



**St. Paul's Hospital
Millennium Medical College**
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**Magnitude and factors associated with hospital acquired infection among
adult patients in St. Paul's hospital millennium medical college, Addis Ababa
Ethiopia.**

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Abstract

Background: Hospital acquired infection (HAI) is alarmingly increasing in low income settings. Hospitals are the main sources for the risk of acquiring infection during health care delivery. Limited researches to specific infections show that a significant number of inpatients acquire infections in hospital set ups in Ethiopia. There is limited information that indicate magnitude and risk factors of hospital acquired infections in teaching hospitals. In Ethiopia, the burden of HAI is still not well described.

Objective: to assess the magnitude of hospital acquired infection and risk factors at St. Paul's Hospital Millennium Medical College (SPHMMC) adult inpatients.

Method: A cross-sectional observational study design was conducted over 2 months from June 1, 2019 to July 31, 2019 G.C in hospitalized adult inpatients at St. Paul's Hospital Millennium medical college. Data was collected from 227 patients admitted adult inpatients from medical ward, surgical ward, GYN/OBS.

Frequencies and percentages were used to express descriptive statistics. Associations between outcome variable and independent variables were analyzed using bivariate and multivariate logistic regression analysis using SPSS version 25.

Results: Out of 227 study patients 138(60.8%) were female and 89(39%) were male. The overall prevalence of hospital acquired infection was 19.8%. HAP was the most common type with 11.9% in prevalence and the second common type was SSI with 7.9% in prevalence. the highest prevalence was seen from Medical ward and GYN. The lowest prevalence was reported from Surgical and OBS wards. Patients those who took antibiotics during the study period were at 4.07 at risk of developing HAI than their counter parts at AOR 4.071, 95%CI (1.939,8.549) and those who had history of catheterizations during the study were at 3.13 at risk of developing HAI at AOR 3.13 ,95%CI (1.493,6.544).

Conclusion: This study revealed high burden of hospital acquired infection. Antibiotics use and catheterizations are highly associated with hospital acquired infection. Hence, any effort to control the observed high burden of hospital acquired infection at the hospital should consider associated factors.

Key words = Hospital acquired infection, Prevalence, St. Paul's, Addis abeba, Ethiopia.

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Acronyms

CDC =Centre for disease control

GP=General Practitioner

CHF= Congestive Heart Failure

CKD= Chronic Kidney Disease

CLD= Chronic Liver Disease

HAI = Hospital acquired infection

HCAI=Healthcare-associated infections

HAP= Hospital Acquired Pneumonia

JUMC= Jima University Medical College

ICU=Intensive care units

MR-=Medical residents

NHSN =National Health care Safety Network

TAH = TikurAmbesa Hospital

SLE= Systemic Lupus Erythematosus

SSI= surgical site infections

SPHMMC = St. Paul's Hospital Millennium Medical College

SPSS - Statistical Package for the Social Sciences.

UTI = Urinary Tract Infection

PI= Principal investigator

CHAPTER ONE: INTRODUCTION

1.1. Background

Hospital-acquired infections (HAIs), also known as healthcare-associated infections (HCAI), are infections occurring in a patient in a hospital or other healthcare facility in whom the infection was not present or incubating at the time of admission(1). HAI is a major problem for patient safety and has a high impact in terms of morbidity and mortality(2,3). Effective surveillance of HAIs helps in quality improvement by identifying a problem, suggesting an intervention and documenting the effectiveness of that intervention and thus directing future infection control practices. The risk to acquire HAI is universal and pervades every healthcare facility and health system worldwide with some high-income countries having a national surveillance system for HAIs. However, the true burden remains unknown in many nations, particularly in developing countries(4). There are scant data available from Ethiopia. HAIs contribute to increased morbidity and mortality[7, 8], excess health care cost [9, 10] and prolonged hospital stay [11].

HAI affects about 7.6% of patients in regular wards [16] and at least half of those admitted to intensive care units (ICU) [17] in developed countries. Studies conducted in low-income settings showed that hospital-wide prevalence of HAI is about 15.5 per 100 patients [18] which is much higher than reports from Europe [20] and North America [21].

As a matter of fact, most of the global reports of HAIs are focused on prevalence and there are only very few reports about the incidence rate of HAIs. In Ethiopia, few HAIs studies focused on point prevalence are available since 1988 [22, 23]. Many of these were limited to postoperative HAIs [22–25] with estimated prevalence of 11% to 36% [24–27]. Surgical site, urinary tract and blood stream infections were found to be commonest forms [24–26].

The type of surgery, patients' underlying medical conditions and the type of the ward were found to be important factors associated with increased risk of HAI in Ethiopia [7, 8, 39, 2].

At least 50% of HAIs are preventable with current evidence based interventions [19, 30]. Despite this fact, they remain great threat to quality of healthcare delivery system worldwide and even more so in low-income settings.

Overcrowding and limited number of health task force in hospitals result in inadequate infection control practices. On top of these, lack of infection control policies, guidelines and trained professionals make the problem even worse [18, 19].

All previously published studies were estimated the point prevalence of HAIs based on a data collected from one or two wards of respective hospitals [22–27]. In the current study, will try to estimate the prevalence and associated factors of HAI at SPHMMC adult hospitalized patients.

1.2. Statement of the Problem

HCAIs are major worldwide public health problems. The Centers for Disease Control and Prevention estimates that 2 million patients suffer from hospital-acquired infections every year and nearly 100,000 of them die(22). HAIs are associated with an increased attributable mortality, length of stay, and healthcare costs incurred by patients, insurers and healthcare facilities(23,24). The burden of HCAI in developing countries is high. Prevalence of HCAI is much higher than proportions reported from Europe and the USA. In Africa, literature review shows that hospital-wide prevalence of HAI varies between 2.5% and 14.8%; in surgical wards, the cumulative incidence ranging from 5.7% to 45.8%. The largest number of studies focused on surgical site infection, whose cumulative incidence ranges from 2.5% to 30.9%(28). Most published studies of HAI originate from hospitals in developed nations. Relatively few data are available from Ethiopia to indicate present HAI status of situation and focused on only surgical site infections on surgery and obstetrics wards(16,34). The proportion of patients with HAIs in developing countries has been estimated to be 25% - 40% or more(37). In Addis Ababa surgical site infections (SSI) in two hospitals (TikurAnbesa and Saint Paul) showed that 6.9 and 5.7% respectively.

Prospective active surveillance of HAI is the gold standard (40). Repeated point prevalence surveys are more feasible methods for the measurement of all HAIs, in the hospitals and it is also important to estimate the burden of HAIs in teaching hospitals. It also important to prioritize areas requiring interventions(33). In the study setting there is no such a comprehensive research that show the prevalence of HAIs; identify determinant factors in SPHMMC teaching hospital.

1.3. Significance of the study

Healthcare-associated infection is a problem increasing worldwide and significantly contributes to morbidity and mortality in hospital population. The additional costs arising from treatment of HCAI place a significant burden on healthcare resources. Limited information is available on the endemic burden of HAI in Africa(28). Health-care-associated infection is the most frequent result of unsafe patient care worldwide, but few data are available from the developing world, including Ethiopia. Hospital-acquired infections take up scarce health sector resources by prolonging patients' hospital stay. Knowing the

prevalence and risk factor of HAI is very essential for the control of the HAI in the Health Care system(39). There is no research conducted on comprehensive HAI prevalence and risk factors in the study area. The study will investigate the prevalence and risk factors for HAI. It is also an input for policy makers and to the health services and health care workers to improve their decision and the development of guideline for the work environment. It also helps to minimize the health cost of patients and the country. This assessment of HAI and identifying risk factors for HAI study in SPHMMC teaching hospital helps as a base line for further Epidemiological studies of HAIs in the country. This will ultimately improve quality of health care, decrease health care cost and HAI related morbidity and mortality by preventing HAI through evidenced based , early identification of the focus infection.

CHAPTER TWO: LITERATURE REVIEW

2.1. Hospital acquired infection prevalence

HAIs are a growing problem at every level of the healthcare system. WHO estimated that it affects hundreds of millions of people worldwide and it is a major global issue for patient safety(29). It complicates between 5 and 10% of admissions in acute care hospitals in industrialized countries(35). HAI reached from 6% in USA to 13% in Finland hospitals(28,29). A point prevalence study in Lithuania on 731 patients in 2010 showed that; the prevalence rate of HCAIs was 3.8%(16). The prevalence differed by hospital wards (range 0.0%–19.2%). The lower respiratory tract (32.2%), urinary tract (28.5%), and surgical site infections (32.1%) were the most common health care-associated infections(16).

A similar study in Iran showed that the overall HAI prevalence was 9.4%(34). The most common HAIs were blood stream infections (2.5%), surgical site infections (2.4%), urinary tract infections (1.4%) and pneumonia 1.3%(34). A six-month point prevalence survey conducted in UK showed that, the prevalence of catheter associated urinary tract infection, central-line-associated bloodstream infection, local vascular access infection, and ventilator-associated pneumonia was 3.9%, 3.1%, 3.8% and 11.6%,respectively(27).

Similar research in Finnish disclosed that the overall prevalence was 13% and hospitalization of >7 days was associated with increased prevalence of HAI 8%(20).

According to the WHO review, hospital-wide prevalence of HCAI varied from 5.7% to 19.1% with a pooled prevalence of 10.1% in low income countries(13). In addition, hospital acquired infection prevalence reports are often not well established because of the lack of centralized guidelines, staff and resources(31).In Africa, reviewed literature show that the hospital-wide prevalence of HAI varies between 2.5% and 14.8%; and the cumulative incidence range from 5.7% to 45.8%(28). The largest number of studies focused on surgical site infection, whose cumulative incidence ranged from 2.5% to 30.9%(28).The prevalence of hospital acquired infection in general is high both in developed and developing countries. In Ethiopia even though there is no a comprehensive general prevalence study on hospital acquired infection, researches in specific SSI in TikurAmbesaHospital(52.1%), Saint Paul Hospital(79%), and Felege-Hiwot

Referral Hospital(10.2%) are recorded (18,16). Study from Jimma University Medical Centre shows the incidence rate of hospital acquired infection of 28.15 per 1000 patient days while the overall prevalence of 19.41% .

2.2 .Risk factors

A matched case control study from amhara teaching hospitals shows, availability of waste management material in the room, immune status of the patient, central vascular catheter, surgery since admission and patient received antimicrobial at the time of survey were the predictors of hospital acquired infection.

A study from Indian shows that Prolonged hospital stay [odds ratio (OR=2.81), mechanical ventilation (OR=18.57),use of urinary catheter (OR=7.89) and exposure to central air-conditioning (OR=8.59) had higher odds. of acquiring HAI ($P<0.05$).

A study from philipines shows that Patients who are immunocompromised may be at a higher risk for HAI. Indoor air pollution, proximity to congested main thoroughfare, and increased human foot traffic may contribute to the susceptibility of patients to HAIs. Hospital layout should be considered in infection control.

CHAPTER THREE:OBJECTIVES

3.1 General Objective

- To assess the magnitude of hospital acquired infection and associated factors at St. Paul's Hospital Millennium Medical College (SPHMMC) adult inpatients from GYN/OBS, Surgery, Medical wards.

3.2 Specific Objectives

- To determine the prevalence of hospital acquired infection(HAI).
- To identify the associated factors for hospital acquired infection (HAI).

CHAPTERFOUR: METHODS AND MATERIALS

4.1. Study Area and period

The study was conducted in St. Paul's Hospital Millennium Medical College, in wards where adult patients are admitted. St. Paul's hospital is one of the largest tertiary referral public hospitals in the capital city under the Federal Ministry of Health. The hospital is located at Gullele Sub city at Swaziland Street, Addis Ababa, Ethiopia. Established by Emperor Haile Selassie in 1961, the hospital primarily gives service to those unable to afford care elsewhere. It has over 1200 clinical and non-clinical staff. The hospital added a medical college in 2007 G.C. The hospital has different units in it: Internal Medicine, Pediatrics, Gynecology/Obstetrics, Surgery, Dentistry, Psychiatry, Ophthalmology, ENT, Hospital pharmacy, Dermatology. Under the department of Internal Medicine, there are a number of sub-specialties. Among these, infectious disease (ID) unit is one of the core areas where both an outpatient and inpatient service as well as academic activities is strongly carried out despite scarcity of human resource, well established ID unit and subspecialist. The study was conducted from June 1, 2019 to July 31, 2019 G.C.

4.2. Study Design

Across-sectional (both descriptive and analytic) study design was conducted in adult hospitalized patients at SPHMMC.

4.3. Population and sampling

4.3.1. Source population

All hospitalized adult patients at St. Paul's Hospital Millennium Medical College during the study period.

4.3.2. Study population

All sampled hospitalized adult patients at St. Paul's Hospital Millennium Medical College during the study period that satisfies the inclusion criteria .

4.3.3. Study subjects

All hospitalized adult patients who fulfilled the inclusion criteria during the study period.

4.3.3.1. Inclusion Criteria:

The inclusion criteria was all adult hospitalized patients at SPHMMC who given consent to the study and admitted at least for 48 hours.

4.3.3.2. Exclusion Criteria

The exclusion criteria was:

- Age <16 years.
- Incomplete or an available chart.
- Patients who died or discharged from the hospital within 48 hours of admission were not included.
- Patients who were admitted with in the preceding 30 days of the study period.

4.3.4 Sample size determination

The sample size for the study was determined using single population proportion formula:

$$n = \frac{(Z_{\alpha/2})^2 P(1-p)}{d^2}$$



Where: n = required sample size

$Z_{\alpha/2}$ = Critical value = 1.96 (Standard normal deviation usually set at 1.96 which corresponds to the 95% confidence interval)

p = a 17.8% proportion of HAI (19), P-value is taken as 17.8.

d = precision (marginal error) = 0.05

$n = 225 + 10\% \text{ non responders} = 248$

4.3.5. Sampling Procedures

- A sampling frame was prepared by registering all adult hospitalized patients from GYN/OBS, Surgery, Medical wards. Participants were selected by Systematic random sampling every second patient. A lottery method was used to get first patient.

4.4. Variables of the study

4.4.1. Dependent Variables

Hospital acquired infection.

4.4.2. Independent Variables

Age, sex, comorbidities, recent history of catheterization, length of hospital stay, waste disposal container availability, recent history of surgery, antibiotics use during the study.

4.5. Data Collection Tools

Data was collected using a well structured data extraction tool which included background information and clinical characteristics of the participants. Patients' chart and interview were used

for back ground information and clinical characteristics. Data was collected by four trained data collectors after being trained ahead of data collection. Data collection was done from June 1 to July 31 2019 G.C .

4.6. Pre-test

By considering 5 %(14), pretest was done two weeks before actual data collection to check its variability and the questionnaire was assessed for its clarity, length and completeness and the necessary correction was done accordingly. The item that was not clear was excluded from the interview schedule. The respondents involved in pretest was excluded from the study.

4.7. Data Collection Procedures

Written consent was obtained from each participant prior to commencing any study procedures. For patients in comma, their closest relatives was consented. Socio-demographic and clinical data was collected by structured questioner. They were followed first for 48 hrs. Patients who have developed any form of infection within 48 hrs of admission and/or had asymptomatic bacteriuria was excluded. All the rest of the patients was followed until the end of the study period for the occurrence of HAI, progress or death by attending physician and research team. Daily checking of the collected data was made and questionnaires was checked for completeness and accurateness to determine their validity.

4.8. Data Analysis

4.8.1. Data Analysis

Data was checked for its completeness every day. It was arranged, cleaned and analyzed; the collected data was entered into a computer and analyzed using Statistical Package for Social Science (SPSS) version 25. The data was summarized and described using tables, pie charts and graphs. Descriptive statistics was used to put results of the study in the form of frequency and percentages. Bivariable and multivariable analyses were done with logistic regression to depict the Odd ratio (COR) and adjusted odd ratio (AOR) to identify

factors with increased risk of HAIs and $p\text{-value} < 0.05$ was considered as statistically significant.

4.8.2. Ethical consideration

Ethical approval was requested and obtained from the Saint Paul's Millennium Medical College institutional review board (IRB). Names and other identification that would reveal patients' identity were kept strictly hidden and were not revealed in the checklist.

4.8.3 Dissemination of results

The results of the study will be presented to the college community using presentation and web posts and the findings will be also published in locally accessible or international journals.

4.9. Operational Definitions

Outcome variables: The primary outcome variable was occurrence of infection after 48 h of hospitalization in a patient otherwise not having symptomatic or incubating infection on hospital admission. The following are definitions used in this study for specific type of HAI (Adopted from Centre for disease control/National Health care Safety Network (CDC/NHSN) surveillance definition for health care–associated infection[15] with slight modification):

Blood stream infection

Patient with any of the following signs and symptoms: fever ($>38^{\circ}\text{C}$), Chills/rigours or hypotension and at least one positive blood culture not related to contamination.

Healthcare associated pneumonia

Respiratory symptoms with at least two of the following signs and symptoms appearing during hospitalization: cough, purulent sputum, new infiltrate on chest radiograph consistent with infection.

Surgical site infection

Any purulent discharge, abscess, or spreading cellulitis at the surgical site during the month after the operation.

Urinary tract infection

Mid-stream urine cultures with $\geq 10^5$ colony forming units (CFU) and catheter urine with $\geq 10^2$ CFU/ml with no more than 2 species of microorganisms isolated OR positive dipstick for leukocyte esterase OR pyuria (≥ 10 white blood cells /high power field) of clean catch urine in a patients with or without signs and symptoms in the presence or absence of recent urinary catheterization.

5. Result

5.1. Socio-Demographic Statistics

A total of 252 hospitalized patients were enrolled in this study. However, 25 participants showed signs of infection and/or discharged and or died within the first 48 hrs and were excluded from the study. The rest 227 were followed for the occurrence of hospital acquired infection until the end of study period.

In this study in the assessment of the magnitude and associated factors of HAIs, 227 patients were of whom 138(60.8%) were female and 89(39%) were male. Majority of patients age category was 31-60yrs accounting 115(50.7%) then 16-30yrs accounting 68(30%). Majority of patients included in this study were from Surgical ward accounting 120(52.9%) and small number of patient were from OBS ward accounting 13(5.7%). most patients length of hospital stay was <10days accounting 148(65.2)% and only 18 (8%) patients stay >21days. Presence of waste disposal in the rooms were patients admitted was 100%. See table 1 below for detailed socio-demographic data's (Table 1).

Table 1: Socio-demographic characteristics of patients formagnitude and associated factors of hospital acquired infection:

S.N	<i>Characteristics</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent (%)</i>
1.	Sex	Male	89	39.2
		Female	138	60.8
2.	Age in yrs	16-30	68	30
		31-60	115	50.7
		>60	44	19.4
3.	Monthly income	<3000	118	52
		3000-4999	89	39.2
		>5000	20	8.8
4.	Ward of admission	Surgical ward	120	52.9
		Medical ward	51	22.5
		Gynecology	43	18.9
		Obstetrics	13	5.7
5.	Length of hospital stay in days	<10days	148	65.2
		11-20days	61	26.9
		>21days	18	8
6.	Presence of waste disposal container in the room	Yes	227	100
		No	0.00	0.00

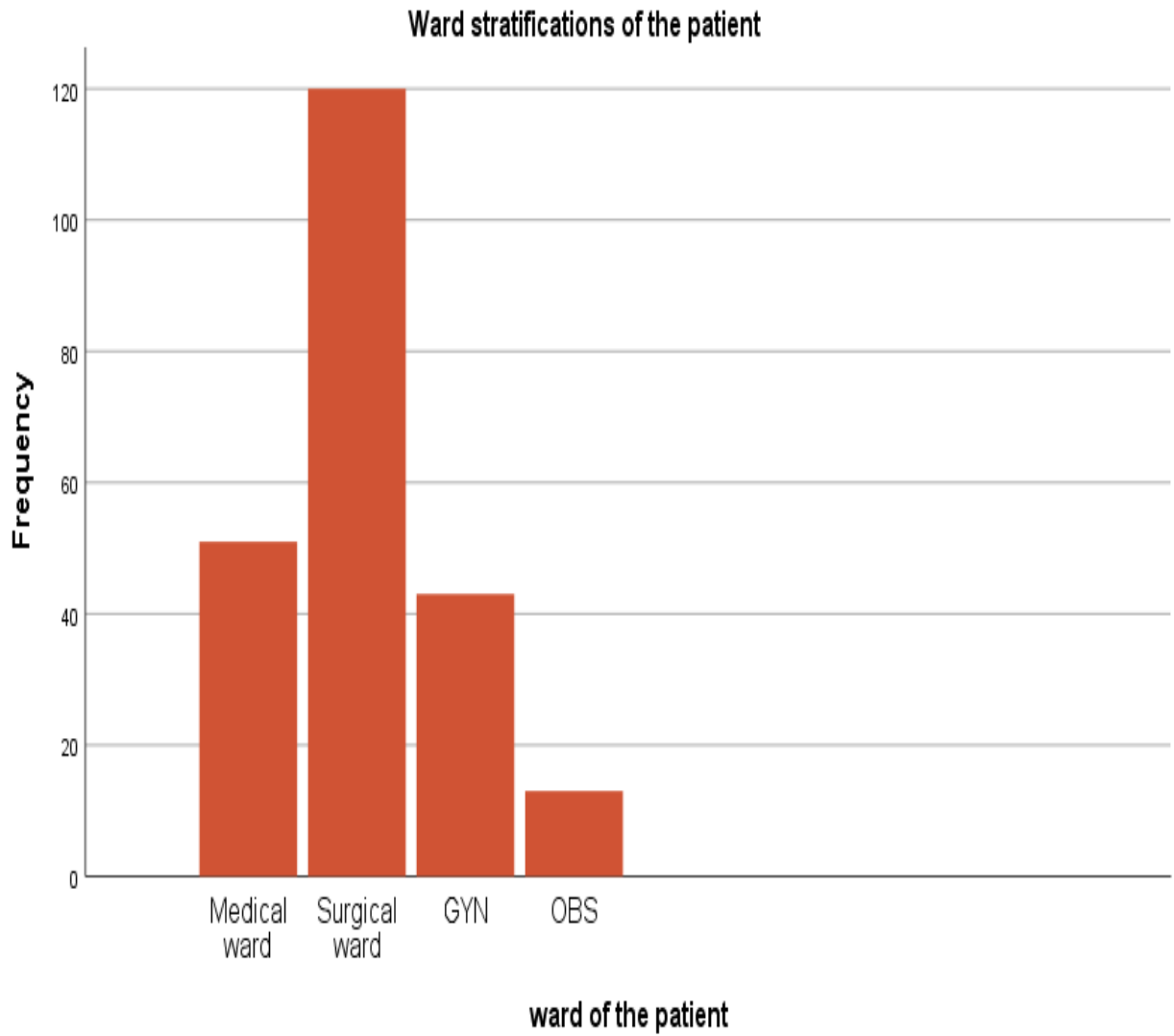


Figure 1: ward stratifications of patients for magnitude and associated factors of hospital acquired infections.

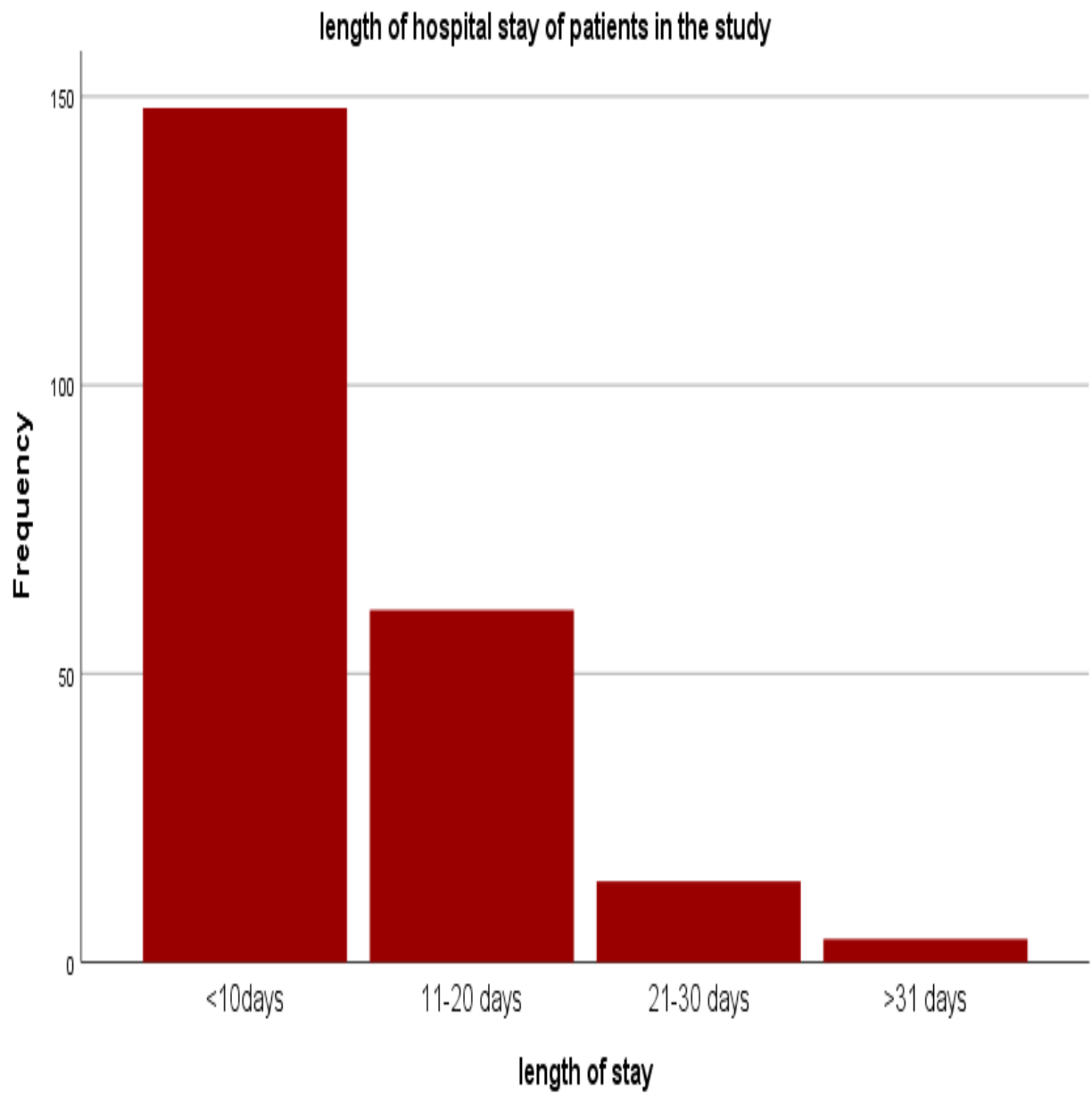


Figure 2: length of hospital stay of patients for magnitude and associated factors of hospital acquired infections.

5.2.Clinical characteristics of participants:

More than half, 124 (54.60%) of the participants underwent surgical procedures during the current admission. Recent history catheterization was reported in 93(41%) of patient in the study and indwelling urinary catheter was the most common type accounting 84(37%) and only 09 (1.3%) patients had central catheter of the participants in the study.

Underlying chronic medical conditions were reported in 104 (45.80%) participants. Malignancy was the most common single disease co-morbidity identified in 26 (11.5%) participants followed by HIV, 11(4.8%) and hypertension 09(4%). Others accounts 47(20.7%) ,some of the comorbidities included are diabetes(DM),chronic liver disease(CLD),congestive heart failure(CHF),chronic kidney disease (CKD) ,stroke, tuberculosis and systemic lupus erythematosus (SLE). More than one third of participant 85(37.4%) was given antibiotics for other reason.

Table.2. Clinical characteristics of participants for magnitude and associated factors of hospital acquired infection::

S.N	Characteristics	Category	Frequency	Percent (%)
1.	Surgery within the recent admission.	Yes	124	54.6
		No	103	45.4
2.	Catheterization	Yes	93	41
		No	134	59
3.	Type of catheter	Indwelling urinary catheter	84	37
		Central catheter	3	1.3
		Indwelling urinary catheter + Central catheter	6	2.6
4.	Antibiotics given during the study	Yes	85	37.4
		No	142	62.6
5.	Comorbidities	Malignancy	26	11.5
		HIV	11	4.8
		HTN	9	4
		DM	6	2.6
		CLD	5	2.2
		Others	47	20.7
		No	123	54.2
6.	Hospital acquired infection (HAIs)	Yes	45	19.8
		No	182	80.2
7.	Types of HAIs	HAP	27	11.9
		SSI	18	7.9

5.3. Prevalence and type of hospital acquired infection:

The overall prevalence of hospital acquired infection at SPHMMC was 19.8%(45/227). The highest prevalence was seen in medical wards and gynecology but low prevalence in surgical wards and there was no even single patient reported with HAI from obstetrics ward. The most common type of HAI reported in this study was hospital acquired pneumonia (HAP) 11.9% (27/227), followed by surgical site infection (SSI) 7.9%(18/227).

5.4. Factors Associated with HAIs:

Bivariable and multivariable logistic regression was used to identify factors associated with HAIs.

Patients those who was given antibiotics during the study period were at 4.078 at risk of developing hospital acquired infections(HAIs) than their counter parts (COR =4.078, 95% CI (2.05-8.10 ,p=0.000). This association persisted even after controlling for age, length of hospital stay ,income, and catheterization (AOR = 4.071, 95% CI: (1.94–8.55, p = .000).

Patients with recent history of catheterization were at 3.78 at risk of developing hospital acquired infections(HAIs) (COR=3.778, 95% CI (1.89- 7.54, P=0.000). This association persisted even after controlling for age, length of hospital stay ,income and antibiotics use (AOR = 3.13, 95% CI: (1.49–6.54, p = .000).

Patients with the age category of 31-60 years and patients with hospital stay of 11-20days were at 2.41 and 2.16 at risk of developing hospital acquired infections(HAIs), (COR=2.41, 95% CI (1.03-5.66, p=0.04) and (COR=2.16, 95% CI(1.07-4.37, p=0.03) respectively. But this association didn't persisted after controlling for income ,catheterization and antibiotics use (AOR = 1.99, 95% CI: (0.77–5.09, p =0.15) and (AOR=1.54, 95% CI(0.71-3.33, p=0.27).See Table.3.

Table.3.Factors associated with HAIs:

S.N	Variable	Category	Frequency	COR(95 % CI)	AOR(95 % CI)
1.	Age	16-30	68	1.00	1.00
		31-60	115	2.41(1.03,5.66)*	1.99(0.774,5.09)
		>60	44	1.93(0.68,5.45)	1.18(0.38,3.66)
2.	Monthly Income	<3000	118	1.00	1.00
		3000-4999	89	1.71(.86, 3.40)	1.68(0.78,3.65)
		>5000	20	1.30(.39,4.33)	1.014(0.271,3.802)
3.	Catheterization	No	134	1	1.00
		Yes	93	3.78(1.89, 7.54)*	3.13(1.49,6.54)**
4.	Antibiotics use during the study	No	142	1.00	1.00
		Yes	85	4.08(2.05,8.10)*	4.07(1.94,8.55)**
5.	Hospital stay in days	<10	148	1.00	1.00
		10-20	61	2.16(1.071,4.367)*	1.54(0.71,3.33)
		>20	18	1.03(0.28,3.85)	0.81(0.19,3.43)

“Significant at p<0.05”***

Abbreviations: COR= crude odd ratio, AOR= adjusted odd ratio, CI=confidence interval.

6. Discussion

In this study the overall prevalence rate of hospital acquired infection (HAI) was 19.8% at SPHMMC teaching hospital adult in patients. A finding which is much higher than most reports from high income settings [16, 20, 21]. It is also higher than the reported prevalence from some of the studies done in the country [25, 26]. This might be associated with the comprehensive nature of this study which involved all admitted patients including those with debilitating medical conditions.

These might have contributed for the observed higher prevalence. But study from jimma university medical college (JUMC) reported almost similar prevalence rate 19.4% which was comprehensive study of HAI including all patients admitted to JUMC [28].

When compared with other similar studies done in Africa, the finding of this study is higher than reports from Nigeria (2.6%), Morocco (10.3%) and Tanzania(14.8%) [31–33]. This could be explained by the high patient load, overcrowding, poor infrastructure and design of the hospital layout. On the other hand, the observed prevalence of HAI in this study is lower than reported prevalence from Addis Ababa (35.8%)and Mekelle (27.6%) [3, 30].

The most common type of HAI reported in this study was hospital acquired pneumonia (HAP) 11.9% (27/227), followed by surgical site infection (SSI) 7.9%(18/227) which is the first study in the country to report high prevalence of hospital acquired pneumonia (HAP) . A point prevalence study in Lithuania on 731 patients in 2010 showed that; the prevalence rate of HCAs was 3.8%(16). The prevalence differed by hospital wards (range 0.0%–19.2%). The lower respiratory tract (32.2%), urinary tract (28.5%), and surgical site infections (32.1%) were the most common health care-associated infections(16). In contrary to our study, study from jimma university medical college (JUMC) shows UTI was found to be the commonest form of HAI followed by surgical site infection[29].The proportion of UTI in the study from jimma university medical college (JUMC) (68.71%) was higher than findings in the other studies [29]. In our study there was no patient with UTI.

Prevalence of surgical site infection (SSI) in our study was higher than other studies done In Addis Ababa surgical site infections (SSI) in two hospitals (TikurAnbesa and Saint Paul) showed that 6.9 and 5.7% respectively[28,29]. This might be associated with the comprehensive nature of this study which involved all admitted patients including those with debilitating medical conditions.

Risk factors for hospital-acquired infection are dynamic and complex phenomena in the hospital. In our study, patients who were given antibiotics during the study and patients who had history of recent catheterization were at 4.07 and 3.78 at risk of developing hospital acquired infections (HAIs) respectively.

A matched case control study from teaching hospitals in Amhara region shows that, availability of waste management material in the room, immune status of the patient, central vascular catheter, surgery since admission and patient received antimicrobial at the time of survey were the predictors of hospital acquired infection[10]. Which supports antimicrobial as a risk factor for hospital acquired infections (HAIs) but in our study there was no significant association between availability of waste management material in the room, immune status of the patient, central vascular catheter, surgery since admission and hospital acquired infections (HAIs). This might be due to availability of waste disposal containers in all rooms of the patients in our study which was the problem in teaching hospitals in Amhara region. The availability of hand-washing facilities waste management material in the ward are important to prevent hospital acquired infection[10].

A study from Indian shows that Prolonged hospital stay [odds ratio (OR=2.81), mechanical ventilation (OR=18.57), use of urinary catheter (OR=7.89) and exposure to central air-conditioning (OR=8.59) had higher odds. of acquiring HAI ($P<0.05$), which shows the high odds ratio urinary catheter use which supports our study.

7. Strength of the study

- Clear title with clear inclusion and exclusion criteria
- It was the first study done at SPHMMC with this topic in adult population in patients.
- The study tried to address one of the major public health problem.
- It was prospective study that it included patients admitted to all adult wards of the hospital.

8. Limitations of the study

- Medical and obstetric patients were less represented due to low bed turnover.
- Culture results was not available for most patients.
- A larger sample size is required to further evaluate the association between outcome variable and predictor variables.
- This is a single center study, therefore, a multicenter study with large number of patients is recommended to look in to the factors associated with hospital acquired infections(HAIs).

9. Conclusion

Hospital acquired infection is a significant problem at SPHMMC. The most common type of hospital acquired infection in the this study was hospital acquired pneumonia. Recent history of catheterizations and antibiotics use during the study period were associated with high risk of developing hospital acquired infections. Hospitals and clinicians need to follow the appropriate safe use of antibiotics and catheterizations. Hence, any prospective effort to control hospital acquired infection at SPHMMC should consider associated factor to tackle the problem with maximum positive outcome.

10. Recommendations

- Clinicians should avoid inappropriate use of antibiotics.
- Clinicians should avoid inappropriate use of catheterizations.
- Hospital administers should plan and focus on prevention of hospital acquired infections since the prevalence is very high.
- Federal minster of health (FMOH) should plan and focus on prevention of hospital acquired infections since the prevalence is very high.

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Interview guide and questionnaire format

St. Paul's Hospital Millennium Medical College Department of Internal Medicine individual consent form for the study on: Assessments of magnitude and associated factors of HAIs in hospitalized adult patients, Addis Ababa, Ethiopia, 2019 G.C.

INSTRUCTION:

This questionnaire is designed to Assess the magnitude and associated factors of HAIs in SPHMMC adult in patients. The study is for academic purpose with an ultimate goal of drawing conclusions and recommendation that would be of help to the further trainees of the college, policy formulation of our hospital and country. This is not a test, there is no right or wrong answer, but please answer the entire question completely and carefully.

Note:

1. This questionnaire is to be filled by volunteer person who are selected for the study.
2. We want to assure that filled questionnaire are not exposed to public (it is confidential)
3. No one required writing his/her name on the questionnaire

Thank you in Advance

DATA COLLECTION FORMAT

1.Socio demographic Data

S.no	Questions	Response category
1.		Ward_____Card No _____ Date of admission_____ Date of discharge_____ Diagnosis at admission----- ----- Diagnosis at discharge----- -----
2. Age in yrs		1.16-30 yrs 2.31-60 yrs 3.>60 yrs
3.Sex		1.Male 2.Female
4. monthly Income		1.<3000 birr 2.3000 – 4999 birr 3.5000 birr and above
2.	Pt clinical profile	
5. comorbidities		1.DM /HTN 2.CHF 3.CLD 4.HIV ----- 5. STROKE 6. MALIGNANCY 7. CKD 8.Other (specify)-----
6. Presence of waste disposal material in the		1.Yes 2.No

room		
7.Any catheter		1.Urinary catheter 2.Centeral catheter 3.Other specify
8. Recent surgery		1.Yes if yes specify..... 2.No
9.Antibiotic at admission		1.Yes 2.No
10.	HAI	1.Yes 2.No
11.	If you say yes for question no.14 specify it	1.HAP 2. UTI 3.SSI 4.Other specify
12.	Length of hospital stay in days	-----

