Outcome Of Nursing Intervention On Knowledge And Skill Of Infection Control Among Nurses In Ekiti State University Teaching Hospital Ado-Ekiti, Ekiti State

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Abstract
Background: *Hospital acquired infection called nosocomial infection is associated with increased morbidity and mortality among hospitalized patients and predisposes healthcare workers (HCWs) to an increased risk of infections. The need for infection control in healthcare facilities is affirmed to the need to prevent Hospital associated infections. The aim of the study was to assess the outcome of nursing intervention on knowledge and skill of infection control among nurses in teaching hospital Ado Ekiti, Ekiti State.*
Materials and Methods: *The study adopted pre-test, post test quasi experimental design. Purposive sampling technique was used to select 112 respondents. The research tool was a structured questionnaire, which consists of socio demographic data, knowledge and skill on infection control. Reliability was also ascertained and the Cronbach alpha coefficient was 0.82- 0.79. Data obtained was analyzed using statistical package of social sciences SPSS version 23. Paired t- Test was used to test the two hypotheses at 0.05 level of significance and the results were presented in tables. Mean frequency percentage and standard deviation was used to analyze the research questions.*
Results: *The result showed the mean age to be 35.44 ±7.44 Result show that during pre intervention majority 60 (53.6%) of the respondent had moderate knowledge and 57 (50.9%) had low skill on infection control with the mean score of 17.10, 5.08 respectively. post intervention findings on skill reveal, majority 110 (98.2%) had high skill on infection control with the mean score of 9.48 and majority had good knowledge on infection control 97 (86.6%). Findings show that there was a significant difference between pre and post intervention knowledge mean score (t=-22.96, p= 0.00), also there was a significant difference between pre and post intervention skill mean score (t=-22.96, p= 0.00) of the respondents.*
Conclusion: *Majority of the respondent had moderate knowledge about infection control measures, but they showed lack of skill prior intervention but was noted to increase significantly during post intervention. Therefore continuous training and monitoring of nurses adherence to practice is of importance.*
Key Words: *Infection control, Knowledge, Nursing intervention, Outcome, skill.*

I.   Introduction
Safety of healthcare worker and client in the health care environment requires the free of microorganism transmission. Infection control skills are directed at controlling or eliminating source of infection in the health care agency, home, communities to reduce the occurrence and transmission of infection diseases. Therefore, inadequate infection control has been an issue of great concern because of its negative effects on the health and productivity of healthcare providers including nurses. Infectious patients are admitted into hospitals and therefore hospitals have become major settings for transmission of infection. Infection prevention is of two important ways: primary and secondary prevention. Primary prevention is a way of preventing disease as well as injury before it occurs. Preventing hazards leading to injury and disease are examples of primary prevention [1]. Primary prevention may be accomplished by procedures intended to uphold general health and welfare of people while secondary prevention lessen the bearing of illnesses or injury that has already happened [2]. In hospitals, infected patients are a source of infection transmission to other patients, health care workers and visitors [3]. Although infection is most prevalent in patients upon admission, health care workers also act as potential vectors for pathogenic agents [4]. Healthcare workers are at increased risk of occupationally acquired infections

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transmitted from both blood-borne pathogens such as hepatitis B and C and human immunodeficiency virus as well as respiratory pathogens such as influenza, tuberculosis, diphtheria and varicella [5].

Health care professionals are constantly exposed to pathogenic microorganisms. Many of which can cause serious or even lethal infections. Nurses in particular are often exposed to various infections during the course of carrying out their nursing activities [6]. Such infections are called Nosocomial infection (NI) or hospital-acquired infection (HAI) or Hospital acquired infection (HAI) which are infections acquired during the process of care and not manifested at the time of admission to a hospital or other health-care facility [7]. It has been estimated that the risk of health care-associated infection is 2 to 20 times higher in developing countries compared to developed countries and 5% and 10% of nurses in the hospitals setting in developed countries acquire these infections [8].

Hospital-acquired infections is one of the leading causes of death and has much economic cost due to increased hospitalization, reduce productivity and prognosis [9]. The rates of hospital acquired infections (HAIs) within a hospital represent the best indicator for the quality of services offered, and a high frequency of HAIs is an evidence of a poor quality of health service delivery [10].

Prevention and management of infection is the responsibility of all staff working in health care setting and an integral element of patient safety programmes. According to Jacoby & De-Angelis HAIs are normally spread by health care staff members and who have poor hand hygiene. It is applicable to all health and social care organizations regardless of the setting or care provider [11]. Infection or disease may be caused by different groups of micro-organisms such as bacteria, fungi, viruses or prions and can result in a wide variety of infections that include, urinary tract, wound, respiratory, blood, bone and skin infections therefore a breach in infection control practices can lead to transmission of infection from patients to health care workers, other patients and attendants [12]. Nurses are responsible for providing medications, dressing, sterilization, and disinfection. They are involved in more contact with patients than other health care workers (HCWs). Therefore, they are more exposed to various HAIs [13]. Hence, nurses play a vital role in transmitting HAIs, and their compliance with infection control measures is necessary for preventing and controlling HAIs [14].

In Nigeria, hospital acquired infection rate of 2.7 % was reported from Ife, while 3.8 % from Lagos and 4.2 % from Ilorin [15]. The cause of hospital acquired infections might be endogenous or exogenous. Endogenous infections are caused by organism present as part of the normal flora of the patient, while exogenous infections are acquired through exposure to the hospital environment, hospital personnel or medical devices [16]. In the past 20 years, the overall incidence of HAI among nurses has increased by 36 percent, and it was also estimated that more than 1.4 million healthcare workers and patients worldwide are suffering from infections acquired in hospitals [17]. One of the biggest problems is inconsistent implementation of proven Infection prevention and control (IPC) measures [18]. This could be attributed to a knowledge and inadequate practice of infection control. A recent study suggested that at least 20% of Healthcare Associated Infection (HAIs) could be prevented through infection prevention and control strategies. Infection prevention and control (IPC) programs have been shown to be both clinically effective and cost-effective providing important cost savings in terms of fewer HAIs, reduced length of hospital stay, less antimicrobial resistance and decreased costs of treatment for infections [19].

Nurses' inadequate knowledge and practices of infection control and prevention has resulted in increased HAIs. According to Tirivanhu, Ancia and Petronella in the study conducted in Zimbabwe identified barriers of infection prevention and control practices among nurses to be lack of knowledge on infection control principles as only 14 out of 50 nurses had excellent knowledge on infection control principles, 21 out of 50 nurses did not utilize the infection control manuals [20]. This study therefore aims at investigating Outcome of nursing intervention on knowledge and practice of infection control among nurses in Ekiti state university Teaching hospital Ado-Ekiti, Ekiti State, Nigeria.

II. Material and Methods
Study setting
The study was conducted at Ekiti State Teaching Hospital, Ado-Ekiti. The hospital was formally known as State Specialist Hospital, Ado Ekiti, but was upgraded to a Teaching Hospital in January 2008. The hospital is situated centrally in the state capital which is in the Ekiti Central Senatorial District. Special services rendered in the hospital include: Intensive care services, renal dialysis, Urology, Nephrology, Cardiology, Opthalmology, Psychiatry, Paediatric. EKSUTH serves as clinical area for teaching medical, nursing, medical laboratory science, radiography and other health related students. It also provides specialist clinical services as well as promotion of scientific knowledge through research. At the apex of administration is the Chief Medical Director. There are several departments in the hospital which include Medical, Nursing, Pharmacy, Medical Laboratory and Medical Records Departments. The hospital runs 24 hours service and offer preventive and curative health care services.

Study Population
The population for the study were nurses working in Ekiti state university Teaching hospital Ado-Ekiti Ekiti State, the number of nurses were 306 nurses.

Inclusion criteria
All nurses working in the hospital as the time of collection of data irrespective of their unit

Exclusion criteria
Nurses who were on leave during the data collection and those who are not on day duty during data collection period were excluded.

Sample Size determination and sampling Technique
The minimum sample size was determined using Cochran formula, 10% attrition rate was also added, Therefore the total sample size was 112.

Convenient/purposive sampling technique was used to select those who are on morning and afternoon duties A proportionate sampling was used to determine the number of nurses who will participate in the study from various ward/unit.

Research design and Instrumentation
Pre-test and post-test quasi-experimental design was adopted to assess the outcome of nursing intervention on knowledge and practice of infection control among nurses in Teaching Hospital, Ado-Ekiti, Ekiti State. One group was used because of the ethical implication of exposing respondent to infection by not training them.

The instruments used for data collection were researcher developed questionnaire consisting of two sections with 30 Items. Section A had 8 questions on demographic data, while section B consist of 22 close ended questions structured around knowledge concerning infection control Every correct answer scored 1 and every wrong answer scored 0. The highest possible score is 22 while mean score was 5.08. Knowledge was categorized into fair, moderate knowledge level and good knowledge level.

A checklist was developed that consist of 10 items close ended questions yes and no. Correct skill score was 1 while wrong skill was 0. Skill score was calculated and the highest possible skill score was 10 the mean skill score of participants was calculated and categorized as 0-4 low skill level, moderate skill and high skill level

A training program implemented based on feedback obtained from pre-intervention knowledge and practice score with learning modules produced for the training of nurse on infection control.

Data Collection methods
The procedure for data collection involves three stages:

Stage 1: it involves meeting with the recruited participants in which information about the purpose, course and potential benefits of the study were discussed. Consent was obtained from the participants after whom they were asked to complete a developed and structured questionnaire. Internet access, interaction and reference materials were not allowed during data collection to avoid external assistance in answering the questions. The researcher stayed with the participants throughout the period of answering the questionnaire and completed questionnaire were checked thoroughly to ensure whether it's properly filled before retrieval from the participants.

Stage 2: Participants was expose to two day training program on during the period while the participant were exposed to training program on hand hygiene, personal protective equipment (PPE) and Disinfection

Stage 3: A post- test was conducted on the participant two weeks post-intervention using the same instruments used during the pre-test. Data on nurses' practice concerning infection control in the participant were collected two weeks post-intervention.

Method of Data Analysis
Data gathered from participants were processed using statistical package for social science (SPPS), version 23. Four research questions were analyzed using descriptive statistics, while two hypotheses were tested using inferential statistics. Descriptive statistics was presented using tables showing frequency, percentages, mean and standard deviation while the inferential statics used was paired t-test at 0.05 level of significance.

Ethical Consideration
Ethical clearance was obtained from the Babcock University Health Research ethics Committee and permission was obtained from the management of Ekiti state University Teaching Hospital, Ado-Ekiti.

Participants were told about the research and permission was obtained before the research was conducted. No compensation paid for patient to collect data from the participants for the research study but refreshment was provided for participants during data collection. No harm was suffered by the participants during the research study. Information obtained from the participants was kept confidential and participants' identity was not disclosed at any time during the study.

III. Results

Table 1: Demographic Data of the Respondents

	Variables	Frequency	Percentage (%)
Age Range	25-34	68	60.7
	35-44	31	27.7
	45-54	13	11.6
Gender	Male	23	20.5
	Female	89	79.5
Marital status	Single	28	25.0
	Married	77	68.8
	Divorced	7	6.3
Ethnicity	Yoruba	62	55.4
	Igbo	22	19.6
	Hausa	22	19.6
	Others	6	5.4
Level of education	Diploma	10	8.9
	BNSC	87	77.7
	MSC	15	13.4
Years in practice	less than 1 year	3	2.7
	1-5years	42	37.5
	6-10 years	50	44.6
	>10 years	17	15.2
Specialty Unit	Medical surgical	41	36.6
	Emergency	35	31.3
	Critical	4	3.6
	Maternity	28	25.0
	Paediatric	4	3.6
Rank	NOII	26	23.2
	NOI	5	4.5
	SNO	25	22.3
	PNO	21	18.8
	ACNO	23	20.5
	ADNS	4	3.6
	DDNS	8	7.1
	Total	**112**	**100**

The findings from Table 1 reveal that 112 nurses participated in the study in which the age range of the respondent were between the ages of 25-34 years which represent 68 (60.7%). The majority 89 (79.5%) of the respondent were female while 77 (68.8%) of the respondent were married. The findings on ethnicity shows that 62 (55.4%) were Yoruba, on level in education 87 (77.7%) had BNSC and 50 (44.6%) have 6-10 years of practice, 41 (36.6%) works in medical surgical unit while 26 (23.2%) are NOII.

Table 2: Pre intervention knowledge of respondent regarding infection control

Knowledge of respondent regarding infection control	Category of score	Pre-intervention	
		F	**%**
Fair	12-16	36	32.1
Moderate	17-19	60	53.6
Good	20-22	16	14.3
Total		112	100
Mean	17.1071		
Maximum	22		
Minimum	12		
Range	10		

Result from Table 2 show that during the pre intervention 36 (32.1%) of the respondent had fair knowledge on infection control, 60 (53.6%) had moderate knowledge and 16 (14.3%) of the respondent had good knowledge.

Table 3 Pre and post intervention knowledge of nurses on infection control

Knowledge of nurses on infection control	Category of score	Pre intervention		Post intervention	
		F	%	F	%
Fair	12-16	36	32.1	0	0
Moderate	17-19	60	53.6	15	13.4
Good	20-22	16	14.3	97	86.6
Total		112	100	112	100
Mean		17.1071		21.1786	
Mean gain		4.0715			
Maximum	22			22	
Minimum	12			17	
Range	10			5	

Result from Table 3 show that during the pre intervention 36 (32.1%) of the nurses had fair knowledge on infection control, 60 (53.6%) had an moderate knowledge and 16 (14.3%) of the respondent had good knowledge but after post intervention, 97 (86.6%) of the respondent had good knowledge on infection control, 15 (13.4%) of the respondent had moderate knowledge while none of the respondent had fair knowledge on infection control. The table also reveals the pre intervention mean score to be 17.1071 while the post interventions mean score was 21.1786. The mean gain was found to be 4.0715. The range was 10 for pre intervention as compared to 5 for post intervention.

Table 4 Pre intervention skills of respondent on infection control practice

Skills of respondent regarding infection control practice	Category of score	Pre intervention	
		F	%
Low	0-4	57	50.9
Moderate	5-6	10	8.9
High	7-10	45	40.2
Total		112	100
Mean	5.0893		
Maximum	10		
Minimum	0		
Range	10		

Result from Table 4 show that during the pre intervention skill 57 (50.9%) of the respondent had low skill on infection control, 10 (8.9%) moderate infection control and 45 (40.2%) high skill on infection control.

Table 5 Pre and post intervention skills of respondent regarding infection control practice

Skills of respondent towards infection control practice	Category of score	Pre intervention		Post intervention	
		F	%	F	%
Low	0-4	57	50.9	0	0
Moderate	5-6	10	8.9	2	1.8
High	7-10	45	40.2	110	98.2
Total		112	100	112	100
Mean		5.0893		9.4821	
Mean gain		4.3928			
Maximum	10			10	
Minimum	0			5	
Range	10			5	

Result from Table 5 show that during the pre intervention practice 57 (50.9%) of the nurses had low skill on infection control, 10 (8.9%) had moderate skill on infection control and 45 (40.2%) of the respondent had high skill on infection but after post intervention, 110 (98.2%) of the respondent had high skill on infection control, 2 (1.8%) of the respondent had moderate skill on infection control while none of the respondent had low skill on infection control, The table also reveal the pre intervention practice mean score to be 5.0893 while the post interventions practice mean score was 9.4821. The mean gain was found to be 4.3928. The range was 10 for pre intervention as compared to 5 for post intervention.

Table 6 Paired t-test to compare pre and post intervention knowledge mean scores of nurses regarding infection control knowledge

Knowledge on infection control	Mean	N	Standard Deviation	Std. error mean	Df	T	*P* value
Pre intervention scores	17.1071	112	2.14080	0.20229	111	-17.493	0.000
Post intervention score	21.1786	112	1.44705	0.13673			

0.05 level of significance

From Table 6 it was observed that there was a significant difference between pre and post intervention mean score knowledge of nurses regarding infection control (t= -17.493, *p*= 0.00 df =111). Hence, the null hypothesis which stated that there is no significant difference between pre and post intervention knowledge mean score of nurses regarding infection control was rejected.

Table 7 Paired t-test to compare pre and post intervention practice mean scores of nurses regarding infection control knowledge

Practice of infection control	Mean	N	Standard Deviation	Std. error mean	Df	T	*P* value
Pre intervention scores	5.0893	112	3.60319	0.34047	111	-12.519	0.000
Post intervention score	9.4821	112	1.01326	0.09574			

0.05 level of significance

From Table 7 it was observed that there was a significant difference between pre and post intervention practice mean score of nurses regarding infection control (t= -12.519, *p*= 0.00, df =111). Hence, the null hypothesis, which stated that there is no significant difference between pre and post intervention practice mean score of nurses regarding infection control, was rejected.

IV. Discussion

The findings of this study revealed that 112 nurses participated in the study with a mean age of 35 ± 7.9 years with the majority 89 (79.5%) of the respondent were female. This contradicts the findings of Saffari which reveal that the mean age of participants in their study was 43.3 ± 9.6 years and most participants were male 21 . More than half of the participants were Yoruba 62 (55.4%) and this may be due to the fact the study setting was within a Yoruba speaking region. As regards respondent's level of education, majority 87 (77.7%) had BNSC with the highest frequent year of practice of 6-10 years of practice making up 50 (44.6%). The findings of this study revealed that majority of the nurses had moderate pre-intervention knowledge of infection control with mean score 17.10 ± 2.1. The finding of the current study is similar to the study of Fashafsheh where approximately 54% of the nurses had a fair level knowledge in their study [22]. This is in contrast to similar studies by Ibrahim, Tirivanhu and Amoran the study showed that knowledge of participants regarding standard isolation precautions was very low; Tirivanhu found out that only 14 out of 50 nurses had excellent knowledge on infection control principle. Amoran found that an inadequate nurses' knowledge on infection control [23, 20, 24]. Furthermore, Eskander reported that approximately 64% of the nurses' knowledge level was unsatisfactory [25]. Alrubaiee study also revealed that the majority of the nurses had a poor level of knowledge [26].

The findings of the current study shows that more than half of the respondents had moderate skill of infection control practices with a mean score of 5.08 ±3.6. Tirivanhu study showed that only 21 out 50 did not utilize the infection control manuals 20. Furthermore, Haile study revealed that a low compliance rate with Standard Precautions in infection control [27].

The study further revealed that there was an increase in participant knowledge after intervention with mean gain 4.07 ±2.5 where the pre intervention mean score of 17.10 ± 2.1, and the post interventions mean score was 21.17 ±1.4. The possible reason for this finding could be the fact that intervention study on basic principles and recommendations of infection control and standards of practice could upgrade the knowledge of nurses. This is comparable with studies of Saffari, Bergström, Gomarverdi which reveal an improved participant knowledge of 17%, post-intervention increase, increase in knowledge from 15 ± 2.47 at pre-test to 19 ± 2.65 at post test respectively [21, 28, 29].

As regards the difference in Pre and post intervention skill of nurses on infection control, findings show that at the pre intervention, majority of the nurses practice skill on infection control was low with a mean score of 5.08 ±3.6, but at post intervention, majority of the respondent practice infection control high with a mean score of 9.48 ± 1.0. This means that there was an improvement in the nurses skill of infection control practices as evident in a mean gain of 4.39± 3.7, at a. pre intervention practice skill mean score 5.08±3.6 to post interventions practice skill mean score 9.48± 1.0. The findings is in line with Gomarverdi which reveal demonstrated an adherence increase from 19.87 ± 4.44 at pre-test to 29.20 ± 5.00 and 28.40 ± 4.37 at two and six weeks post-test, respectively [29].

The null hypothesis which stated that there is no significant difference between pre and post intervention knowledge mean score of nurses regarding infection control was rejected as Findings of the current study shows that there was a significant difference between pre and post intervention mean score knowledge of nurses regarding infection control t = -17.493, *p* ≤0.005. This is similar with studies of Gaikwad et al. Goyal and Chaudhry whose result reveal significant difference in the scores of pre-tests t = 22.162, *p* ≤0.005. Also the findings reported that the moderate percentage of test score increased significantly from 19.71% (pre-test score:

3.94 ± 2.3) to 76.69% (post-test score: 15.33 ± 2.4). The class-moderate normalized gain was 0.7097 (70.97%) [30, 31].

Findings of this study also observed that there was a significant difference between pre and post intervention practice skill mean score of nurses regarding infection control t= -12.519, $p \leq 0.005$. Hence, the null hypothesis which stated that there is no significant difference between pre and post intervention practice mean score of nurses regarding infection control was rejected. This is similar to findings of Farotimi who found that there is a significant difference in the mean practice score of infection control in their study [32].

V. Conclusion
It was concluded that the majority of the nurses had moderate knowledge about infection control measures, but they showed lack of skills prior intervention but was noted to increase significantly during post intervention. This denotes that continuous training and monitoring of nurses adherence to practice is of importance.

VI. Recommendations
The following recommendations were made based on the findings from this study:
1. Nurse managers need to be supervising the staff nurses on the practicing skills of infection control
2. There is need for nurse manager to monitoring nursing adherence to policies of infection control of the hospital.
3. The administration should make adequate provision for infection control tools in the hospitals.

Suggestions for Further Studies
Further studies in other regions or zones of the country are being recommended for generalization of findings. Further studies should be conducted on compliance to infection control practices among health workers.

VII. Implication to Nursing
The outcome of this study revealed that nurses had poor skills prior the intervention despite the fact that they have moderate knowledge which can predisposes healthcare workers and patient to an increased risk of infections thereby increases the morbidity and mortality rate therefore continuous refresher training and measure to compel implementation of infection control in the hospital will help even with the recent emergence of corona virus and other epidermic virus, it becomes imperative to adopt strict measures of infection control in hospitals.

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