

## KNOWLEDGE, UTILIZATION OF MATERIALS AND CONTROL MEASURES IN NOSOCOMIAL INFECTION IN SELECTED HEALTH CARE FACILITIES, EDO STATE, NIGERIA

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### Abstract

*Healthcare facilities are dangerous places for acquisition of nosocomial infections. As much as literature abounds on nosocomial infection in tertiary health care in Nigeria, there is a dearth of information on both secondary and primary health facilities. This study examines knowledge, utilization of materials and control measures of nosocomial infections in selected health facilities in Edo State, Nigeria. The study was a descriptive survey Design carried out in three Health Care Facilities (Primary, Secondary and Tertiary) in Edo State which are Central Hospital Benin, UBTH and Primary Health Centre Okada. The target population are the health personnel-Nurses and Doctors working in these Healthcare Facilities. Multi-Stage sampling technique was used to select 330 respondents from a total of 1293 in this study. The instrument used for this study are Qualitative and quantitative instrument consisting of three research tools named -key informant interview (KII) guide, observational methods and structured questionnaire. The method of data analysis includes Quantitative data analyzed using frequency tables, simple percentages and Chi-square, while qualitative data were analyzed using narration and content analysis. The result of this study shows that the demographic characteristics of respondents as follows, majority of respondents are between 30 – 39years, majority are females and are married, majority of respondents are nurses with less than 6years of experience and majority are Christians. Further findings showed that respondents are highly knowledgeable about the causes of nosocomial infection and nosocomial control measures. Also, this study shows that the respondents level of utilization of materials and control measures of nosocomial infections was low and the ones mostly used are making the environment clean and hygienic, use of anti-septic lotion in hand washing, use of aseptic techniques in invasive procedures, having an effective infection control program, having good lab back-up and use of Personal Protective Equipment (PPE) such as hand gloves, apron, mask etc, but the level of utilization of hospital policy on infection control is high in selected health facilities in Edo State, Nigeria. Therefore, this study advocated for encouragement in the utilization of materials and control measures to reduce the incidence of nosocomial infections in hospitals since people are more likely to patronize the primary and secondary healthcare.*

**Keywords:** Breastfeeding: Utilization: Control Measures: Healthcare Facilities.

### Introduction

Healthcare facilities whether hospitals, nursing homes or outpatient facilities can be dangerous places for the acquisition of infection, these infections are called nosocomial infections. The most common types of nosocomial infections are surgical wound infections, blood-borne infection, respiratory infections, genitourinary infections, as well as, gastrointestinal infections. These infections are often caused by breaches of infection control practices and procedures, unclean and non-sterile environmental surfaces and /or ill employees (EHA, 2017). Oli, Okoli, Ujam, Adjedu and Ezeobi, (2016) states that the occurrence and unwanted consequences of nosocomial infections have been known for several decades and the primary purpose of hospitals is to ensure that sick people recover from their illnesses. But this is not always so, because, sometimes illness gets complicated and healthy people gets infected in health care facilities. CDC (2014), states that a major

part of health care includes protecting patients from infections while they get medical care in hospitals, Nursing homes, clinics, home and other settings. Without this protection, infections themselves can become deadly, and strides made in modern medicine are greatly undermined.

The WHO establishes that the rate of nosocomial infection will continue to rise as a result of four factors which include – crowded hospital condition, new micro-organisms and increasing bacterial resistance (Samaila, Istifonus, Aliyu, Mohammed, Omoruyi and Haruna, 2015). In the same vein, Oli et al., (2016) opine that among the many factors responsible for the continued increase of hospital-acquired infections in hospitalized patients are – poor immune status of patients, extreme age, uses of medical procedures and/or invasive techniques. According to Adunwoke, (2016) ideally, a hospital should be among the

cleanest and most hygienic places. That patients who are in a vulnerable state, are likely to recover more quickly when shield from harmful germs and bacteria which could aggravate their conditions. Mbim, Mbot and Agbo, (2016) said that nosocomial infection developments are characterized by series of events and are often influenced by the microbe (inoculum, size and virulence), transmission route, micro-environment and patient's immune system.

WHO (2018) asserts that no one should catch an infection while receiving health care, yet hundreds of millions of people are affected every year leading to significant mortality and financial losses for health system. Immuno-compromised patients are connected with health care workers hand contamination in almost 40% of cases and are a challenging problem in modern hospitals (WHO, 2009). The source of an infection might be the host or the susceptible visitor and that there could also be a transmission medium, usually through blood and blood products. So most people get infected when they visit the hospital because the patient is infected with a particular disease and the visitor is susceptible. And that hospital needs to take precautions by telling visiting individuals what to do to avoid contracting infection, especially tuberculosis, HIV/AIDs etc. (Oni (in) Adunwoke, 2016). Nosocomial infection (or hospital-acquired infections (HALs) add to functional disability and emotional stress of patients and may in some cases lead to disabling conditions that reduce the quality of life. Nosocomial infections occur worldwide and affect both developed and resource-poor countries. Infections acquired in health care settings are among the major causes of death and increased morbidity among hospitalized patients. They are a special burden both for the patient and for public health (WHO, 2002). Effective infection prevention and control (IPC) is the cornerstone for the delivery of safe, effective, and high-quality health care (WHO, 2018).

Centre for Disease Control (CDC) (2016) explains that the most common pathogens that cause nosocomial infections are *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *E. coli*, but these infections are not just limited to bacterial, certain fungi such as *Candida Albicans* and *Aspergillus*, as well as, viruses such as respiratory syncytial virus and influenza have also been implicated in a number of hospital-acquired infection. Graham (2016) states that bacteria, fungi and viruses can cause nosocomial infections mainly. Ninety percent (90%) of cases are caused by bacteria, *Pseudomonas aeruginosa* accounts for 11% and has a high mortality and morbidity rate. He further states that bacteria, fungi and viruses spread mainly from person to person contact. This includes unclean hands and medical

instruments such as catheters, respiratory machines and other hospital tools. And that hospital-acquired infection cases also increase when there is an excessive and improper use of antibiotics and can lead to bacteria that are resistant to multiple antibiotics. According to McCaughey, (2015), hospitals are plagued by the deadliest hospital infection, Carbapenem-Resistant Enterobacteriaceae (CRE), which is highly resistant to antibiotics.

The CDC called this Superbug 'nightmare bacteria' because it kills up to 50% of infected patients. Most of these infections are gotten through oral-faecal contamination, meaning invisibly small particles of someone else's waste get into your mouth, through germs that lurk on bed rails, table top, faucet handles for weeks and patient touch these surfaces and eventually touch the mouth or food and swallow the germs. Being assigned to a hospital room where a *Clostridium difficile* patient was treated can be a death sentence and hospital staffs too often ignore the risk. He further opine that new research in the latest issue of critical care medicine shows Doctors and other hospital staff routinely ignore steps known to protect patients from infections such as putting on a mask and gown before doing certain procedures. That they have the knowledge to prevent infection, but they lack the 'will'. Rigorous cleaning is the answer to *Clostridium difficile*, cleaning surfaces around patients' beds once a day, with a bleach-wipe. But the terrifying news is that virtually all hospitals around the world are struggling with CRE and are making little progress.

Nosocomial infections control practices in hospitals remain rudimentary in the developing world, mostly due to severely limited resources. Reports of nosocomial or hospital-acquired infection rates in African countries are scarce, particularly at national level, however, several reports in the literature of the occurrence of HAI outbreak and hospital-wide prevalence surveys have revealed rates ranging between 2.5% and 14.8% (Ahoyo, Bankola, Adeoti, Gbohoun, Assavedo, Amoussou-Guenou, Kinde-Gazard and Pittet (2014). According to Ahoyo et al., (2014) nosocomial infections are a global problem in every hospital around the world. The quantification of HAI is needed to help justify resources dedicated to infection control. Recognition of the problem and its characteristics vary considered from country to country. Ige, Adesanmi, and Asuzu (2011), also said that the concern about hospital-associated infection is global, but in developing countries where the burden is estimated to be highest, information on surveillance activities in the prevention and control is not often available. And that in Nigeria, the inadequate knowledge of the risk of hospital-

associated infection and the measures of risk reduction have limited control activities.

Samuel, Kayode, Musa, Nwigure, Alodein, Salami and Taiwo (2010) observe that most hospitals in developing countries especially Africa have no effective infection control program due to lack of awareness of the problem, lack of personnel, poor water supply, erratic electricity supply, ineffective antibiotic policies in the emergence of multiple antibiotic-resistant microbes, poor lab back-up, poor funding and non-adherence to safe practices by health workers. They further state that the prevalence of healthcare-associated infections in developing countries varies from 5.7% to 19.1% with a pooled prevalence of 10.1 per 100 patients and most reported resources note the proportion of infected patients higher than 10% with a pooled prevalence of affected patients are 10.2% per 100 patients. The most frequent hospital-associated infections are Urinary Tract Infections (UTI), Surgical-site wound, lower respiratory tract infections and so on. Hospital-acquired Urinary Tract Infection (UTI) has shown to contribute immensely to nosocomial infection in some part of northern Nigeria, causing about 43% of the UTIs (Oli et al., 2016).

Mishra, Banergee and Gosain (2014) posit that healthcare-associated infections occur in relation to health care interventions including invasive, diagnostic, surgical and medical procedure. For example, in India, a nosocomial infection affects approximately 2 million patients annually in acute facilities and their annual patient care costs several millions of rupees in India. Also, the incidence of nosocomial infection varies according to the settings, that is, the type of hospital or ward, the population of patients and the precise definition used such as Intensive Care Unit (ICU), nosocomial pneumonia etc. CDC (2016), state that modern healthcare employs many types of invasive devices and procedures to treat patients and to help them recover. Infection can be associated with the devices used in medical procedures such as catheters and ventilators. These associated infections include central line-associated bloodstream infections, catheter-associated urinary tract infections, ventilator-associated pneumonia infection may also occur at surgery sites known as surgical site infection.

Mishra et al. (2014) reveal that the hospital management is responsible for the provision of a safe environment for patients, staff and visitors also ensuing management support and allocation of appropriate resources for effective prevention, monitoring and control of infection. Studies have shown that nearly 113 nosocomial infections can be prevented by a well - organized infection control

program. But only less than 10% are actually prevented. According to WHO, (2008), Effective infection prevention and control reduces healthcare-associated infection by at least 30%. WHO (2016), Hospital Associated Infections (HAIs) comprise occupational infections among the medical staff and that risk factors determining nosocomial infections depends upon the environment in which care is delivered, the susceptibility and condition of the patient and the lack of awareness of such prevailing infections among staff and health care providers, poor hygiene condition and inadequate waste disposal from healthcare settings.

Healthcare waste as an important source of hospital-acquired infection should be considered as a reservoir of pathogenic microorganisms which can cause contamination and give rise to infection if the waste is inadequate. Infectious waste contributes in this way to the risk of nosocomial infections, putting the health of hospital personnel and patients at risk (Mishra et al. (2014). Nosocomial infection control is not simply a matter of encouraging hand hygiene in settings where clean water, soap may not be consistently available, neither is infection control a matter of providing supplies of materials to health care workers who are not trained to use them properly (WHO, 2010). Mishra et al. (2014) also opine that the aim of the hospital infection control program is the dissemination of information surveuately managed. According to the WHO (2016), hospital waste serves as a potential source of pathogens and about 20%- 25% of this waste is termed hazardous, and microorganism can be transmitted by direct contact, air or by a variety of vectors. illance activities, investigation, prevention and control of nosocomial infection in the hospital. Samuel et al. (2012), stated that nosocomial infections pose a problem of enormous magnitude globally and that, hospital localities have proven favourable in transmitting infections due to the existing suitable pathogen-host-environment relationship.

The significance of nosocomial infection lies not only in its ability to substantially alter morbidity and mortality statistics but also in its economic implications. Nosocomial infection prolongs the duration of hospitalization, increases the cost of healthcare, the emergence of multiple antibiotic-resistant microorganisms and reduces the chances of treatment for others. Allegranzi and Pittel (2008) explained that in developing countries the magnitude of the problem remains underestimated or even unknown largely because hospital-acquired infection (HAI) diagnosis is complex and surveillance activities to guide intervention require expertise and resources. Surveillance system exists in some developed

countries and provides regular reports on national trends of endemic HAI such as the national hospital infection surveillance system; the German hospital infection surveillance system. This is not the case in most developing countries because of the social health care system deficiencies that are aggravated by the economic problem.

Also, overcrowding and understaffing in hospitals results in inadequate infection control practices and a lack of infection control policies, guidelines and trained professionals also adds to the extent of the problem (Sepideh, 2011). In the 21st century, it is unacceptable that a person, who is ill, runs the additional risk of acquiring an infection while seeking respite from his present ailment. Hospital-acquired infections are thus a major patient safety issue as a cause of preventable illness and death (Ige et al., 2011). In a study conducted in Edo state, Nigeria on the role of door handles in the spread of microorganisms, the finding suggests that hospital door handles harbour a significant variety of pathogenic microorganism of public health value and thus could act as potential fomites for communicable disease dissemination. The surface of door handles of the general toilet, paediatric ward, theatre ward generally have the highest viable bacterial counts (Odigie, Ekahiase, Orjiakor and Omozuwa, 2017). On the basis of the literature, this study is designed to investigate the knowledge, utilization of materials and the control measures of nosocomial infections in healthcare facilities in Edo State.

Nosocomial refers to the association between care and the subsequent onset of infection (Alemu, Bezune, Joseph, Ebru, Ayene and Tamene, 2015), in community and health care setting. Hospitals as health care setting provide a favourable transmission pathway for the spread of nosocomial infection, owing partly to poor infection control practices among health workers and overcrowding of patients in most clinical settings (Bello, Asiedu, Adegoke, Quartey, Appiah- Kubi and Owsu- Anasah, 2011). The causes of nosocomial infection in hospital or health facilities are patients prone, although studies carried out have also alleged health workers. This is because most patients that come in to the hospitals carry microbial agents and resident flora. In the bid of care, health workers also breach infection control practices which may lead to nosocomial infection contraction and transmission. For example, issues such as puerperal sepsis after delivery, hepatitis B, HIV/AIDs, when in contact with body fluid, have occurred in patients and health workers in the course of treatment and health services.

On the knowledge of health personnel in the control of nosocomial infection, it appears as if some health

workers did not have adequate knowledge of the infection because some are even the carriers of this communicable disease and are not often screened from time to time. Moreover, some of the health personnel do not use Personal Protective Equipment (PPE) such as hand gloves, apron, mask etc, in the discharge of their duties for self-protection and that of the patients. This calls for worry, whether they have adequate knowledge or not. There are certain control measures that need to be put in place in order to prevent nosocomial infection, such as the PPE, running tap and sink in strategic places, materials for hand washing and ward maintenance, antibiotic policies among others. However, most of these health care facilities lacks water supply, running taps and adequate sinks. They are also characterized by poor hand hygiene, indiscriminate antibiotic use, poor waste disposal and dirty environment. Hospital policies for nosocomial infection control will be researched in this work, this is to ascertain whether there are hospital policies for nosocomial infection control or not. Although literature did affirm that policies exist, our concern may now be on the implementation of such policies. In the light of the above, the researcher seeks to investigate the knowledge, utilization of materials and control measures in nosocomial infection in health care facilities in Edo State.

#### **Objectives of the study**

1. To investigate the knowledge on the causes of nosocomial infection in health care facilities.
2. To assess the level of knowledge of health personnel about nosocomial infection control measures in the health facilities.
3. To determined utilization of materials and control measures of nosocomial infections in selected health facilities in Edo State, Nigeria.
4. To identify the level of utilization of hospital policy on infection control

#### **Methodology**

The study adopts a descriptive survey design. The study was carried out in three healthcare Facilities (Primary, Secondary and Tertiary) in Edo State, Central Hospital, Benin City in Oredo Local Government Area, UBTH and primary health centre, Okada in Ovia North - East Local Government Area. These settings were ideal for the study due to the fact that the three levels of healthcare delivery systems were represented. It will help to identify variables of interest such as funding by the three tiers of government, how health materials and equipment are utilize and other resources such as manpower to correlate how Nosocomial Infection are tackle in the various levels.

The University of Benin Teaching Hospital (UBTH), is located in Ovia North-East Local Government Area, in Edo State, Nigeria. UBTH as a tertiary health institution is involved in research, training and curative services. The University of Benin Teaching Hospital is situated along Benin- Lagos High Way in Ugbowo Quarters. It shares a boundary with the main campus of University of Benin, its other boundaries are the Federal Girls College Road and Ikpoba River, in Benin City. It was founded in 1973 with 360 bed wards, but now has facilities for over 900 in-patients. It was taken over by the federal government on 1st April 1975. It is headed by a Chief Medical Director, a rotational position for competent hands. As a tertiary facility, it is one of the old generation teaching hospitals in Nigeria and serve as referral for expert management of most disease conditions in the defunct Midwestern area. It is a referral hospital acknowledged as a centre of excellence and is being funded by the Federal Government. It offers over 28 medical services to the population. It has about 800 Nursing personnel and 300 Doctors both consultants and registrars and other health personnel cadre and administrative staff. It has about 8 training health Institutions and many areas of specialties such as Virology, Oncology, Haematology, In-vitro Fertilization (IVF), Gynaecology etc.

Ovia North-East is one of the local government areas of Edo State, Nigeria. Okada being the headquarter has an area of 2.301 km<sup>2</sup> and a population of 153,849 as at the 2006 census. Okada is a town in Ovia North- East Local Government Area of Edo State. It consists of 17 villages. Okada Health Centre is located at maternity Road and it serve the people around it and refer patients above their capacity to secondary health care facilities. It has a visiting Doctor, Nursing personnel and other health assistants. It runs a 24 hours services where minor ailments are treated, delivery of pregnant women and immunization of under-five children. It is a four (4) bed facility with dispensary and semi-laboratory services.

Central hospital is a government hospital located in the centre of Benin, on Sapele road, few kilometers from the city centre. The hospital can be accessed from either the ring road or any of the adjoining roads and is within close proximity of the Benin city Airport and Oba-Palace. Central hospital is a secondary level health care that renders high quality health care services in response to the changing demands for efficient, effective and affordable treatment, rehabilitation and preventive health care programs. The hospital was created in 1902 by the then colonial masters, which was owned by the British government before the independence and the head-quarter was then at Ibadan. Midwest state was created in 1963

and the head-quarter was moved to Benin City and was under the Ministry of health till 1970 when an Edit now established Hospital management Board by the Military under Ogbemudia's regime. Edo state hospital management board was the 1st to be established in Nigeria. At this time, the ministry of health was for prevention while curative was handed over to Hospitals Management Board. The training of personnel such as student Nurses, Midwives and school health technology were under the supervision of ministry of health. Central Hospital first name was General Hospital. It was changed to Specialist Hospital in the early 70s, thereafter, it metamorphosed to Central Hospital in the 80s. The hospital is made up of various department to render specialized care to patient and clients that need health care services. It is a centre for curative health care and training of health personnel in various discipline, it has 251 beds.

The health personnel-Nurses and Doctors 1293 working in these healthcare facilities formed the population of this study. UBTH: 737 nurses, 214 doctors; Central Hospital Benin: 165 nurses, 97 doctors; Primary Healthcare Centre, Okada: 78 nurses, 2 doctors. The sample size of 330 was determined using Slovin's formular of Ryan (2013). Multistage sampling technique was used in this study.

**Stage I:** A non- probability sampling method using purposive selection of the three healthcare facilities located within the Benin metropolis and Okada. This method was necessary based on the nature of duty of health personnel, who are either on shift duty or on call duty.

**Stage II:** Cluster sampling was used to select primary, secondary, and tertiary health care level.

**Stage III:** participants were randomly selected from of each health care level selected. Approximately 4% of each level population was taken. UBTH: 170 nurses, 80 doctors; Central Hospital Benin, 44 nurses, 23 doctors; Primary Health Care Centre: 17 nurses, 2 doctors. However, ethical clearance was given in order to access respondents. Introduction was done and questionnaire was distributed to any doctor or nurse met on duty until sample size was obtained. Key interview was conducted in the various respondent's office.

Qualitative and quantitative instrument was used. These research tools were key informant interview (KII) guide, observational methods and structured questionnaire. The key informant interview (KII) participants were purposively selected among the senior executive healthcare practitioners from the three levels of health care. The structured

questionnaire was distributed purposively among the Nursing staff and Doctors at their duty post.

Key informant interview (KII): These are qualitative in-depth interview with respondents who know about the management of the hospital. The purpose of KII here was to collect information from health experts in managerial position with particular reference to hospital policies and program. Those that were selected purposively included the representatives of the Medical Director/ Chief Medical Director of these hospitals, and Nursing administrators in these hospitals. Key informant interview was conducted to ascertain management position in the control of nosocomial infection in the hospitals, while depth interview was conducted on some participants in their respective offices. Observations: Physical behaviour and practices during procedures was determined. Their surrounding environment was also observed in terms of cleanliness, renovations and waste disposal technique adopted by management.

Questionnaire was also used to obtain information on personal bio-data, knowledge, utilized materials and control measures for nosocomial infection. The questionnaire was administered to Nurses and Doctors who were on duty in the selected study areas during the period of distribution and were retrieved almost immediately. The duration for this study was eight weeks. Administration of Data Collection Instrument: A letter of introduction was obtained from the Head of department of Sociology and Anthropology, College of Arts and Social Sciences, Igbinedion University, Okada, to the Medical Director Central Hospital, Benin City, Chief Medical Director, UBTH, Benin City and PHC Coordinator, Okada Ovia North- East. This enabled the researcher to interview and also distributes questionnaires among respondents. The respondents' consent was obtained after due explanations of the nature and purpose of the study. Ethical clearance certificate was obtained from management of UBTH and Central Hospital, Benin City before the conduct of the study. Reliability of instrument was ascertained.

**Results**

The respondents are between the ages of 20 to 65 years of age. The group of 30 – 39 years are with highest number 40%, while the least group between 50 and 65 years are 13.6%, female respondents are highest 72.7%, while male 27.3%. Majority of the respondent are married are 65.5%, single are 32.7%, while separated and divorced are 0.9%. Among the sets of research subjects (Nurses and doctors), majority are from the Nursing profession are 68.2%, while Doctors are 31.8%. In years of experience among the respondents, majority of respondents hold between 6 – 15 years are 42.4% less than 5 years are 33.3%, 16 – 25 years are 11.2%. Among the

respondents, Christianity have the highest in religious group: are 93.0%, Traditional are 5.5% while are 1.5%were Muslim. In the level of health care delivery system tertiary level care has the highest respondent of 76.1%, followed by the secondary health care are 18.8%, while primary level of health care is 5.2%. This study concludes that the demographic characteristics reveal that the age of majority of respondents are between 30 – 39years, majority are females and are married. The study also shows that majority of respondents are nurses with less than 6years of experience and majority are Christians.

**Table 1:** Socio-demographic characteristics of respondents

Characteristics	N	%
Age		
20-29years	90	27.3
30-39years	132	40.0
40-49years	63	19.1
50years and above	45	13.6
Total	330	100.0
Gender		
Male	90	27.3
Female	240	72.7
Total	330	100.0
Marital Status		
Single	108	32.7
Married	216	65.5
Separated	3	.9
Divorced	3	.9
Total	330	100.0
Profession		
Nurse	225	68.2
Doctor	105	31.8
Total	330	100.0
Years of Experience		
Less than 6years	110	33.3
6-15years	140	42.4
16-25years	37	11.2
16-30years	43	13.0
Total	330	100.0
Religion		
Christianity	307	93.0
Muslim	5	1.5
Traditional	18	5.5
Total	330	100.0
Delivery Service		
Primary	17	5.2
Secondary	62	18.8
Tertiary	251	76.1
Total	330	100.0

**Objective one**

To investigate the knowledge on the causes of nosocomial infection in health care facilities.

Table 2 reveals that 91% of respondents agree that nosocomial infections are hospital-acquired infections

while 9% did not. 97% of the respondents agree that hospitals, nursing homes or outpatient facilities can be dangerous places for the acquisition of infection while 3% did not. About 85.5% of the respondents agree that the most common types of nosocomial infections are surgical wound infections and blood-borne infection while 14.5% did not. 85.5% of the respondents agree that other types of nosocomial infections include respiratory infections, genitourinary infections as well as gastrointestinal infections while 14.5% did not. This study further observes that 95.5% of respondents agree that nosocomial infections are often caused by breaches of infection control practices and procedures while 4.5% disagree. It also observes that 91.5% of the respondents agree that nosocomial infections are also caused by unclean and non-sterile environmental surfaces and /or ill employees while 8.5% disagree. 80% of the respondents agree that the occurrence and unwanted consequences of nosocomial infections ensure that sick people do not recover quickly from their illnesses while 20% disagree.

This study further observed that 85% of the respondents agreed that bacteria, fungi and viruses can cause nosocomial infections while 15% disagree. This study also shows that 75.5% of the respondents agree that nosocomial infection developments are characterized by series of events influenced by the microbe transmission route, micro-environment and patient’s immune system while 24.5% disagree. 80% of the respondents agree that bacteria, fungi and

viruses causing nosocomial infection spread mainly from person to person contact while 20% disagreed. 93% of the respondents agree that causes of nosocomial infection include unclean hands and medical instruments such as catheters, respiratory machines and other hospital tools while 7% did not. 92.5% of the respondents agree that hospital-acquired infections cases also increase when there is an excessive and improper use of antibiotics and can lead to bacteria that are resistant to multiple antibiotics while 7.5% did not. This study further observes that 58% of respondents agree that factors responsible for the continued increase of hospital-acquired infections in hospitalized patients are – poor immune status of patients, extreme age, uses of medical procedures and/or invasive techniques while 42% did not. 60.5% of the respondents agree that patients who are in a vulnerable state, are likely to recover more quickly when shield from harmful germs and bacteria which could aggravate their conditions while 39.5% do not. 56.5% of the respondents agree that healthcare waste as an important source of hospital-acquired infection while 43.5% do not. 97% of the respondents agree that healthcare waste should be considered as a reservoir of pathogenic microorganisms while 3% do not. 85.5% of the respondents agree that healthcare waste can cause contamination and give rise to infection while 14.5% do not. This study implies that respondents are highly knowledgeable about the causes of nosocomial infection. (83%).

**Table 2:** Knowledge of causes of Nosocomial Infection

SN	ITEMS	YES	NO
1	Nosocomial infections are hospital-acquired infections	300(91%)	30(9%)
2	hospitals, nursing homes or outpatient facilities can be dangerous places for the acquisition of infection	320(97.0%)	10(3.0%)
3	The most common types of nosocomial infections are surgical wound infections and blood-borne infection.	282(85.5%)	48(14.5%)
4	Other types of nosocomial infections include respiratory infections, genitourinary infections as well as gastrointestinal infections.	282(85.5)	48(14.5%)
5	nosocomial infections are often caused by breaches of infection control practices and procedures.	315(95.5%)	15(4.5)
6	nosocomial infections are also caused by unclean and non-sterile environmental surfaces and /or ill employees	302(91.5%)	28(8.5)
7	The occurrence and unwanted consequences of nosocomial infections ensured that sick people do not recover quickly from their illnesses.	264(80%)	66(20%)
8	bacteria, fungi and viruses can cause nosocomial infections	280(85.0%)	92(15.0%)
9	nosocomial infection developments are characterized by series of events influenced by the microbe transmission route, micro-environment and patient’s immune system.	249(75.5%)	81(24.5%)
10	Bacteria, fungi and viruses causing nosocomial infection spread mainly from person to person contact.	264(80%)	66(20%)
11	Causes of nosocomial infection includes unclean hands and medical instruments such as catheters, respiratory machines and other hospital tools.	307(93.0%)	23(7.0%)
12	hospital-acquired infections cases also increase when there is an excessive and improper use of antibiotics and can lead to bacteria that are resistant to multiple antibiotics	305(92.5%)	25(7.5%)

13	factors responsible for the continued increase of hospital-acquired infections in hospitalized patients are – poor immune status of patients, extreme age, uses of medical procedures and/or invasive techniques.	191(58.0%)	139(42.0%)
14	That patients who are in a vulnerable state, are likely to recover more quickly when shield from harmful germs and bacteria which could aggravate their conditions.	200(60.5%)	130(39.5%)
15	Healthcare waste as an important source of hospital-acquired infection	186(56.5%)	144(43.5%)
16	Healthcare waste should be considered as a reservoir of pathogenic microorganisms.	320(97.0%)	10 (3.0%)
17	Healthcare waste can cause contamination and give rise to infection	282(85.5%)	48(14.5%)
	Total	82.9%	17.1%

The qualitative data showcase some finding on the causes of nosocomial infection in selected health care facilities in Edo State. Participants held their views, one participant from the primary health care said:

Non-sterile technique for invasive procedures, inadequate hand washing, non-use of personal protective equipment such as glove, patient to patient transmission, health workers to patient are responsible for transmissions of nosocomial infections in hospitals **(IDI, Female Senior Nurse, Primary health care)**.

The counterpart in the secondary health care responded thus:

Poor hand washing, poor personal hygiene, over-crowding of pts on the ward affects sterile utilities, non-use of aseptic technologies for invasive procedure, poor environmental condition/ waste disposal **(IDI, Female1 Senior Nurse, Secondary health care)**.

Similarly, another senior nurse affirm that:

Although, nosocomial infections are caused by micro-organism, but other factor potentiate its occurrence, such as patient to patient colonies; when health workers do not wash their hands thoroughly before touching other patients and carrying out procedures. Also, non -use of sterile materials/equipment in invasive procedure. For example, carrier personnel may infect patient, over-crowding of the ward, poor ward sanitation and poor environmental sanitation **(IDI, Female2 Senior Nurse, Secondary health care)**.

One doctor also attests to the causes of nosocomial infection, he said that:

Any organism strain from patients to patients, health work to patient, patients’ visitors or relation, over- crowded ward, Dust from doors, non-use of Isolation/ Barrier nursing adequately may result in nosocomial infection **(IDI, Male Doctor, Secondary health care)**.

In the tertiary health care, one participant affirmed what both primary and secondary health care

participants earlier said. According to her nosocomial infection can be transmitted by:

Medical personnel, Patients relation during visiting can transmit from their colony, poor hand washing technique, poor method sterilization of instrument is all liable in nosocomial infection. **(IDI, Female Senior Nurse, Tertiary health care)**.

**Objective two**

To assess the level of knowledge of health personnel about nosocomial infection control measures in the health facilities.

Table 3 shows that 96.1% of the respondents agree that working in the cleanest and most hygienic environment is a control measure for nosocomial infection while 3.9% do not, 65.8% of the respondents agree that isolation/barrier nursing of patients, use of anti-septic lotion in hand washing, aseptic techniques in invasive procedures are control measures while 34.2% do not, 39.7% of the respondents agree that nursing of all patents in open ward is a control measure while 60.3% do not, 38.2% of the respondents agree that the use of septic techniques in invasive procedures is a control measure while 61.8% do not.

Also, the study shows that 28.5% of the respondents agree that educating patients’ visitors what to do to avoid infection is a control measure while 71.5% disagree. 65.8% of respondents agree that avoiding excessive and improper use of antibiotics is a control measure while 34.2% disagree. 72.1% of the respondents agree that avoiding contamination of instruments as a control measure while 27.9% disagree. 86% of the respondents agree that having an effective infection control program is a control measure while 14% disagree. Furthermore, this study shows that 97% of the respondents agree that having good lab back-up is a control measure while 3% did not agree. 63% of the respondents agree that having good funding is a control measure while 37% did not agree. 83.9% of the respondents agree that adhering to safe practices by health workers is a control measure while 16.1% did not agree. 95.2% of the



respondents agree that healthcare facilities employing many types of invasive devices and procedures to treat patients is a control measure while 4.8% did not. 18.5% of the respondents agree that having safe environment and adequate waste disposal from healthcare settings is a control measure while 81.5% did not agree.

This study further shows that 71.2% of the respondents agree that the health personnel using Personal Protective Equipment (PPE) such as hand gloves, apron, mask and so on, in the discharge of their duties for self-protection and that of the patients are control measures while 28.8% of the respondents disagree. 83.9% of the respondents agree that there

are certain control measures that need to be put in place in order to prevent nosocomial infection, such as running tap and sink in strategic places are control measures while 16.1% of the respondents disagree. 72.4% of the respondents agree that other control measures that need to be put in place in order to prevent nosocomial infection includes materials for hand washing and ward maintenance, antibiotic policies while 27.6% of the respondents agree. 96.1% of the respondents agree that there should be infection control policies, guidelines and trained professionals as a control measure while 3.9% of the respondents disagree. From this study, the respondents are knowledgeable on the nosocomial control measures. (69%)

**Table 3:** Level of knowledge of nosocomial control measures

Control of Nosocomial infection among patients/staff is by.		YES	NO
1	Working in the cleanest and most hygienic environment	317(96.1%)	13(3.9%)
2	Isolation/barrier nursing of patients, use of anti-septic lotion in hand washing, aseptic techniques in invasive procedures	277(65.8%)	53(34.2%)
3	Nursing of all patents in open ward	131(39.7%)	199(60.3%)
4	Use of septic techniques in invasive procedures	126(38.2%)	204(61.8%)
5	Educating patients' visitors what to do to avoid infection	94(28.5%)	236(71.5%)
6	Avoiding excessive and improper use of antibiotics.	217(65.8%)	113(34.2%)
7	Avoiding contamination of instruments	238(72.1%)	92(27.9%)
8	Having an effective infection control program	284(86%)	46(14%)
9	Having good lab back-up.	320(97.0%)	10(3%)
10	Having good funding.	208(63.0%)	122(37%)
11	Adhering to safe practices by health workers.	277(83.9%)	53(16.1%)
12	Healthcare facilities employing many types of invasive devices and procedures to treat patients	314(95.2%)	16(4.8%)
13	Having safe environment and adequate waste disposal from healthcare settings.	61(18.5%)	269(81.5%)
14	The health personnel using Personal Protective Equipment (PPE) such as hand gloves, apron, mask etc. in the discharge of their duties for self-protection and that of the patients	235(71.2%)	95(28.8%)
15	There are certain control measures that need to be put in place in order to prevent nosocomial infection, such as running tap and sink in strategic places.	277(83.9%)	53(16.1%)
16	Other control measures that need to be put in place in order to prevent nosocomial infection includes materials for hand washing and ward maintenance, antibiotic policies.	239(72.4%)	(27.6%)
17	There should be infection control policies, guidelines and trained professionals.	317(96.1%)	(3.9%)
Total average		69%	31%

The qualitative data buttress the fact that participants' level of knowledge on the infection control measures is high. Participants from primary health care observe that they acquire their knowledge on nosocomial infection 'during training at school and at subsequent seminar'. The secondary health care did not differ in anyway, but the tertiary health care adds a little more comprehension as the participants explain how they acquire the knowledge. She said 'they have the knowledge as they are trained and skillful nurses. In-service training is organized for those not trained in UBTH'

### Objective three

To determined utilization of materials and control measures of nosocomial infections in selected health facilities in Edo State, Nigeria.

From Table 4, this study shows that 56.1% of the respondents agree that making the environment clean and hygienic is a control measure used while 43.9% do not. 91.2% of the respondents agree that the use of anti-septic lotion in hand washing is used as a control measure while 8.8% do not. 19.4% of the respondents agree that isolation/barrier nursing of patients is a control measure used while 80.6% do not. 80.6% of the respondents agree that the use of aseptic techniques in invasive procedures while 19.4% do not. 43.9% of respondents agree that

nursing of all patents in open ward is a control measure used while 56.1% do not. This study also shows that 33% of the respondents agree that educating patients’ visitors on what to do to avoid infection is a control measure used while 67% do not. 46.9% of the respondents agree that avoiding excessive and improper use of antibiotics is a measure used while 53.1% do not. 32.7% of the respondents agree that avoiding contamination of instruments is an infection control method while 62.3% do not. 97.9% of the respondents agree that having an effective infection control program is an infection control method while 2.1% do not. 94.2% of the respondents agree that having good lab back-up is an infection control method while 5.8% do not.

Furthermore, 12.1% of the respondents agree that having good funding is an infection control method while 87.9% of the respondents disagree. 15.2% of the respondents agree that adhering to safe practices by health workers is an infection control method while 84.8% of the respondents disagree. 48.2% of the respondents agree that employing many types of invasive devices and procedures to treat patients is an infection control measure while 51.8% of the respondents disagree. 31.2% of the respondents agree that having safe environment and adequate waste disposal from healthcare settings is an infection control measure while 68.8% of the respondents disagree. 93% of the respondents agree that the use of Personal Protective Equipment (PPE) such as hand gloves, apron, mask etc is an infection control measure while 7% disagree. 47% of the respondents

agree that self-protection and that of the patients are infection control measures while 53% of the respondents disagree.

Also from this study, 37% of respondents agree that running tap and sink in strategic places is an infection control measure while 63% of the respondents did not agree. 20.9% of the respondents agree that materials for hand washing and ward maintenance, antibiotic policies are infection control measures while 79.1% of the respondents did not agree. 13.9% of the respondents agree that infection control policies, guidelines and trained professionals are infection control measures while 86.1% of the respondents did not agree. 11.5% of the respondents agree that treatment starting before laboratory investigation is an infection control measure while 88.5% of the respondents did not agree. 14.2% of the respondents agree that hospital fumigation is an infection control measure while 85.8% of the respondents did not agree. 14.8% of the respondents agree that hospital renovation is an infection control measure while 85.2% of the respondents did not agree. This study implies that the level of utilization of infection control materials is low (43.4%) and the ones mostly used are making the environment clean and hygienic, use of anti-septic lotion in hand washing, use of aseptic techniques in invasive procedures, having an effective infection control program, having good lab back-up and use of Personal Protective Equipment (PPE) such as hand gloves, apron, mask etc.

**Table 4:** The level of Utility of Infection Control Materials and Types by Health Workers

	YES	NO
1 Making the environment clean and hygienic	185(56.1%)	145(43.9%)
2 Use of anti-septic lotion in hand washing.	301(91.2%)	29(8.8%)
3 Isolation/barrier nursing of patients.	64(19.4%)	266(80.6%)
4 Use of aseptic techniques in invasive procedures	266(80.6%)	64(19.4%)
5 Nursing of all patents in open ward	145(43.9%)	185(56.1%)
6 Educating patients’ visitors what to do to avoid infection	109(33.0%)	221(67%)
7 Avoiding excessive and improper use of antibiotics.	155(46.9%)	175(53.1%)
8 Avoiding contamination of instruments	108(32.7%)	222(67.3%)
9 Having an effective infection control program	323(97.9%)	7(2.1%)
10 Having good lab back-up.	311(94.2%)	19(5.8%)
11 Having good funding.	40(12.1%)	290(87.9%)
12 Adhering to safe practices by health workers.	50(15.2%)	280(84.8%)
13 Employing many types of invasive devices and procedures to treat patients	159(48.2%)	171(51.8%)
14 Having safe environment and adequate waste disposal from healthcare settings.	103(31.2%)	227(68.8%)
15 Use of Personal Protective Equipment (PPE) such as hand gloves, apron, mask etc.	307(93.0%)	23(7.0%)
16 Self-protection and that of the patients	155(47.0%)	175(53.0%)
17 Running tap and sink in strategic places.	122(37.0%)	208(63.0%)
18 Materials for hand washing and ward maintenance, antibiotic policies.	69(20.9%)	261(79.1%)
19 Infection control policies, guidelines and trained professionals.	46(13.9%)	284(86.1%)
20 Treatment start before laboratory investigation.	38(11.5%)	292(88.5%)
21 Hospital fumigation.	47(14.2%)	283(85.8%)
22 Hospital renovation.	49(14.8%)	281(85.2%)
	<b>43.4</b>	<b>56.6</b>

It is important to note that one aspect used in the control of cross infection is not enough as hand hygiene, Aseptic technique, Isolation/Barrier Nursing and even adequate bed spacing are very vital in the control of nosocomial infection. Aitken and Jeffries (2001) attribute poor hygiene practice to nosocomial infection. Revelas (2012) also opine that nosocomial infection or hospital acquired infection caused by bacterial or fungi pathogens have a predisposition to infection caused by invasive supportive measures such as endotracheal intubation and placement of intravascular lines and urinary catheters. So the use of aseptic technique before use of instrument is one of the methods of control of cross infection. Graham (2016) attributes limited Isolation facilities to cross infection since all patients will be nursed in the same open ward without barrier nursing activities.

Parveen, (2011) attributes puerperal infections contraction with carelessness regarding hand washing, break in aseptic technique and Hussein *et al* (2011), also assert that puerperal sepsis (infection) are often introduced when the birth attendants(health personnel) conducts invasive procedure such as vaginal examination, instrumental or caesarean section (c/s) and that this puerperal sepsis is introduced during childbirth with poor infection control, but manifests in the postpartum within the first 42 days after delivery.

On how often Hospital is renovated: 25.5% agree every year, 28.2% every 5 years, 4.5% every 10 years while 22.7% agree on more than 10 years. Most primary and secondary level of care are usually not renovated in decades and with insanitary environment based on site observation, but the tertiary level of care is fairly renovated. According to Mehta *et al* (2014), consider environmental cleaning and disinfection by fumigation, especially to avert surgical site contamination with air and water borne microbes. (Wang *et al*, 2010). Leung, Chan (2006), started that WHO recommends that operation theatres and delivery rooms should have a positive air pressure control and a total air change rate of 15 air changes per hour. So hospital, their theatres, delivery room should be renovated from time to time to prevent nosocomial infection. According to WHO (2002), Health care settings are an environment where both infected persons and persons of increased risk of infection congregate. In line with this fumigation of hospital at regular intervention will help combat transmission of insect borne diseases such as malaria.

On method of waste management 21.8% agree on open dumping only, 41.5% the use of incineration, 3.6% said segregation/sand fill, 4.8% said by buying only, while 13.6% agree on segregation/sand fill and

by buying. This later one is the ideal method of hospital waste disposal. The percentage 21.8% that agree on open dumping may have their environment fitly with hazards from and breeding place for rodents and infection carrying insects like flies, mosquitoes, and so on. These may find their way into the ward and infect patient and blood. Also environmental pollution in areas where wastes are dumped, Mishra *et al* (2014), assert that "health care waste as an important source of hospital acquired infection and should be considered as a reservoir of pathogenic microorganisms which can be transmitted by direct contact, air or by a variety of vectors. He further observes that infectious wastes contribute in this way to the risk of nosocomial infections putting the health of hospital personnel and patients at risk.

On Management screening and immunizing medical staff against communicable diseases 39.7% note that they have no screening, 17.0% says yearly, 13.6% says every 5 years, 5.5% says every 10 years. It is pertinent to note that higher percentage of health personnel are neither screened nor immunized against communicable disease, so they are exposed to nosocomial infections in the course of service rendered to patient increasing the percentage of nosocomial infections worldwide. According to William (1998) hospital personnel are at risk of exposure to and possible transmission of vaccine-preventable disease because of their contact with patients or materials from patients with infection. Maintenance of immunity is an essential part of a hospital's personnel health and infection control program. He further observes that it is important that all institutions have a screening program.

#### Objective four

To identify the level of utilization of hospital policy on infection control

Qualitative data further explain the control of nosocomial infection as viewed by the participants. In the primary health care the participant affirmed thus:

*To control nosocomial infection, we must use sterile instrument, ensure environment is clean. Thorough hand washing despite no tap and running water, improvising where materials are inadequate. The use of hand gloves despite other PPE measures. Then refuse are to be disposed adequately by burning and burying at the back yard of the facility (IDI, Female Senior Nurse, Primary health care).*

The participant from secondary health care is also in agreement, but further stresses the needs. She says: *there supposed to have adequate bed spacing but none in the facility as a facility attend to more than enough clients/patients all through*

*the year. No renovation nor fumigation of hospitals. There supposed to be adequate running taps for washing and scrubbing but hospitals become short of these facilities. No adequate materials /equipment for barrier nursing. No central unit for sterilization of instruments. Faulty sterilizing unit abound. Hospitals does not provide adequate PPE. Poor waste disposal as there are no designated cellophane for segregation (IDI, Female<sup>1</sup>Senior Nurse, Secondary health care).*

In the same line of thought, the doctor in the secondary health care responds that:

*There is practicable control such as hand washing, aseptic procedures, and no contact with patients without washing hands. PPE are supposed to be provided by government but sometimes is in short supply (IDI, Male Doctor, Secondary health care).*

However, the tertiary health care has adequate measures of infectious control, this may be probably because of adequate funding compared to primary and secondary health care.

*We use hand washing technique with facilities on ground that enable it. Sink and running tap are in strategic position on the ward and each bay. PPE are adequately available as provided by management, we have adequate sterilization due to the CSSD. Also isolation*

*and barrier nursing is effectively carried out (IDI, Female Senior Nurse, Tertiary health care).*

This study in table 5 shows that 30.3% and 45.5% of the respondents strongly agree and agree respectively that there is infection policy in our hospital while 14.2% and 10% disagreed and strongly disagreed respectively. 27% and 32.1% of the respondents strongly agree and agree respectively that the infection control policy is implemented in our hospital while 30.3% and 10.6% disagree and strongly disagree respectively. 44.8% and 22.7% of the respondents strongly agree and agree respectively that there is visitation policy while 18.2% and 14.2% disagree and strongly disagree. The study further establishes that 25.2% and 56.7% of the respondents strongly agree and agree that visitation policy is implemented in our hospital while 15.2% and 3% of the respondents disagree and strongly disagree respectively. 44.5% and 30.3% of the respondents agree that there is anti-biotic prescription policy while 13% and 12.1% of the respondents disagree and strongly disagree. 27.3% and 26.1% of the respondents strongly agree and agree that anti-biotic prescription policy is implemented in our hospital while 30.3% and 13.4% of the respondents disagree and strongly disagree. This study implies that the level of utilization of hospital policy for infection control implementation is high.

**Table 5:  
Level of Utilization of Hospital Policy for Infection Control Implementation**

ITEMS	SA	A	D	SD
There is Infection control policy in our hospital	100(30.3%)	150(45.5%)	47(14.2%)	33(10%)
The Infection control policy is implemented in our hospital	89(27%)	106(32.1%)	100(30.3%)	35(10.6%)
There is visitation policy.	148(44.8%)	75(22.7%)	60(18.2%)	47(14.2%)
Visitation policy is implemented in our hospital	83(25.2)	187(56.7%)	50(15.2%)	10(3%)
There is anti-biotic prescription policy	147(44.5%)	100(30.3%)	43(13%)	40(12.1%)
anti-biotic prescription policy is implemented in our hospital	90(27.3%)	86(26.1%)	100(30.3%)	54(13.4%)
<b>Total</b>	<b>33.2%</b>	<b>35.6%</b>	<b>20.2%</b>	<b>10.6%</b>

Qualitative data further explained policy for infection control as viewed by participants.

In primary health care the participant affirmed thus:  
*Infection control policy cut across all health care delivery facilities, but full implementation is the issue from facility to facility. But for from primary health care centre, there are no lay down policies. So, no infection control committee neither antibiotic prescription policy. (IDI, female senior Nurse: primary level of care).*

The participants from secondary level of care equally agreed there is infection control policy, but further says:

*There is hospital infection control policy, but not adequately implemented as there is no committee set for it, personnel are not trained and no standard antibiotic prescription policy. (IDI, Female<sup>1</sup>senior Nurse: secondary level of care).*

A second opinion also affirm there is infection control policy but not fully implemented,

*That before now, there was infection control committee during nation –wide period of sharps (injection needles, scalpel. etc) control and health workers were trained then, but now no more training and refresher courses since then. Also, no antibiotic prescription policy. (IDI, Female<sup>2</sup> senior Nurse: secondary level care).*

A participant Doctor affirm thus:

*Administration is difficult and that there is no infection control committee for now and no training of staff for now for infection control since staff strength is constrained. As regards antibiotic prescription policy, it is fully implemented as certain drugs used are reserved through collection of samples for empirical study or investigation before treatment. But sometimes antibiotics are commenced before laboratory investigations in*

*some cases. (IDI, Male Doctor (consultant): secondary level care)*

Participant in tertiary level of care affirm thus:

*There is active policy as there is infection control committee and training is on- going from time to time. Also there is an established centre for Disease control and prevention in the facility. Antibiotic prescription policy is maintained, no prescription until laboratory results are scrutinized (IDI, Female Senior Nurse, Tertiary health care).*

Table 6 shows the chi-square analysis of knowledge of professional and causes of nosocomial infection;  $\chi^2$  calculated on the knowledge of the professional ( $\chi^2=39.723$ ) significantly influences the causes of nosocomial infection. Thus, there is a significant relationship between the knowledge of professional and causes of nosocomial infection

**Table 6:** Knowledge of professionals and causes of Nosocomial Infection

Variables	Professionals		Total	$\chi^2$	Df	p-value
	Nurses	Doctors				
Causes						
Bacteria	38(62.3)	23 (37.7)	61	39.723	3	0.013
Viruses	3(75.0)	1 (25.9)	4			
Fungi	9(69.2)	4(30.8)	13			
All of the above	163(68.2)	76(31.8)	239			
Total	213 (67.2)	104 (32.8)	317			

**Discussions**

This study concludes that the demographic characteristics reveal that the age of majority of respondents are between 30 – 39years, majority are females and are married. The study also shows that majority of respondents are nurses with less than 6years of experience and majority are Christians. The study reveals that respondents are highly knowledgeable about the causes of nosocomial infection. This study is in line with Centre for Disease Control (CDC) (2016) who reports that the cause of nosocomial infection are staphylococcus aureus, pseudomonas aeruginosa and *E. Coli*, but these infections are not just limited to locational, certain fungi such as *Candida Albicans* and *aspergillus*, as well, as viruses such as respiratory syncytial virus and influenza have also been implicated in number of hospital acquired infection. This study agree with Graham (2016) who observe that bacteria, fungi and viruses can cause nosocomial infections 90% of cases are caused by bacteria, pseudomonas aeruginosa accounts for 11% and has high mortality and morbidity rate.

This study observes that the respondents are knowledgeable on the nosocomial control measures according to Ahoyo *et al*(2014). This study is in line

with the study of Goldman *et al*(2009) who reports that many of the success of their respondents in controlling nosocomial infections have come from improving the design of invasive devices. This study does not support Samuel et al (2010) who observes that most hospitals in developing countries do have effective infection control program due to lack of awareness of the problem and so on. and Sepideh (2011) who reports lack of guideline of trained professionals. The qualitative data buttress the fact that participants’ level of knowledge on the infection control measures is high.

This study shows that the level of utilization of infection control materials is low and the ones mostly used are making the environment clean and hygienic, use of anti-septic lotion in hand washing, use of aseptic techniques in invasive procedures, having an effective infection control program, having good lab back-up and use of Personal Protective Equipment (PPE) such as hand gloves, apron, mask and so on. This study also supports Mehta et al (2014) who assert that measure of infection control includes identifying patients at risk of nosocomial infection, observing hand hygiene, following standard precaution to reduce transmission and strategies to reduce it and hand hygiene is the style most effective

means of preventing the horizontal transmission of infections among hospital patients and health care personnel as hands are the most common vehicle for transmission of organisms.

This study observes that the level of utilization of hospital policy for infection control implementation is high. The writer believes that with this high percentage may influence of patients' relative that may constitute infection transmission is greatly reduced because patients are usually brought in by their relations who would want to remain with them 24 hours, unknown to them that they can be infected and get infected during the course of staying with their relatives (patient). In some facilities patients' relations are seen loitering about in and outside the ward with no restriction, the qualitative result further explain policy for infection control as viewed by participants. This study does not support Brent, Davidson and Seale (2014) who asserts that hospital bring vulnerable individuals and health care workers into close proximity with a wide range of potential transmission risk and Hospital can serve as a breeding ground for drug resistance.

### Conclusion and recommendations

Three levels of healthcare delivery systems in Edo State are used for this study. Health professionals (Doctors and Nurses) are the respondents. Generally, the knowledge of Nosocomial Infections is high across the professionals which also influence the causes of the infections. Barrier nursing of patients, use of antiseptic lotion in hand washing and aseptic techniques in invasive procedures are the most used techniques in the control measure. Hospital policies are equally in place in all the health care facilities but are mostly implemented in the tertiary health care.

There is the adequate utilization of infection control materials in the study area but the tertiary health care seems to be more funded. Therefore, this study advocates for equal funding in order to reduce the incidence of nosocomial infection in the hospitals since people are more likely to patronise the primary and secondary care more, compared to the tertiary healthcare facilities which stands as referral facility for secondary health care level.

There should be adequate knowledge of the causes of Nosocomial Infection in health care facilities among health workers through training and retraining of health personnel on Nosocomial Infection and others infectious diseases. The individual Health Care Administrator should ensure the implementation of effective infection control policies. This should include the continuous education of hospital authorities and health care workers on principles of infection control through training and retraining and should embrace compliance. Healthcare

professionals should be educated to accept preventive and control measures for a safe healthy environment for themselves and their patients. Health care settings should be clean, safe, hygienic and renovated regularly to prevent Nosocomial Infections or Hospital Acquired Infections (HAI). Effective control program with computer-assisted epidemiological surveillance for monitoring and evaluation of staff and facilities may enhance the eradication of nosocomial infection.

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