessible in the course of the study at the particular wards, and the reason for conducting the study was explained to them, and they requested to participate. Nurses who wished to participate in the study were given a consent form to read and sign.

Data Collection Techniques

The researcher used a self-administered questionnaire to collect data. Data were collected over a period of 7 days (Monday – Sunday) to allow for coverage of the participants who were on shift duties. Rapport was created then questionnaires were distributed to eligible participants at various shifts. Completed questionnaires were retrieved immediately after completion.

Data Collection Tools

Data were collected through the self-administered structured questionnaire on Knowledge, attitude, and practices of nurses on Hospital-acquired infections, and interview guides were used to collect data from key informants (hospital administrators). The research instruments were structured into three sections.

Data Analysis

Complete pre-coded data were double-entered into a computer using Epi-Info version 3.5 and transferred to SPSS version 20.0 after cross-checking and data cleaning.

Tabulation, frequencies, proportion, and summary statistics were used to present the distribution of the study findings and to check missing values. Binary logistic regression was used to determine the association between dependent and independent variables.

Variables that have a significant association with delay in treatment-seeking in binary logistic regression were further tested by a multivariable model. Multivariable logistic regression was used to determine the relationship between several independent variables and a dependent variable. Odds ratio with 95% CI and P-value <0.05 were considered as the cut point to measure the strength and significance of the association.

Data Quality Control

Supervisors and data collectors were trained on research tools and data collection procedures. The questionnaire was translated into the local language. A pre-test was performed to check the consistency of the questionnaire and the time it took to conduct the interview. Supervision was provided throughout the data collection period by supervisors and the principal investigator to check the completeness and consistency of the questionnaires.

Results

Socio Demographic Characteristics of Respondents

As seen in Table 1, 34.1% of the respondents were male, while 65.9% were female. The enrolled nurses constituted 29.5%, the diploma 48.9%, and 21.6% of the respondents were graduates with degree awards. A greater percentage of the respondents were diploma holders. The average age of the participants was 21-30 years, with a percentage of 48.9%. The participants belonged to four departments, departments, 21.6% belonged to surgery, 26.1% were under Paediatrics, 21.6% accident and emergency, and 30.7% belonged to the medical department. A majority of the respondents (76.1%) had the experience of more than four years. 63.6% of the participants were knowledgeable about the causes of hospital-acquired infections, and another 77.3% were knowledgeable about the transmission of hospital-acquired infections. 67.1 % of the respondents perceived that the risk of getting infections at the hospital is high, while 80.7% acknowledged the use of infection control measures. As regards practice, 85.2% of the participants segregated the medical wastes, 77.3% washed their hands regularly after attending to every patient, and 92% used safety boxes to store medical wastes before disposal.

Table 1. Socio-demographic and Economic Characteristics of the Study Participants in Ngora Fredica Hospital, Ngora District Eastern Uganda, March 2020. (n = 88)

Demographic	Category	Frequency	Percent
Gender	Male	30	34.1
	Female	58	65.9
Cadre	Enrolment	26	29.5
	Diploma	43	48.9
	Degree	19	21.6
Age	<20 years	13	14.8
	21-30 years	43	48.9
	31-40 years	17	19.3
	>40 years	15	17.1
Specialty	Surgery	19	21.6
	Paediatrics	23	26.1
	Accident & Emergency	19	21.6
	Medical	27	30.7
Experience	1-4 years	21	23.9
	5 and more years	67	76.1
Knowledge on Causes of Hai	Yes	56	63.6
	No	32	36.4
Knowledge on Transmission	Yes	68	77.3
	No	20	22.7
	Not risky	29	32.9

Perception on Risk of getting	Risky	59	67.1
Perception on using Infection Control Measures	Worthy trying	71	80.7
	Not worthy trying	17	19.3
Practice – Segregate Medical Wastes	Yes	75	85.2
	No	13	14.8
Practice – Wash Hands after Every Patient	Yes	68	77.3
	No	20	22.7
Practice-use Safety Boxes	Yes	81	92.0
	No	9	8.0

Factors Associated with Prevention and Control of Hospital-Acquired Infections in Ngora Fredica Hospital Ngora District Eastern Uganda

Bivariate analysis with an unadjusted odds ratio at 95% confidence level was performed to determine the factors that were associated with the prevention and control of hospital-acquired infections in Ngora Fredica Hospital, Ngora District.

As indicated, females were 2 times more likely to be infected with hospital acquired infection as compared to males with COR = 1.54 (1.14-2.07). The study discovered that the nurses with enrolment were 1.4 times more likely to be infected in the hospital as compared to the degree or graduates with COR = 1.41 (1.10-1.82). Age had no significant association with hospital-acquired infections, but specialty showed a string association as those nurses at the medical department were 3 times more likely to be infected as compared to surgery with COR = 3.34 (1.89-5.80). I also discovered that nurses with low experience of 1-4 years were 1.4 times more likely to acquire infections as compared to the more experienced with five years and more with COR = 1.43 (1.03-1.96). Knowledge factor significantly influenced the risk of acquiring hospital infection such that the nurses who were not knowledgeable about the causes of the hospital-acquired infections were 1.3 times more likely to be infected as compared to the nurses who were more knowledgeable about causes of HAIs with COR = 1.33 (1.03-1.73). On the same note, nurses who were not knowledgeable regarding the transmission of hospital infections were 3 times more likely to be infected as compared to those nurses who were more knowledgeable about modes of transmission of hospital infections with COR = 3.14 (1.73-5.71). The study also discovered that attitude is associated with the risk of getting infected in a way that the nurses whose perception was that it was not risky to get infections in the hospital were 2 times more likely to get infections as compared to those who perceived that it is risky with COR = 1.81 (1.19-2.76). Likewise, the nurses who never believed that infection control measures were worth trying in the hospital were also 2 times more likely to be infected with COR = 1.57 (1.14-2.18). The study further discovered that certain practices were associated with hospital-acquired infections, such as the segregation of medical wastes such that the nurses who never segregated the medical wastes were 2 times more likely to get infected with COR = 1.92 (0.89-2.59), washing hands regularly after attending to every patient COR = 2.26 (1.16-4.37) and using safety boxes to collect medical wastes COR = 1.66 (1.13-2.46) and nurses who never used to wash their hands regularly after attending to every a patient and nurses who never used safety boxes to collect medical wastes were 2 time more likely to get infected. Table 2.

Table 2. Factors Associated with Prevention and Control of Hospital-acquired Infections in Ngora Fredica Hospital, Ngora District Eastern Uganda, March 2020. (n = 88)

Variable	Category	Hospital Acquired Infection		COR (95%) CI
		Yes (n)	No (n)	
Gender	Male	12	18	1
	Female	38	20	1.54(1.14-2.07
Cadre	Enrolment	15	11	1.41(1.10-1.82)
	Diploma	18	25	0.88(0.75-0.99)
	Degree	14	5	1
Age	<20 years	5	8	0.82(0.61-1.10)
	21-30 years	23	20	0.74(0.45-1.20)
	31-40 years	8	9	0.76(0.57-1.02)
	>40 years	9	6	1
Specialty	Surgery	12	7	1
	Paediatrics	9	14	1.22(1.10-1.34)
	Accident & Emergency	8	11	1.34(0.68-2.67)
	Medical	18	9	3.34(1.89-5.89)
Experience	1-4 years	14	7	1.43(1.03-1.96)
	5 and more years	33	34	1
Knowledge	-	-	-	-
Causes of Hai	Yes	18	38	1
	No	21	11	1.33(1.03-1.73)
Transmission of Infections	Yes	36	32	1
	No	13	7	3.14(1.73-5.71)
Attitude	-	-	-	-
Perception of Risk of getting Infections	Not risky	18	11	1.81(1.19-2.76)
	Risky	15	44	1
Infection Control Measures are Worthy Trying	Yes	14	57	1
	No	10	7	1.57(1.14-2.18)
Practices	-	-	-	-
Segregate Medical Wastes	Yes	12	63	1
	No	9	4	1.92(0.89-2.59)
Wash Hands after Every Patient	Yes	13	55	1
	No	14	6	2.26(1.16-4.37)
Use Safety Boxes	Yes	12	69	1
	No	5	2	1.66(1.13-2.46)

Discussion of Results

Infection prevention is one of the most important challenges in health institutions. For this, the study assessed associated factors towards infection prevention and control among the nurses in Ngora Fredica Hospital Ngora District Eastern Uganda.

In this study, Female nurses were found to be two times more likely to be exposed to infections at the hospital when compared with males. The possible explanation of this finding might be linked to the educational status of participants as the majority of the BSc or MSc holders were males. This finding is in line with other studies done on Knowledge, practice, and associated

factors towards prevention of surgical site infection among nurses working in Amhara regional state referral hospitals, Northwest Ethiopia, [15] where the males were found to be more knowledgeable about infection prevention.

The nurses with lower education levels (enrollment) were found to be at higher risk of getting infections than highly qualified (degree).This might be so because nurses with higher educational levels might have acquired essential information on infection prevention and control. Hence they might acquire infection prevention courses. Similar to these findings are [16] on Knowledge and Practice of infection control among health workers in a tertiary hospital in Edo state, Nigeria, and [17] on Knowledge and Practice of Nursing Staff towards Infect Control Measures in Palestinian Hospitals.

This study revealed that there was no association between prevention and control by the nurses with age. This is contrary to study findings of [18], who discovered that advanced age was significantly associated with Knowledge (AOR = 3.15, 95% with CI of 2.467–5.025). This might be attributed to the fact that as healthcare workers get older, they are more likely to advance their Knowledge through experience and working with senior staff. Age is one of the significant factor of the practice of infection prevention, showed that healthcare workers aged above 30 years or older were about two times more likely to practice infection prevention activities properly when compared with those who are less than 30 years old. This is comparable with other studies done by [15] on Knowledge, practice, and associated factors towards the prevention of surgical site infection among nurses working in Amhara regional state referral hospitals Northwest Ethiopia, where the results showed a significant association between age and practice. This could be due to the fact that as age advances, years of service increase, improving their practice over time. In regard to educational level, healthcare workers with increased educational levels were positively associated with a better practice of infection prevention activities than those healthcare workers with lower educational levels.

The proportion of nurses who were knowledgeable about infection prevention and control was found to be 63.6%. This finding indicated that the majority of the nurses in the hospitals had adequate Knowledge of the prevention of infections, a finding in line with many similar and related studies in Zambia 74.4% [19] and Bahirdar city 84.5% [20]. This finding is better than studies done in Nigerian, 65% [21], Nepal, 22% [22], Palestine, 53.9% and Iran hospital [17], 57% (due to knowledge score difference) [23] despite lower than a study done in Addis Abeba [24] and Dessie referral hospital, 95.7% [25]. This difference might be due to lack of in-service training, sample size, and socio-demographic difference.

The proportion of the nurses who were practicing proper infection prevention activities was 80.7% which is in line with a study conducted in an Egyptian hospital [26] and in Bahirdar city [20]. However, this is much lower than studies by [25]. on Assessment of Knowledge and practice on infection prevention among health Care Workers at Dessie Referral Hospital [25]. This discrepancy might be due to a difference in Knowledge of towards infection prevention, methodology, sample size, socio-demographic difference, lack of in-service training and infection prevention supply, and professionals' non-adherence to infection prevention.

Lengthy of working experience was also another factor associated with knowledge score, which stated that nurses who had served for less than 4 years were more likely to have high exposure to infections than long experienced (COR = 1.43 95% CI (1.03-1.96) this is true because the less experience, the less knowledgeable on infection prevention and control. This is in line with findings from Ethiopia by [15] on Knowledge, practice, and associated factors towards prevention of surgical site infection among nurses working in Amhara

regional state referral hospitals, Northwest Ethiopia, where Knowledge was significantly associated with the experience. This could be due to as the number of years of practice increasing, and health workers are exposed to it repeatedly and become more experienced through working with senior staff.

Moreover, this study showed that those healthcare workers who adhered to the guideline were more likely to practice infection prevention activities than those who didn't adhere to the guideline. This is in line with other studies in Nigeria by [16] and Australia by [27]. This is since those who adhered to the IP guidelines know the up-to-date information and perceive they are being exposed for HAIs, which improves their practice.

These results are in accordance with the findings of [28]. He observed that infection control of HAIs is dependent upon factors such as education level, specialization, and experience of the respondents. According to the study conducted by [29] to assess the Knowledge of 100 intensive care units' nurses in Apollo Hospitals, Ludhiana, India, about Infection Control measures, they stated that irrespective of advances done in the healthcare systems, the threat of HAIs is continuing as a result of nurses lacking Knowledge concerning Infection Control measures which in turn reduces compliance to their application.

Generally, the attitude of the nurses towards control prevention of HAIs is good, and this is attributed to the fact that they fear contracting the diseases from the patients. A study conducted on UK workers by [30] revealed that 86% of HCWs treated individual patients as if they had blood-borne pathogens. According to [31], 53.3% of nurses and midwives fear occupational exposure most, especially in contact with HIV-positive patients, and 93.4% were eager to know whether the patient is positive for HIV/HBV/HCV. The attitude of being extra careful when the patient's serology status is known needs to be changed because this makes HCWs less vigilant in handling other patients [32]. 77.3% of the respondents confirmed that they wash their hands between patients. This study's results are higher than those from a study conducted in Ethiopia by physicians who reported performing hand hygiene 7% and 48% before and after patient contact, respectively. Barriers to performing hand hygiene include lack of hand hygiene agents (67%), sinks (30%), and proper training (50%), as well as irrigation and dryness (57%) caused by hand sanitizers made in accordance with the WHO formulation [33].

92% of the respondents said they place disposable sharps in a safety box immediately after use. This finding is quite higher than the findings of a cross-sectional descriptive survey conducted on 115 nurses at the Lome Campus Teaching Hospital in Togo to assess the Knowledge, attitudes, and practices of hospital nursing staff in relation to the infectious risks of the hepatitis B and C viruses revealed that 75.5% used safety boxes for storing sharps [34].

Supplementary studies related to this study are elaborated. A study conducted at Mulago National Referral Hospital found that the Knowledge of HCAIs is high among health workers, but the practice is low [14]. Nurses may be forced to decide not to practice universal precautions when they have no resources at their disposal or when there are no practice guidelines. This leads to a negative attitude to Ward the prevention of Hospital Acquired Infections [34].

According to [35], in research carried out on medical waste management in university hospitals of Norfolk and Norwich, it was revealed that an onsite incinerator with an actively functioning waste management program was important in any hospital to reduce on waste accumulation thus decrease the occurrence of Nosocomial infections. It was found out that the administrators of only one-fourth of the eight participating hospitals in a study to assess the current practices of waste management in Karachi provided its waste handlers with protective gear. It was further identified that

62.5% of the hospitals had waste storage areas, 62.5% incinerated their wastes, 12.5%, without any treatment, burnt their wastes in the open, and 25% publically disposed of their wastes [36].

Infection Control includes the prevention of infections through the washing of hands, use of personal protective equipment, cleaning, disinfection, and sterilization, vaccination of health workers and post-exposure prophylaxis, proper waste management, and safe injection practices [37]. The decisions about the level of precaution to use are based on the nature of the procedure to be done but not on the actual or assumed serological status of the patient [38].

Conclusions

The study has demonstrated that the majority of the nurses who had adequate Knowledge about infection prevention and nearly one-third of healthcare providers had poor practice towards infection prevention. Individual factors (gender, advanced age, educational status - cadre, serving year-experience, specialty, Knowledge, perceptions, and practice were significantly associated with nurses' infection prevention and control. Considering this finding, there is a need to support existing and come up with new policies targeting these variables, especially among the poor and vulnerable healthcare workers. Therefore, the Ministry of Health and the Hospital, with the collaboration of other stake holders, have to be made to update the Knowledge and practice of healthcare workers regarding infection prevention activities with pre-service or in-service training, fulfilling necessary infection prevention supplies, developing professional's educational levels, introducing healthcare workers infection prevention standard of practice and continuous mentorship/supervision to improve HCWs adherence to infection prevention is recommended. Further Qualitative research on behavioral factors is also recommended.

Conflicts of Interest

The author declares that there have been no conflicts of interest in this study and its outcomes.

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