

## Research Article

# Knowledge of Prevention and Contributory Factors of Nosocomial Infections among Nurses in a Tertiary Hospital in Ibadan, Nigeria

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## Keywords

- Contributing factors
- Prevention
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- Nurses

## Abstract

**Background:** Nosocomial Infections (NIs) are a significant and serious public health problem which occur worldwide and affect both developed and resource-poor countries. NIs contribute to the burden of care of clients causing increased morbidity, higher healthcare costs, increased length of stay, delayed wound healing, delayed rehabilitation or even permanent disability. This study was aimed at exploring nurses' level of knowledge of factors that contribute to the incidence and prevalence of NIs and how nursing activities predispose clients to developing NIs.

**Methods:** This was a descriptive survey wherein 3 departments were purposively selected in a tertiary hospital in Ibadan, Nigeria. One hundred and forty six (146) respondents were selected and a structured questionnaire containing 56 items was used. Analysis was done using descriptive statistics and Pearson chi-square.

**Results:** It was deduced from the findings that nurses have a high level of knowledge about NIs and nurses' attitude about NIs was positive, which should influence their practice of preventive measures in the long run.

**Conclusion:** Nurses know that standard and transmission based precautions are effective in the reduction of the incidence and prevalence of NIs. Nevertheless, the implementation of these precautions should be made optimal by identifying barriers which could be overcome by institutional and federal government interventions.

## ABBREVIATIONS

NI(s): Nosocomial Infection(s)

## INTRODUCTION

Nosocomial infection (NI) is one of the leading causes of death and increased morbidity for hospitalized patients [1]. Nosocomial infections have been traditionally referred to as infections that develop during hospitalization and so have also been known as *hospital-acquired infections (HAIs)*, and may be acquired by staff or patients in the hospital. As health care increasingly expands beyond hospitals into outpatient settings, nursing homes, long-term care facilities, and even home care settings, the more appropriate term has become healthcare-acquired infection [2].

Globally, by any name, nosocomial infections affect more than 2 million patients each year—or about 5% to 10% of hospitalized patients—leading to approximately 90,000 deaths per year [3]. In addition to the significant morbidity and mortality burdens, nosocomial infections are associated with higher healthcare costs, with an average cost of \$14,000 to \$38,000 per infection, adding more than \$4.5 billion to the total national healthcare

bill [4]. Within the realm of safety in the healthcare setting, nosocomial infections have the most substantial impact [5].

The most frequent nosocomial infections are infections of surgical wounds, urinary tract infections and lower respiratory tract infections. The WHO study (2002) [1], and others, has also shown that the highest prevalence of nosocomial infections occurs in intensive care departments and in acute surgical and orthopaedic wards. Infection rates are higher among patients with increased susceptibility because of old age, underlying disease, or chemotherapy.

Hospital-wide HAI prevalence varied between 2.5% and 14.8% in United Republic of Tanzania, Senegal, Burkina Faso and the Algeria, [6-9]. Overall HAI cumulative incidence in surgical wards ranged from 5.7% to 45.8% in studies conducted in Nigeria and Ethiopia [10,11]. This Nigerian study reported an incidence as high as 45.8% and an incidence density equal to 26.8 infections per 1000 patient-days in paediatric surgical patients [10].

Certain hazards are inherent in modern hospital practice and hospital-acquired infection is one of them. It is estimated that 5-10% of patients admitted to hospitals get some form of

infection, the frequency and severity of which varies with the type of patient, the nature of treatment and the duration of stay in the hospital [5]. These infections may be life threatening such as meningitis caused by *Flavobacterium meningosepticum* in the neonates or result in economic loss in terms of health resources and man hours of work due to prolonged hospital stay [5]. Infection acquired in the hospital may be caused by bacteria, viruses or fungi, and may also take the form of an infestation and involve parasites and helminths.

The healthcare environment increases the risk of infection for two primary reasons. First, it is likely that normally sterile body sites will become exposed, allowing pathogens to cause infection through contact with mucous membranes, non-intact skin, and internal body areas. Second, the likelihood of a susceptible host is high because of the vulnerable health status of patients. Especially in an era of decreased hospital stays and increased outpatient treatments, it is the sickest patients who are hospitalized, increasing the risk not only for infection to develop in these patients but also for their infection to be more severe and for it to be transmitted to others [12]. Nurses are in the frontline of caring for patients both at the acute care setting and the community; in the process they move from one patient to another. The purpose of this study was to identify nurses' knowledge of contributory and risk factors for the development of NIs and to explore ways of preventing clients' development of NIs.

Various research studies exist on nosocomial infections; its incidence and prevalence rates, risk factors and epidemiology but very few of these was done in Nigeria. Acutely ill and patients with life-threatening diseases are normally admitted in tertiary hospitals. However, there is currently a far-cry from the ideal nurse-patient ratio with scarce material resources necessary to attend to the health care needs of these patients thus contributing to the high rates of NIs reported in Nigeria. This research work focused on nurses and their activities or lack of that contributes to clients' development of NIs.

This study also explored factors that contribute to developing NIs and identified preventive measures necessary to be taken by nurses. The result and findings of this research work is expected to help nurses have a better understanding of NIs and the influence they have on its development thereby reducing its prevalence and its resultant effects.

The specific objectives of this research work were:

1. To explore nurses' knowledge of nosocomial infection and its aetiology.
2. To assess nurses' attitude to prevention of nosocomial infections.
3. To identify the risk and contributory factors of nosocomial infections.
4. To identify preventive measures to development of nosocomial infections in inpatients.

## MATERIALS AND METHODS

This descriptive study was carried out at a teaching hospital in Ibadan. The hospital has 12 departments, of which 3 departments (Surgery, Medicine and Neurology) were selected for this

study because clients here are more predisposed to developing nosocomial infections and researchers were of the opinion that nurses working in these departments are mostly appropriate for the study. Clients on medical and neurology wards are on admission for a long time ranging from weeks to months or even a year or more, which predisposes them to developing nosocomial infection. Clients admitted on surgical wards require management adhering strictly to aseptic techniques and also, catheters, nasogastric or drainage tubes are inserted for clients before, during or after surgery, which predisposes them to the development of nosocomial infections.

The study population consisted of nurses working within the 3 selected departments of the hospital. There were 11 adult wards (medicine: South-West3, East3, South-East3, West3, East2; surgery: South-West1, South-East1, East1, West2 and neurology: North-West1, West-West2) within the 3 selected departments and a total of 229 nurses out of which a sample size of 146 was arrived at using Fisher's sample size formula.

A summary of the study protocol was sent to the University of Ibadan/University College Hospital Health (UI/UCH) Ethical Review Committee where an approval was obtained to carry out the study. Consent was taken verbally and confidentiality assured to each respondent before administering the questionnaires.

A descriptive survey design was used whereby questionnaires were administered to the respondents and retrieved after completion. A simple randomized sampling technique was used for selecting 146 respondents and the instrument used was a self-designed and self-administered structured questionnaire containing 56 items. The socio-demographic data from the respondents were summarized using frequency tables, percentages and charts, while other sections were analysed using statistical package for social sciences (SPSS) version 20.

## RESULTS

Figures 1-5 represent the socio-demographic characteristics of the nurses that participated in this study. This research was carried out in 11 wards within 3 departments, 5 cadres of nurses participated in this research study and the respondents were grouped under 6 professional qualification groups. Their gender, age and their years of practice in UCH were also assessed and grouped.

Tables 1-2 represent nurses' knowledge of nosocomial infection using a scale ranging from 0-14. The mean score for knowledge was 12.79 out of a total of 14, which showed that participating nurses had a high level knowledge of nosocomial infection and its aetiology. This mean score was greater than the average rating score for knowledge (7.0) and none of the respondents had a score lower than the average.

Table 3 represents the variables used to determine the attitude of nurses to prevention of nosocomial infections. It showed that the nurses who participated in this study had a positive attitude towards the prevention of nosocomial infections.

Table 4 represents the variables used to identify their knowledge of the risk and contributory factors of nosocomial infection. Findings showed that most nurses have optimal knowledge and adhere to universal precautions to prevent the

**Table 1:** Mean knowledge of nurses.

Variable	Minimum score	Maximum score	Mean	Standard Deviation	Average rating scale
Knowledge	11.0	14.0	12.79	0.95	7.0

**Table 2:** Percentage knowledge of nurses.

Variable	Score	Frequency	Percentage	Average Rating score	Remark
Knowledge	≤7.0	0	0.0	7.0	Low
	>7.0	146	100.0		High

**Table 3:** Nurses' attitude to prevention of nosocomial infections.

	SD (%)	D (%)	UD (%)	A (%)	SA (%)
As a nurse, I need to be familiar with practices to prevent the occurrence and spread of infection	0(0.0)	0(0.0)	0(0.0)	24(16.6)	121(83.4)
I wash my hands before and after a contact with any client	0(0.0)	8(5.5)	0(0.0)	24(16.4)	114(78.1)
Using antiseptic soaps every time I need to wash my hands can be time consuming	12(8.2)	109(74.7)	0(0.0)	25(17.1)	0(0.0)
The use of gloves delay me in carrying out procedures	24(16.4)	113(77.4)	4(2.7)	5(3.4)	0(0.0)
I am experienced enough to carry out procedures without gloves	47(32.2)	98(67.1)	1(0.7)	0(0.0)	0(0.0)
I don't need frequent hand washing since I make use of gloves for my procedures	42(28.8)	95(65.1)	0(0.0)	9(6.2)	0(0.0)
I can recap used needles if I am very careful while doing so	52(35.6)	94(64.4)	0(0.0)	0(0.0)	0(0.0)
Having to bend and empty urine bags can be too tasking	28(19.2)	97(66.4)	0(0.0)	21(14.4)	0(0.0)
Changing catheters every 2 weeks is a waste of client's finances	42(28.8)	87(59.6)	12(8.2)	5(3.4)	0(0.0)
I make use of exposed instruments for clients when no CSSD pack is available	67(45.9)	66(45.2)	0(0.0)	13(8.9)	0(0.0)
I assist my clients by using already opened dressing packs	87(59.6)	42(28.8)	0(0.0)	16(11.0)	1(0.7)
I make use of a dressing trolley for two or more clients at a time since we have only one functioning one	72(49.3)	53(36.3)	8(5.5)	12(8.2)	1(0.7)
I can wear long nails if I am very careful not to injure my clients	72(49.3)	74(50.7)	0(0.0)	0(0.0)	0(0.0)
Adhering by all aseptic principles during wound dressing is time and energy consuming	32(21.9)	105(71.9)	0(0.0)	8(5.5)	1(0.7)
As a care giver, I can't take a sick day even when I have a cold	52(35.9)	81(55.9)	4(2.8)	8(5.5)	0(0.0)
Packing my hair up and wearing stud earrings is just a tactic administrators use against nurses to prevent them from looking beautiful and attractive on duty	97(66.4)	40(27.4)	4(2.7)	0(0.0)	5(3.4)

**Table 4:** Risk and contributory factors of nosocomial infection.

Factors	True (%)	False (%)
Advanced age or very young age increases the risk of NI	146(100.0)	0(0.0)
Invasive procedures increase the risk of NI	146(100.0)	0(0.0)
A client undergoing chemotherapy has an increased susceptibility to developing NI	136(93.8)	9(6.2)
The incidence and prevalence of NI will increase in a health institution where poor infection control practices may facilitate transmission.	146(100.0)	0(0.0)
A client can develop NI after intubation.	103(73.0)	38(27.0)
A client that requires intermittent suctioning may develop NI	141(96.6)	5(3.4)
Inadequate antibiotic therapy is associated with poor outcome and emergence of bacterial resistance	141(96.6)	5(3.4)

occurrence and spread of infection among hospitalized patients.

Table 5 reveals the respondents opinion on preventive measures that can be taken to prevent nosocomial infections in patients. It was revealed that almost all respondents are highly knowledgeable about the various client's factors that are contributory to developing nosocomial infection

## DISCUSSIONS

It was deduced from this study that majority of the nurse respondents had a high level of knowledge of nosocomial infection (NI) especially about the common causes of NIs, its consequences and factors predisposing to it. The high very level of knowledge obtained in this study could be as a result

**Table 5:** Preventive measures to development of nosocomial infections in patients.

	True (%)	False (%)
Standard precautions: Include the recommendations to protect only the patients	27(18.5)	119(81.5)
Include the recommendations to protect the patients and the healthcare workers	146(100)	0(0.0)
Apply for all the patients	146(100)	0(0.0)
Apply for only healthcare workers who have contact with body fluid	16(11.0)	130(89.0)
The standard precautions recommend use of gloves For each procedure	140(95.9)	6(4.1)
When there is a risk of contact with the blood or body fluid	137(93.8)	9(6.2)
When there is a risk of a cut	137(93.8)	9(6.2)
When healthcare workers have a cutaneous lesion	138(94.5)	8(5.5)
When is hand hygiene recommended? Before or after a contact with (or care of) a patient	121(83.4)	24(16.6)
Before and after a contact with (or care of) a patient	146(100.0)	0(0.0)
Between patient contacts	146(100.0)	0(0.0)
After the removal of gloves	146(100.0)	0(0.0)
When there is a risk of splashes or spray of blood and body fluids, the healthcare workers must wear mask, goggles, and gown	146(100.0)	0(0.0)
Alcohol-based hand rub can be used on unsoiled hands instead of surgical hand washing (3 min)	67(45.9)	79(54.1)
A traditional hand washing must be done before hand washing with alcohol-based hand rub	57(39.0)	89(61.0)
Used needles should be recapped	4(2.7)	142(97.3)
Needles can be reused for members of the same family	4(2.7)	142(97.3)
Used needles should be disposed in pedal bins	20(13.7)	126(86.3)
Spills of body fluids should be cleaned up immediately	62(42.5)	84(57.5)
Clients should not use ITNs in hot weather	32(21.9)	114(78.1)
Urine bags can be placed on the client's bed	0(0.0)	146(100)
Urine bags can be placed on the floor beside the client's bed	0(0.0)	146(100)

of inclusion of nosocomial infections as a topic taught in the nursing curriculum in Nigeria, and it's usually featured as part of sensitization seminars and continuous nursing education for hospital workers. This poses a great prospect for control of nosocomial infections in Nigeria. However, this high level of knowledge does not completely translate to effective control of NIs given the high incidence and prevalence of NIs in Nigeria. This might be as a result of non-availability of human and material resources needed to prevent and control NIs. There is a need to further explore these factors in subsequent studies.

In this study, reported preventive practices of nurses towards NIs were favourable for hand washing, and for wearing personal protective equipment (PPE) like gloves. It was discovered in this study that age (old or very young individuals), invasive procedures, poor infection control within a health facility, intermittent suctioning and inadequate antibiotic therapy are associated with poor outcome and emergence of bacterial resistance; with chemotherapy and intubation being important risk factors that predisposes to NI.

The hands of staff are the commonest vehicles by which micro-organisms are transmitted between patients. Hand washing is accepted as the single most important measure in infection control. Most of the nurses in this study were ready to always wash their hands before and after procedures. In order to

reduce the incidence of NIs, good attitude and compliance with preventive interventions are mandatory.

In many settings, hand washing may be seen as a trivial issue that is not routinely taken serious, most especially in non-surgical and non-invasive sessions. To this effect, sensitization seminars for all categories of health care workers will go a long way in reducing prevalence of the different types of NIs within our hospital settings. Regular monitoring and effective mentoring of health workers, most especially by concerned authority would ensure routine universal precautions and regular hand washing practices. In addition, infection control committees and units in hospitals should live up to the task of making the provision of hospital NI prevention policy available and accessible to health care workers and take active part in creating awareness. It is also important to make adequate human and material resources available to promote strict adherence.

### Nursing implication

Though there is paucity of information available on the impact of NI in terms of cost, prolonged hospital stay and attributable mortality in Nigeria, however, few studies conducted in other African countries have tried to explore these. The studies from the United Republic of Tanzania, Burkina Faso and Ethiopia showed that there was a prolonged stay of an average of 8 to 15 days postoperatively among patients with NIs [13-16]. There

was also a reported mortality of 10.8% for patients with surgical site infection compared with 3.9% for patients without infection [16]. Given the high level of knowledge of risk and contributory factors of NIs possessed by nurses as revealed by the study, it is important for nurses to strictly adhere with the practice of universal precautions to reduce the incidence and prevalence of hospital acquired infections. It is also imperative to carry out researches that would help explore factors influencing non-adherence to prescribed universal precautions by nurses. The findings from such researches could help inform institutional policies for training and retraining of nurses in this teaching hospital. All the above have become necessary to reduce prolonged hospital stay and mortality with serious economic and psychological implications.

## CONCLUSION

As health care has evolved, lowering the rate of nosocomial infections has been a challenge for infection control programs. Advances in medical treatments have led to more patients with decreased immune function or chronic disease. The increase in these patients, coupled with a shift in health care to the outpatient setting, yields a hospital population that is both more susceptible to infection and more vulnerable once infected. The increased use of invasive devices and procedures has also contributed to higher rates of infection [1-3]. Of particular danger are the several resistant strains of bacteria that have developed through their natural course of adaptation and the overuse of antibiotics. Nearly 70% of nosocomial infections are caused by drug-resistant strains of bacteria [3].

Evidence-based guidelines exist for the prevention and control of nosocomial infections, and the guidelines address a wide range of issues from architectural design of hospitals to hand hygiene. These guidelines have been established primarily by the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO), as well as infection-related organizations and other professional societies. Proper hand washing is the single most important preventive measure, yet compliance rates among healthcare workers have ranged from 16% to 81% [17]. Heightened awareness of this guideline and others, as well as ways to promote adherence, are necessary.

This study was aimed at exploring factors that contribute to the incidence and prevalence of NIs and those factors that predispose clients to developing NI that are related to nursing care and procedures. It was deduced from the findings that majority of the nurses are still in active phases and they have good knowledge of nosocomial infection (NI) especially about the common causes of NIs, its consequences and factors predisposing to it; which was due to its inclusion in the nursing curriculum in Nigeria, sensitization seminars and continuous nursing education. This implies that continuing nursing education is an integral part of the nursing profession and should be made mandatory for all nurses. Nurses need to be encouraged and motivated to attend conferences and seminars at least once a year to improve their efficiency.

The research findings from this study showed that preventive practices of nurses towards NIs were favourable, with positive attitude towards prevention of NI. It was found out that

the incidence and prevalence of NI will increase in a health institution where poor infection control practices may facilitate transmission. Hospital policies and regulations need to include good and effective infection control practices, with nurses being active participants.

## LIMITATIONS

This study is limited to nurses working in surgical department of the only teaching hospital in Ibadan, Nigeria. It is also limited to exploring the knowledge of nurses about NIs about client's contributory factors and did not investigate barriers/ factors influencing their practice of universal precautions.

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