HAND HYGIENE PRACTICE AND ASSOCIATED FACTORS AMONG NURSES IN GOVERNMENTAL HOSPITALS OF HARARI REGIONAL STATE, EASTERN ETHIOPIA

MSC THESIS

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Hand hygiene practice and associated factors among Nurses in Governmental Hospitals of Harari Regional State, Eastern Ethiopia

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APPROVAL SHEET

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LIST OF ABBREVIATIONS AND ACRONYMS

ABHR	Alcohol Based Hand Rub
AOR	Adjusted Odds Ratio
COR	Crude Odds Ratio
ETB	Ethiopian Birr
HCAIs	Health Care Associated Infections
HCWs	Health Care Workers
HFSUH	Hiwot Fana Specialized University Hospital
HH	Hand Hygiene
HU-IRB	Haramaya University Institutional Review Board
HW	Hand Washing
IHRERC	Institutional Health Research Ethics Review Committee
IPC	Infection Prevention Committee
IT	Information Technology

JU	Jugel Hospital
MOU	Measurement of Unit
PH	Police Hospital
SECL3H	South East command level three hospital
WHO	World Health Organization

ABSTRACT

Introduction: Healthcare workers' hands are the most common vehicle for the transmission of healthcare-associated pathogens from patient to patient and within the healthcare environment. Hand hygiene is the leading measure for preventing the spread of antimicrobial resistance and reducing healthcare-associated infections (HCAIs), but healthcare worker practices on hand hygiene remains low in most settings. Previous studies in Ethiopia focus on general health care workers. This study assessed hand hygiene practice and influencing factors among nurses in governmental hospitals who make the majority and providing care to the patients 24 hours.

Objective: To assess Hand hygiene practice and associated factors among Nurses in governmental hospitals of Harari regional state in Eastern Ethiopia from January 25 –February 20/2017.

Methodology: Hospital based cross-sectional was applied to assess 388 nurses selected from governmental hospitals of Harari regional state. Data were collected by self-administered questionnaire and Ward infrastructure survey by 4th year nursing students. The collected data were entered into Epi Data 3.1 and then exported and analyzed using SPSS 22. Bivariate and multivariate logistic regression models were used to identify factors associated with the self reported practice of hand hygiene. Then information's were presented by using frequencies, summary measures, tables and graphs. A total of 369 study participants

were interviewed that gave a response rate of 95.1%. The self reported practice was found to be 63.1%. Being male [(AOR=2.04, 95% CI: (1.21, 3.45)], participated in training [AOR=3.38 95% CI: (1.83, 8.04)], hospitals where sink conveniently located [AOR=2.74 95% CI: (1.61, 4.65)] and nurses who did not wear glove [AOR=2.03 95% CI: (1.20, 3.43)] working in medical ward [(AOR=0.34, 95% CI: (0.14, 0.79)], Surgical ward [(AOR=0.37, 95% CI: (0.16, 0.90)] and Intensive care unit (ICU) [(AOR=0.30, 95% CI: (0.09, 0.97)] and fear irritation and dryness to hand washing agent [AOR=0.26 95% CI: (0.15, 0.44)] were factors significantly associated with hand hygiene practice.

Conclusion and recommendation: Even though the self reported practice was good. Factors associated with hand hygiene practice were absence of resources, inconvenient infrastructure, poor awareness may be due to lack specific training, effect of detergents on the skin and the assertion that nurses believe wearing gloves is a substitute for hand hygiene practices. Therefore, training and educating nurses, monitoring compliance and providing feedback, and embedding the practice of hand hygiene in the institutional safety culture and patient engagement should be considered to increase the practice of hand hygiene.

1. INTRODUCTION

1.1. Background

Hand hygiene is a general term referring to any action of hand cleaning which is related to the removal of visible soil and removal or killing of transient microorganisms from the hands while maintaining the good skin integrity resulting from a hand care program (Birtish Columbia Minstry of Health, 2012). Resident flora are found in deeper layers of skin and are more resistant to removal and the transient flora, which colonizes the superficial layers of the skin and are acquired during direct contact with patients, healthcare providers, contaminated equipment or the environment, and is more amenable to removal by routine hand hygiene practice (BCMH, 2012; Mathur, 2011).

Healthcare workers' hands are the most common vehicle for the transmission of healthcare-associated pathogens from patient to patient and within the healthcare environment. Hand hygiene is the leading measure for preventing the spread of antimicrobial resistance and reducing healthcare-associated infections (HCAIs), but healthcare worker compliance with optimal practices remains low in most settings (Mathai E et al., 2010).

Nurses constitute the largest percentage of the health care workers (HCW) and they are the "nucleus of the healthcare system". Because they spend more time with patients than any other HCWs, their compliance with hand washing guidelines seems to be more vital in preventing the disease transmission among patients(Nair et al., 2014).

Health care associated infections (HCAIs) and the associated antimicrobial resistance (AMR) is a major global public health problem causing increased hospital stay, cost of therapy and mortality. The impact of HCAIs and antimicrobial resistance is much higher for developing countries because of limited resources, healthcare infrastructure and competence (Makic et al., 2013; World Health Organization, 2009a;Swedish Civil Contingency Agency, 2013).

Healthcare-associated infections (HAIs) occur worldwide and affect both developed and developing countries. At any time, over 1.4 million people worldwide suffer from infections acquired in hospital (BCMH, 2012;International Federation of Infection Control, 2011). It is

estimated that in developed countries, 5 to 10% of patients admitted to acute care hospitals (BCMH, 2012; WHO, 2009a) and 4.5 of every 1000 hospital admissions (Makic et al., 2013) acquire an infection. In high risk settings, such as intensive care units, more than one-third of patients can be affected (BCMH, 2012). For example in the United States, the Centers for Disease Control and Prevention (CDC) estimated that 1.7 million HAIs contribute to 99,000 deaths each year; they are among the top ten leading causes of death and the highest morbidity was among patients in intensive care units (ICU) (IFIC, 2011).

Health care-associated infection (HCAI) places a serious disease burden and has a significant economic impact on patients and healthcare systems throughout the world (Longtin Yves et al., 2011). Yet good hand hygiene, the simple task of cleaning hands at the right time and in the right way, can reduce HCAIs that are transmitted by Health-care workers' hands which become progressively colonized by germs and potential pathogens during patient care (WHO, 2009a).

1.2. Statement of problem

The hands of HCWs are commonly colonized with pathogens like methicillin resistant *S. aureus* (MRSA), vancomycin resistant *Enterococcus* (VRE), (Multi Drug Resistant) MDR-Gram Negative bacteria (GNBs), *Candida* spp. and *Clostridium difficle*, by performing "clean procedures" or touching intact areas of the skin of hospitalized patients which can survive for as long as 150 h. (Centers for Disease Control, 2002; Mathur, 2011; WHO, 2009a). As the result, their hands act as a vehicle for transmission of microbes from patient to patient, from patient to equipment and the environment, and from equipment and the environment to the patient (BCMH, 2012; Makic et al., 2013; Mathai E et al., 2010).

It is estimated that approximately 30% of healthcare providers report symptoms or signs of dermatitis involving their hands, and as many as 85% give a history of having skin problems after performing health care activities. Hence, promoting skin integrity through providing good hand hygiene products and teaching the correct techniques for hand hygiene is vital for the safety of both the healthcare provider and patients (BCMH, 2012). Nurses, who are the majority, can contaminate their hands with 100–1,000 colony-forming units (CFUs) of *Klebsiella*spp. during

"clean" activities (e.g., lifting a patient; taking a patient's pulse, blood pressure, or oral temperature; or touching a patient's hand, shoulder, or groin) (CDC, 2002).

In developing countries the risk of Health care-associated infection (HCAI) is 2-to-20 times higher and the proportion of infected patients can exceed 25% (WHO, 2009a). But many studies have consistently shown that Hand hygiene is considered the most important, simplest, least expensive and effective infection prevention and control measure to prevent the spread of HAIs and cross contamination of multi resistant infection in hospitals (BCMH, 2012; IFIC, 2011; Makic et al., 2013; Mathai E et al., 2010; Mathur, 2011). Hand hygiene is although associated with decreasing transmission of *Klebsiella* spp. among patients and health care workers (CDC, 2002; Mathur, 2011).

However, previous studies on public health institutions indicated poor practice of hand hygiene and factors related to poor compliance such as lack of time, lack of equipment/supplies, and behavioral factors, (IFIC, 2011; Nura Muhammed Abdella et al., 2014), poor knowledge and lack of training toward hand hygiene (Langoyaa Charles O.C. and Fullerb Nigel J., 2015; Nura Muhammed Abdella et al., 2014; Segun Bello et al., 2013) often result in HCWs non compliance toward hand hygiene.

Most studies in Ethiopia focus on general HCWs and no study is conducted in Harari regional state regarding hand hygiene practice. This study assessed hand hygiene practice (self reported and observational) and influencing factors among nurses in governmental hospitals who make the majority and providing care to the patients 24 hours.

1.3 Significance of the study

The aim of this study is to identify the level of practice of hand hygiene which is core of infection prevention practice and factors associated with it. The primary beneficiaries of this study are governmental hospitals in Harari regional state. The study may help the hospitals and other policy makers to identify factors that hinder good practice of hand hygiene among nurses so as to reduce the prevalence of hospital acquired infection. The study also helps to increase the quality of health care delivered by nurses by intervening to the gaps accordingly.

In addition, findings of this study provide the basic framework for future studies in assessing and comparing the performance of interventions. It also helps policy makers from hospitals to ministry of health level by identifying the problems and intervening at each level accordingly.

1.4 Objectives of the study

1.4.1 General Objective

To assess Hand hygiene practice and associated factors among Nurses in governmental hospitals of Harari Regional State, Eastern Ethiopia from January 25 –February 20/2017

1.4.2 Specific Objectives

- To assess practice of Hand hygiene among Nurses in governmental hospitals of Harari Regional State
- To identify associated factors toward compliance of hand hygiene practice among Nurses in governmental of Harari Regional State

2. LITERATURE REVIEW

2.1 Hand hygiene Practice

Self reported hand hygiene practice was 92% (De Wandel et al., 2010) in study conducted in Belgium, 98.2% (Al-Wazzan Batool et al., 2011) in cross sectional study conducted in Kuwait in 2009.

In study conducted in Addis Ababa in 2012 indicated Nurses base line adherence to hand hygiene practice was 3.5% but after implementation of the WHO multimodal hand hygiene strategy the practice increased to 19.3% (Schmitz Karen et al., 2014), 16.5% (Nura Muhammed Abdella et al., 2014) observational cross sectional study conducted in Gondar, North West Ethiopia..

2.2 Factors associated with Hand Hygiene practice

2.2.1 Socio demographic characteristics

Educational level is significantly associated with hand hygiene practice, Nurses having Baccalaureate degree/Graduate degree washed their hand 1.68 times more than Diploma Nurses (AOR 1.68 95% CI 1.06-2.66 P= 0.028) in cross sectional study conducted in Italy from 2008-2009 (Sessa Alessandra et al., 2011). In other study conducted in Uganda in 2008 Nurses whose educational level was beyond Ordinary level (≥11 years of formal education) practiced hand hygiene 3.3 times more than nurses with ≥7 years formal education (AOR 3.30 95%CI 1.44–7.54 P=0.005) (Wasswa Peter et al., 2015).

Sex is significantly associated with hand hygiene practice, more female washed their hands frequently than their male counterparts (p=0.013) in prospective cross sectional study conducted in Nigeria in 2014 (Tobi KU. and Enyi-Nwafor K., 2013). Also cross-sectional study conducted in

Uganda in 2008 indicated female nurses practice hand hygiene 1.33 times better than male encounter (AOR 1.33 95%CI0.65–2.73) (Wasswa Peter et al., 2015).

Descriptive cross sectional study conducted in Malaysia in 2010 showed there was significant differences with respondents' year of service with knowledge (P<0.01) and compliance to hand hygiene practice (P=0.012). The study also indicated there was significant differences between respondents' years of service with the knowledge and compliance to hand hygiene with p values <0.05(Ho et al., 2012).

Age is significantly associated with hand hygiene practice, Nurses with age category <35 Years practice hand hygiene 1.15 times more than other age group (AOR 1.15 95%CI 0.56–2.37) in cross-sectional study conducted in Uganda in 2008 (Wasswa Peter et al., 2015).

2.2.2 Organizational Factors

Cross sectional study done in Italy from 2008-2009 indicated Nurses working in medical ward performed hand hygiene 1.4 times more than nurses working in other ward (AOR 1.4 95% CI 0.92-2.14 P=0.115) (Sessa Alessandra et al., 2011) but study conducted in Addis Ababa in 2012 indicated Nurses working in Emergency Department had 4.9 better hand hygiene adherences compared to nurses working in Surgical ward (AOR = 4.9, 95% CI 2.8-8.6, p < 0.001)(Schmitz Karen et al., 2014).

Availability of hand hygiene facility was associated with hand hygine practice, in Cross sectional study conducted in Southern Nigeria from 2009 to 2010 indicated Nurses who believed that facilitiesfor handwashing were inadequate, were less likely tohave good handwashing practice (X2= 21.90, p<0.001)20.9% and 29.1% responded inadequacy of water and absence of detergent/soap respectively (Segun Bello et al., 2013).Similarly in cross sectional study conducted in Gonder, North West Ethiopia in 2013 showed hand hygiene practice was significantly associated with availability of soap and water (AOR3.20 95%CI 1.86,5.55), 59.5% of respondents indicated lack soap and water(Nura Muhammed Abdella et al., 2014).

Also study indicated association of hand hygiene facility to practice of hand hygiene. Presence of alcohol based hand rub in the institution increased the practice of hand rubbing 6.58 times (AOR

= 6.58, 95% CI 2.67, 16.22) and Availability of sink in working ward increased the practice of hand hygiene 2.46 times (AOR = 2.46, 95% CI 1.44, 4.21) in cross sectional study conducted in Gonder, North West Ethiopia in 2013 (Nura Muhammed Abdella et al., 2014).

Knowledge on the presence of infection prevention committees (IPC) was significantly associated with hand hygiene practice, respondent who knows that there is IPC practiced hand hygiene 2.6 times more than those who do not know (AOR = 2.6, 95% CI 1.23, 5.37) in cross sectional study conducted in Gonder, North West Ethiopia in 2013 (Nura Muhammed Abdella et al., 2014).

2.2.3 Individual factors

In cross sectional study conducted in Gondar, North West Ethiopia in 2013 indicated, having knowledge about hand hygiene practice, was significantly associated with hand hygiene compliance. Those who had Good knowledge on HH had 3.8 times more hand hygiene practice than those with poor knowledge(AOR = 3.80, 95% CI 1.60, 8.97). (Nura Muhammed Abdella et al., 2014).

Training was significantly associated with hand hygiene practice. Those who were trained had 2.6 times more practice than those who were not trained (AOR = 2.60, 95% CI 11.21, 5.62), in cross sectional study conducted in Gonder in 2013 (Nura Muhammed Abdella et al., 2014). Similarly in cross-sectional study conducted in Uganda in 2008 indicated nurses who Received in-service training had 2.71 times more practice of hand washing than those who do not received training (AOR2.71 95% CI (1.03–7.16) P=0.045) (Wasswa Peter et al., 2015). Also observational study conducted in Turkey in 2010 indicated Hand hygiene adherence rate of trained nurses was higher than untrained ones before patient contact (63% versus 76% $p<0.05$), After patient contact (91% versus 84% P=0.370), Before aseptic/clean procedure(76% versus 94% P= 0.370) (Teker et al., 2015).

2.2.4 Barriers for practicing Hand Hygiene

Reasons for not practicing hand hygiene which have significant associations were being busy (A*OR,* .231; 95% *CI,* .126 – .423) $p < .001$, forgetfulness (A*OR,* .356; 95% *CI,* .186 – .678)

p=.002; alcohol hand rub damages skin (A*OR,* .163; 95% *CI* .070 – .380) p < .001in cross sectional study conducted in Canada in 2011 (Foote and El-Masri, 2015).

2.3 Conceptual framework

Conceptual framework was developed by reviewing different literatures

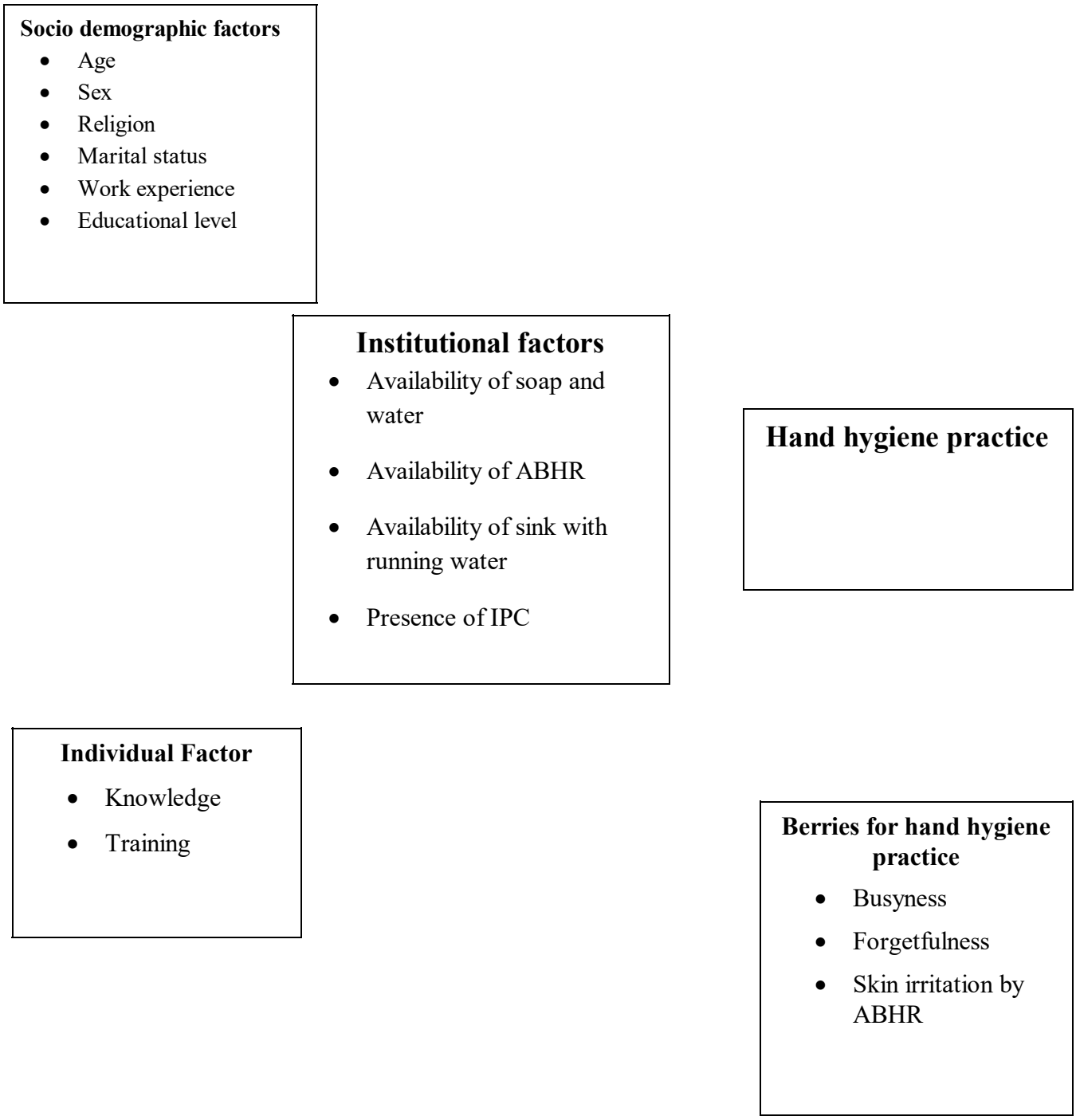

Figure 1 Conceptual framework for Hand hygiene practice and associated factors among Nurses in governmental hospitals of Harari Regional State, 2017

3. METHODOLOGY

3.1 Study area and period

Harari Regional state is located 515 km away from A.A to the south-east part with estimated area of 334 square kilometers. Based on 2002 (EFY) figures from the Central Statistical Agency (CSA) of Ethiopia, the Harari Regional State has an estimated total population of 198,980 consisting of 100,126 male and 98,854 female. 49.5% of the population is estimated to be rural inhabitants; while 50.5% are urban dwellers (CSA and ICF, 2012). This is divided in to 9 districts and 36 Kebeles.

The health profile of the region shows there are six hospitals of which four are governmental and two are private hospitals. In addition to this, there are eight health centers and 22 health posts. The study was conducted on four governmental hospitals. The four governmental hospitals are Hiwot Fana Specialized University Hospital (HFSUH),Jugel Hospital (JH), Police Hospital and South East command level three hospital (SECL3H). HFSUH is a teaching University hospital of Haramaya University with a total of 161 beds and having medical, surgical, gynecology, pediatrics, psychiatric wards. The total number of Nurses in HFSUH is 142 (HFSUH, 2016). Jugel Hospital is a regional referral hospital of the Harari Regional State with 95 beds and medical, surgical and gynecology wards with 84 nurses (JU, 2016), PH have total of 50 Nurses (PH, 2016) and South East command level three hospital (SECL3H) have total of 112 Nurses (SECL3H, 2016). The study was conducted from January 25 –February 20/2017.

3.2 Study design

Hospital based Cross-sectional design with quantitative methods was used to study Hand hygiene practice and associated factors among Nurses.

3.3 Population

3.3.1 Source population

All nurses working in the governmental hospitals in Harari regional state.

3.3.2 Study population

All nurses working in the governmental hospitals in Harari regional state.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion

- All nurses who are permanent recruit having diploma and above qualification were involved in the study.

3.42 Exclusion

- No exclusion criteria

3.5 Sample size determination

3.5.1 Sample size determination for first objective

To estimate the sample size we used a single population proportion formula, [n = (Z α/2)2 p (1 − p)/d2], will be used. Where:-

□–minimum sample size,

□–estimated proportion of hand hygiene practice of Nurses was 3.5 in study conducted in Addis Ababa (Schmitz Karen et al., 2014)will be used.

□–the margin of sampling error tolerated (3%),

□/2—the standard normal variable at 1−□% confidence level (5% = 1.96)

With adjustment for non response (15%) the final sample size becomes 166

3.5.2 Sample size determination for second objective

Double population proportion formula was used to determine the sample size for factors associated toward compliance of hand hygiene practice. Sample size was calculated for some of the associated factors obtained from (Nura Muhammed Abdella et al., 2014) by using the Statcalc of Epi Info statistical software version 7 with the following assumptions:

- Confidence level = 95%

- Power = 80%
- The ratio of unexposed to exposed almost equivalent to 1

Table 1 Sample size determination for second objective of Hand hygiene practice and associated factors among Nurses in governmental hospitals of Harari Regional State, 2017

Factors		Outcome (*HHP)			*FSS	*Ref
		Good	Poor			
Training	Exposed (Yes)	57	187	Outcomes in Exposed = 23.4%		(Nur
	Unexposed (No)	10	151	Outcomes in Unexposed =6.2%	154	a
	Exposed (Yes)	60	253	Outcomes in Exposed = 19.17%		Muh
Knowledge	Unexposed (No)	7	85	Outcomes in Unexposed =7.61%	304	amm
Availability	Exposed (Yes)	61	170	Outcomes in Exposed = 26.41%		ed
of ABHR	Unexposed (No)	6	168	Outcomes in Unexposed = 3.45%	90	Abd
Availability	Exposed (Yes)	41	132	Outcomes in Exposed = 23.6%		ella
of sink	Unexposed (No)	26	20	Outcomes in Unexposed = 11.21%	324	et
Availability	Exposed (Yes)	43	121	Outcomes in Exposed = 26.22%		al.,
of soap and water	Unexposed (No)	24	21	Outcomes in Unexposed = 9.96%	198	2014)

*HHP Hand Hygiene Practice *FSS Final Sample Size *Ref Reference

Generally, sample sizes were calculated for the first and the second objectives and the largest sample size is found to be 324 from the second objective. The total populations of nurses in selected study area were 388 and they are close to calculated sample and manageable, therefore all of the nurses were included in the study.

3.6 Sampling technique

All nurses in selected four Governmental hospitals were included in the study.

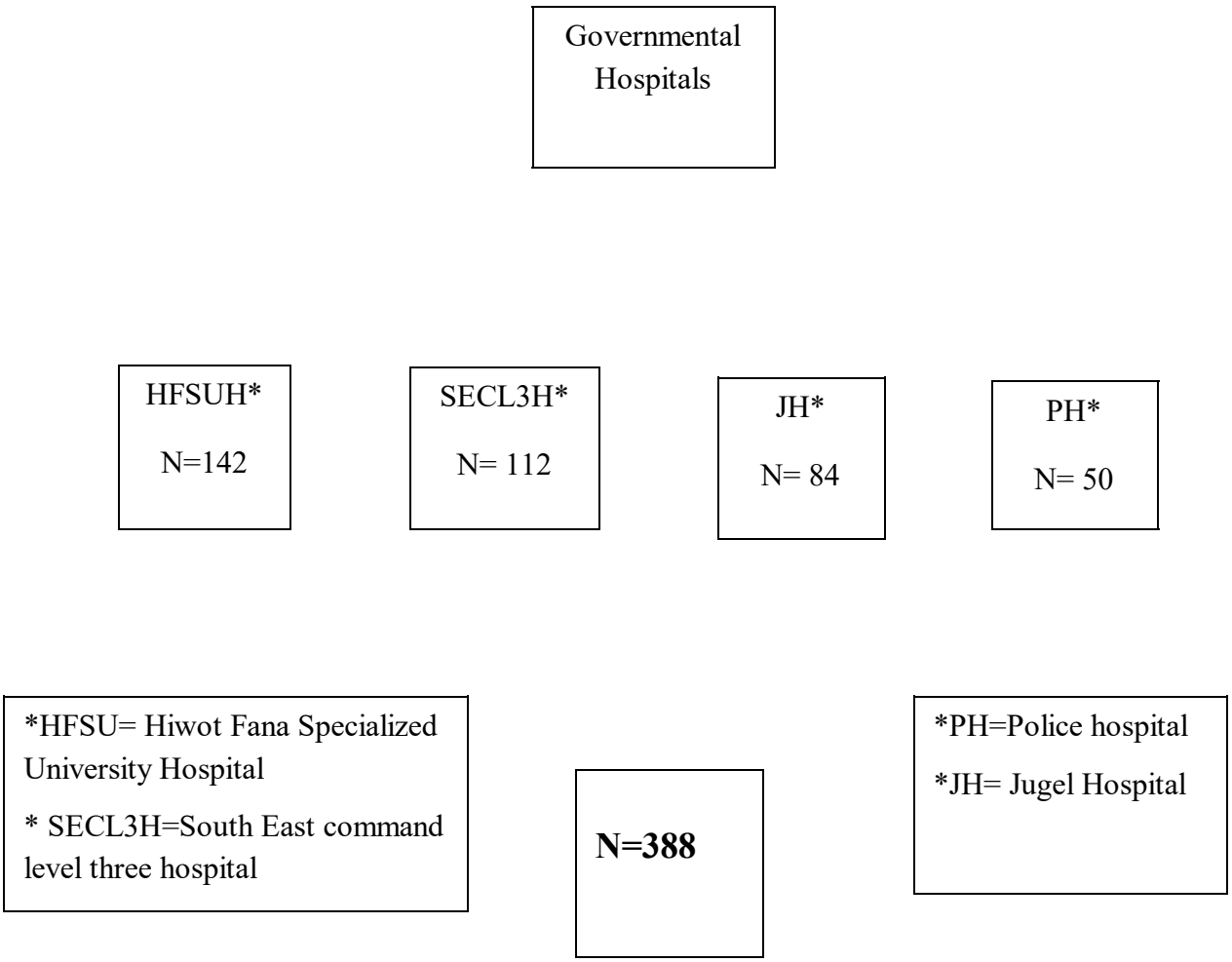

Figure 2 Schematic diagram of study population and sample size distribution of Hand hygiene practice and associated factors among Nurses in governmental hospitals of Harari Regional State, 2017

3.7Data Collection

3.7.1 Data collection tools

Two tools were used to collect data. First self-administered questionnaire which contains three parts was used. Part I is about socio demographic characteristics of respondents. Part II contains 26 Knowledge questions that are adapted from WHO Hand Hygiene Knowledge Questionnaire for health workers (WHO, 2016) and Part III includes 4 questions which contain questions on factors other than knowledge and barriers that hinder the practice of hand hygiene. Part IV includes questions on self-reported practice of Nurses toward hand hygiene practice.

Second tool was questionnaires on ward Infrastructure survey in which data were collected by interview of head nurse of each ward and observation of the infrastructures. It contains 9 questions which were adapted from WHO ward infrastructure survey form (WHO, 2016).

3.7.2 Data collectors

The data were collected by 8 fourth year nursing student and 3 infection prevention personnel's who were selected from four hospitals supervised the activities of data collectors.

3.7.3 Data collection procedure

Data were collected for 2 weeks. Self-administered questionnaire was administered at 1st week of the data collection period. The questionnaire was given for the respondents before 1 hrs left for end of the regular working hours and the data collectors collected the questionnaires before the respondent left the hospitals by completing their shift work. For nurses who were on the night shift the questionnaire was given at 8:00 pm at night and collected back after 1 hr. Ward Infrastructure survey was conducted by interviewing head nurse of each ward and observation of the infrastructure at end of collection of self-administered questionnaire.

3.8 Study Variables

3.8.1 Dependent Variable

- Hand hygiene practice

3.82 Independent Variables

Socio demographic factors: Age, Sex, Work experience, Educational level

Institutional factors: Availability of soap and water, Availability of ABHR, Availability of sink with running water, Presence of IPC and Unit of work, Work shift

Individual Factor: Knowledge, Training,

Barriers hand hygiene practice: Busyness, Forgetfulness, Skin irritation by ABHR

3.9 Operational Definition

Hand hygiene: A general term referring to any action of hand cleansing. Hand-rubbing with an alcohol-based hand-rub or hand-washing with soap and water aimed at reducing or inhibiting the growth of micro-organisms on hands (WHO, 2009b).

Self reported practice

Good practice: - Nurses who scores above mean composite score.

Poor practice: Nurses who score below mean composite score.

Knowledge was assessed using WHO‟s hand hygiene questionnaire for health care workers. The questionnaire contains 26 questions included multiple choice questions; “yes” or “no” questions; and “true” or “false” questions. 1 point was given for each correct response so that maximum score for knowledge was 26. Finally mean composite score was calculated and nurses who scored above mean score were considered as knowledgeable on hand hygiene and those who scored below mean score were considered as not knowledgeable hand hygiene (Nura Muhammed Abdella et al., 2014).

3.10 Data Quality Control

Self-administered questionnaire and ward infrastructure survey checklists were prepared on English. Prior to actual data collection two day training was given for data collectors and supervisors on the data collection tool, data collection procedure, aim of the study and on confidentiality of the collected data from respective nurses. Pre-test on self-administered questionnaire and observational check list was conducted on 5% of final study subjects in Dilchora Hospital in Diredawa to ensure its validity, reliability and to check wording of the

questionnaires. Completeness of each questionnaire was checked by supervisors on daily basis then finally it was checked by principal investigator. Double data entry was done by two data clerks and consistency of the entered data were cross checked by comparing the two separately entered data on EpiData.

3.11 Data Processing and Analysis

The data were first coded, entered and cleaned using EpiData statistical software version 3.1 and then exported into SPSS statistical software version 22 for analysis.

Self reported hand hygiene practice was assessed by 5 items namely Before touching a patient Before clean/aseptic procedure, After body fluid exposure risk, After touching a patient, After touching patient surroundings which will be measured by 4 level Likert scales Always, Intermittently, Rarely and Never with values of 3, 2,1and 0 respectively with minimum total score of 0 and maximum total score of 15 finally mean composite score was calculated and magnitude above mean score was considered as Good hand hygiene practice and below mean score was categorized as Poor hand hygiene practice).

Descriptive statistical analysis such as simple frequencies, measures of central tendency and measures of dispersion were used to describe the characteristics of participants such as socio demographic characteristics; self-reported practice, knowledge and institutional factors

Then the information's were presented using frequencies, summary measures, tables and figures. Bivariate and multivariate logistic regression models were used to identify factors associated with the self reported practice of hand hygiene. Finally variables with p-value ≤ 0.25 were taken into the multivariable model to control for all possible confounders. Hosmer Lemshow and Omnibus tests were done to test for model fitness. Multi-collinearity was also checked to see the linear correlation among the independent variables by using variance inflation factor and standard error. Variables with variance inflation factor >10 and standard error of > 2 were dropped from the multi-variable analysis. Odds ratios with 95% CI were estimated to identify the factors associated with hand hygiene practice using multivariable logistic regression analysis. Level of statistical significance was declared at p-value ≤ 0.05.

3.12 Ethical Considerations

Before starting of the data collection process, the study protocol was approved by the Haramaya University, College of Health and Medical Sciences, Institutional Health Research Ethics Review Committee. Official letters of co-operation was written to all hospitals and concerned bodies to obtain their co-operation in facilitating the study. Information on the study was explained to the participants, including the procedures, potential risks and benefits of the study. The respondents were informed of their right to refuse or decline participation in the study at any time and refusing to participate in the study will not affect them. Participants' confidentiality of information was assured by excluding names and identifiers in the questionnaire. Informed voluntary written and signed consent were obtained from all respondents prior to the study.

4. RESULT

4.1. Socio-demographic Characteristics

A total of 369 study participants were interviewed that gave a response rate of 95.1%. Majority of the respondents were from Hiwot Fana Specialized University Hospital (HFSUH).The mean age (±SD) of respondents was 31.2 ± 7.5 years. Female participants account 208(56.4%). Majority of the respondents 230(62.3 %) were Orthodox Christians. Two hundred (54.2%) reported to be married. Majority of the respondents have greater than four year of experience with 6.33 mean working years. Seventy eight (21.1%) of the respondents were from medical ward of the hospitals (Table 2)

Table 2 Socio-demographic characteristic of Nurses in Governmental hospitals of Harari Regional State, Eastern Ethiopia, 2017 (n=369)

Variables		Frequency	Percentage
Hospitals	HFSUH	132	35.8
	Jugel	77	20.9
	South east command level 3	115	31.2
	Police	45	12.2
Age	18-25	84	22.8
	26-35	196	53.1
	>=36	89	24.1
Sex	Male	161	43.6
	Female	208	56.4
Religion	Orthodox Christians	230	62.3
	Protestant	59	16.0

	Muslim	64	17.3
	Other	16	4.3
Marital status	Single	160	43.4
	Married	200	54.2
	Divorced	9	2.4
Educational level	Diploma	147	39.8
	BSc and above	222	60.2
Year of experience	<=1	57	15.4
	2-4	118	32.0
	>4	194	52.6
Ward currently working	Medical	78	21.1
	Surgical	76	20.6
	Pediatrics	54	14.6
	Maternity	40	10.8
	OPD	64	17.3
	ICU	23	6.2
	Others	34	9.2

4.2. Individual characteristics

About half 194(52.6%) of the respondents were knowledgeable on hand hygiene. Only 98 (26.6%) of Nurses were trained on hand hygiene in the last three years. The low level of training was highly related to poor knowledge (Figure 3). Regarding awareness on the presence of infection prevention [IP] committees, 205(55.6%), of the respondents knew the presence IP committees and the others not.

Figure 3 Knowledge and Training on hand hygiene of Nurses in Governmental hospitals of Harari Regional State. Eastern Ethiopia, 2017 (n=369)

4.3. Institutional factors

Ward infrastructure survey

Total of 29 wards of each hospitals were observed and head nurse of each wards were interviewed using ward infrastructure survey checklist and questionnaire. All 29 wards had sink. In the majority of wards sinks, water was regularly available and in the 44.8% of the ward sinks soap and towel was available intermittently. Alcohol base hand rub which was bottle affixed to trolley was available at all 29 ward of each hospitals (Table 3).

Table 3 Ward infrastructure survey of Governmental hospitals of Harari Regional State, Eastern Ethiopia, 2017 (n=29)

Infrastructures		Frequency	Percent
Availability of sink in ward	Yes	29	100
	No	0	-
Regular availability of water in the sink	Always	14	48.3
	Intermittently	10	34.5
	Rarely	5	17.2
Soap availability at each sink	Always	7	24.1
	Intermittently	13	44.8
	Rarely	7	24.1
	Never	2	6.9
Disposable towel availability at each sink	Always	2	6.9
	Intermittently	8	27.6
	Rarely	14	48.3
	Never	5	17.2
Availability of ABHR*	Yes	29	100
Poster illustration displaying indication of HH* posted in multiple areas of ward	Yes	5	17.2
	No	24	82.8

*ABHR= Alcohol Based Hand Rub *HH= Hand Hygiene

4.4. Self reported practice of hand hygiene

The self reported practice of nurses toward hand hygiene showed that majority 233 (63.1%, 95% CI: 58.3%, 68.3%) of nurses had good practice. About half of the respondents 181(49.1%) and 176(47.7%) reported 'sometimes' performing hand hygiene 'before and after any direct patient contact' respectively. Majority 223(60.4%) of the respondents performed hand hygiene 'always' after exposure to body fluid and the same proportion 226(61.2%) of respondents reported 'sometimes' performing hand hygiene after contact with any object in patient's immediate surroundings. One hundred forty two (38.5%) of the nurses reported they perform hand hygiene 'always' before any clean/aseptic procedure. The median score of the self-reported HH practice score was 9, and the mean was 8.6 out of a maximum of 15 (n = 369) (Table 4).

Table 4 Self reported practice of hand hygiene of Nurses in Governmental hospitals of Harari Regional State, Eastern Ethiopia, 2017 (n=369)

Moments	**Hand hygiene practice**			
	Always	**Intermittently**	**Sometimes**	**Never**
Before having direct contact with patient	53(14.4%)	67(18.2%)	181(49.1%)	68(18.4%)
Before clean/aseptic procedure	142(38.5%)	118(32%)	90(24.4%)	19(5.1%)
After body fluid exposure risk	223(60.4%)	84(22.8%)	49(13.3%)	13(3.5%)
After having direct contact with patient	61(16.5%)	98(26.6%)	176(47.7%)	34(9.2%)
After touching patient surrounding	51(13.8%)	71(19.2%)	226(61.2%)	21(5.7%)

4.5.Factors Associated With Hand Hygiene Practice

4.5.1. Results of Multivariable Logistic regression analysis

Being male [(AOR=2.04, 95% CI: (1.21, 3.45)], participated in training [AOR=3.38 95% CI: (1.83, 8.04)], hospitals where sink conveniently located [AOR=2.74 95% CI: (1.61, 4.65)] and nurses who did not wear glove [AOR=2.03 95% CI: (1.20, 3.43)] were more likely to practice HH as compared with their counter parts (Table 5**).**

Nurses who worked in medical ward [(AOR=0.34, 95% CI: (0.14, 0.79)], Surgical ward [(AOR=0.37, 95% CI: (0.16, 0.90)] and Intensive care unit (ICU) [(AOR=0.30, 95% CI: (0.09, 0.97)] compared to those worked in outpatient department (OPD) and those who fear irritation and dryness to hand washing agent [AOR=0.26 95% CI: (0.15, 0.44)] were less likely to practice hand hygiene (Table 5**).**

Table 5 Factors associated with self reported Hand hygiene practice of nurses in Governmental hospitals of Harari Regional State, Eastern Ethiopia, 2017 (n=369)

Independent variables		Frequency (%)	Hand hygiene practice		COR (95% CI)	AOR (95% CI)
			Good	Poor		
Sex	Male	116(43.6)	113	48	1	1
	Female	208(56.4)	120	88	0.58(0.38,0.90)*	0.49(0.29, 0.83)*
Work experience						
	<1	57(15.4)	32	25	1	1
	2-4	118(32.0)	68	50	1.06(0.56, 2.01)	0.63(0.25, 1.61)
	>4	194(52.6)	133	61	1.7(0.93, 3.12)	0.62(0.20, 1.81)
Age						
	18-25	84(22.8)	43	41	1	1
	26-35	196(53.1)	128	68	1.80(1.07,3.02)*	1.85(0.79, 4.36)
	>=36	89(24.1)	62	27	2.19(1.18, 4.08)*	2.42(0.79, 7.37)
Knowledge						
	Good	194(52.6)	135	59	1.80(1.17, 2.76)*	1.14(0.65, 2.00)
	Poor	175(47.7)	98	77	1	1
Ward						
	OPD	64(17.3)	48	16	1	
	Medical	78(21.1)	42	36	0.39(0.12, 0.80)*	0.34(0.14, 0.79)*

Surgical	76(20.6)	44	32	0.46(0.22, 0.95)*	0.37(0.16, 0.90)*
Pediatrics	54(14.6)	37	17	0.73(0.32, 1.63)	0.53(0.20, 1.37)
Maternity	40(10.8)	29	11	0.88(0.36, 2.15)	0.78(0.27, 2.27)
ICU	23(6.2)	10	13	0.26(0.09, 0.70)*	0.30(0.09, 0.97)*
Others	34(9.2)	23	11	0.70(0.28, 1.74)	0.44(0.15, 1.30)
Training					
Yes	98(26.6)	83	15	4.46(2.45, 8.13)**	3.9(1.85, 8.3)**
No	271(73.4)	150	121	1	1
Presence of IPC					
Yes	205(55.6)	143	62	1.89(1.24, 2.91)*	1.60(0.95, 2.69)
No	164(44.4)	90	74	1	1
Conveniently located sink					
Yes	146(39.6)	154	59	2.54(1.65, 3.93)**	2.74(1.61, 4.65)**
No	223(60.4)	79	77	1	1
Availability of hand washing agents					
Yes	174(47.2)	134	61	1.66(1.09, 2.55)*	1.33(0.79, 2.23)
No	195(52.8)	99	75	1	1
Wearing glove					
Yes	153(41.5)	83	70	1	1
No	216(58.5)	150	66	1.92(1.25, 2.95)*	2.03(1.20, 3.43)*
Fear irritation & dryness of HW agents					
Yes	139(37.7)	62	77	0.28(0.18, 0.43)**	0.26(0.15, 0.44)**
No	230(62.3)	171	59	1	

*=p-value <0.05, **=p-value<0.001, CI = Confidence Interval, COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio HW= Hand Washing

5. DISCUSSION

In this study prevalence of reported hand hygiene practice was good mainly affected by being males, convenient location of sinks in ward, training, glove use, fear of irritation and dryness to hand washing agents and working in inpatient departments of the hospitals.

The prevalence of Self reported practice of nurses was low compared to studies conducted in Belgium were the practice was 92% (De Wandel et al., 2010) and 98.2% in Kuwait (Al-Wazzan Batool et al., 2011). This difference might be attributed to difference in the socioeconomic status, level of knowledge of nurses and lack of hand hygiene supplies in our setting.

Concerning sex difference two studies conducted in Africa indicated more female washed their hands frequently than males in Nigeria (Tobi KU. and Enyi-Nwafor K., 2013) and Uganda

(Wasswa Peter et al., 2015). This finding contradicts with these studies which might be explained the fact that strong commitment was observed among males in performing hand hygiene and this needs further investigation.

The study from Addis Ababa indicated nurses working in Emergency Department had better hand hygiene practice compared to nurses working in Surgical ward (Schmitz Karen et al., 2014). Finding from this study contradicts with AA which might be difference in patient load and difficult sink location which was observed in the emergency wards in this study area.

This study was consistent with the study conducted in Southern Nigeria in which Nurses who believed that facilities for handwashing were inadequate, were less likely to have good handwashing practice (Segun Bello et al., 2013) and Gonder were Availability of sink in working ward increased the practice of hand hygiene (Nura Muhammed Abdella et al., 2014). Because presence conveniently located sinks at point of care will ease the practice of hand hygiene.

Training about hand hygiene was found to be significantly associated with hand hygiene practice. Which supported by study from Gonder were trained nurses had more practice than those who were not trained (Nura Muhammed Abdella et al., 2014). This might be due to the fact that training built the capacity of nurses which had a significant association with hand hygiene practice. Training might be very vital to remind the practice of hand hygiene.

Nurses who do not wear glove were more likely to practice hand hygiene compared to those who wear glove for nursing activities which was supported by the statement that glove use does not replace the need to perform hand hygiene. When an indication for hand hygiene occurs during glove use, the health care worker must remove the gloves, perform hand hygiene, and don another pair of gloves as indicated in the study conducted in Geneva (Longtin Yves et al., 2011)

Fear of irritation and dryness to hand washing agents decreases the hand hygiene practice. This was supported by the findings from Canada and Kuwait (Foote and El-Masri, 2015 and Al-Wazzan Batool et al., 2011) Even though there was difference in socio economic statuses between these two countries, hand hygiene agents used were may be similar.

Generally, the study tried to assess the prevalence and factors associated with hand hygiene practice and it can be an input for the infection prevention program together with other pocket

studies from different corners of the country (Ethiopia). But the study might have faced some limitations; such as socially desirability bias since the study assessed self reported practice there might be over reported a behavior which was minimized by explaining the purpose of the research also this study did not take into account technique or duration when measuring compliance.

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusion

Self reported practice of the Nurses on hand hygiene practice was good. Poor hand hygiene practice among nurses which may be related to absence of resources, inconvenient infrastructure, poor awareness may be due to lack specific training, effect of detergents on the skin and the assertion that nurses believe wearing gloves is a substitute for hand hygiene practices

6.2. Recommendations

To Nurses

- Glove use does not replace the need to perform hand hygiene. When an indication for hand hygiene occurs during glove use, nurses must remove the gloves, perform hand hygiene, and don another pair of gloves, if still indicated.
- To prevent skin irritation, use skin-care products frequently during work shifts favor the use of alcohol-based hand rubs rather than soap

To hospital Administration

- Training and educating nurses, monitoring compliance and providing feedback, and embedding the practice of hand hygiene in the institutional safety culture and patient engagement
- Provide staff with hand moisturizing skin-care products (and encourage regular frequent use) to minimize the occurrence of irritant contact dermatitis associated with hand hygiene
- The location and design of hand hygiene facilities shall be developed in consultation with infection prevention and control personnel so that it should be easily accessible to ease the practice.

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ANNEXES

Annex I Information Sheet and Informed Voluntary Consent Form for Hospital Heads

My name is_____, I am working as data collector for the study being conducted in this Institution by Nefsu Awoke who is studying Masters Degree at Haramaya University College of Health and Medical Sciences. I kindly request you to lend me attention to explain you about the study and being selected as the study participant.

Title of the study: Hand hygiene practice and associated factors among Nurses in governmental and private hospitals of Harari Regional state, Eastern Ethiopia.

Purpose: The findings of this study can be of a paramount importance for your institution to know the level of practice of hand hygiene and to point out major factors that hinder the practice and take corrective actions toward the factors to increase the level of practice so as to reduce cross contamination that occur between hospital environment, patient and Nurses and to reduce prevalence of hospital acquired infection by adhering to correct practice of hand hygiene. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's program in Adult Health Nursing for the principal investigator whose name is mentioned above.

Procedure: I will observe the nurses when they are practicing hand hygiene using observational checklist which will last 10-20 minute for data collection period of three weeks which will be helpful to know correct practice and at the end of the observational period (i.e. at fourth week of data collection period) the nurses are requested to respond for self-administered questionnaires to provide me with pertinent data that is helpful for the study. There are 32 questions to answer with their possible choices. The questionnaire will take about 25-30 minutes.

Risk and benefits: By participating in this study you may feel that it has some discomfort specially on wasting time of employees (about 25-30 minutes) but this may not be too much comparing its potential benefits it contributes for your institution on identification of factors that hinder good performance of hand hygiene practice and intervene accordingly to decrease

prevalence of hospital acquired infection and increase quality care provided by nurses. There is no risk in participating in this study.

Confidentiality and Anonymity: The information that we will collect from individual Nurses for this study will be kept confidential. Information collected during the study will be stored in a file, which will not have individual name on it, but a code number assigned to it. Which number belongs to which name will be kept under lock and key, and it will not be revealed to anyone except the principal investigator.

Rights: permission to this study is on voluntary basis. You have the full right to permit or not for the study. You have also the full right to terminate this study at any time if you get something wrong with the study.

Persons to contact: If there are any questions about study, you can contact by any of the following addresses.

Nefsu Awoke*:* Mobile number +251 913712302

E-mail: nefsea@gmail.com

Institutional Health Research Ethics Review committee:

Tel: 0254660708

P.O.Box 235, Harar

Declaration of informed voluntary consent: I have heard/read the information sheet and voluntary consent form for hospital heads. I have clearly understood the purpose of research, procedures, the risks and benefits, issue of confidentiality, the right of participating and contact address for any queries. I have been given opportunity to ask questions for things that are unclear. I was informed my rights whether to continue or terminate the study. Therefore I declare my voluntary consent to permit this study to be conducted in_____with my signature as indicated below.

Name and signature of head of hospital_____

Signature of data collector_____

Thank you for your cooperation!

Annex II Participant Information Sheet and Informed Voluntary Consent Form

My name is _____. I am working as data collector for the study being conducted in this Institution by Nefsu Awoke who is studying his Master's degree at Haramaya University, College of Health and medical Sciences. I kindly request you to give me your attention to explain you about the study and being selected as the study participant.

The study title: Hand hygiene practice and associated factors among Nurses in governmental and private hospitals of Harari Regional state, Eastern Ethiopia

Purpose of the study: The findings of this study can be of a paramount importance for your institution to know the level of practice of hand hygiene and to point out major factors that hinder the practice and take corrective actions toward the factors to increase the level of practice so as to reduce cross contamination that occur between hospital environment, patient and Nurses and to reduce prevalence of hospital acquired infection by adhering to correct practice of hand hygiene. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's program in Adult Health Nursing for the principal investigator whose name is mentioned above.

Procedure and duration: I want you to spend some of your time to fill the questionnaires below by providing me the pertinent information. There are 32 questions that you can fill by your own. There are choices for some questions and you are requested to write their number in front of column named code. If your answer is not found among the choices you can write any possible answer in space in front of the questions. Some questions are answered without choice. The questionnaire will take about 30 minutes, so I kindly request you to spare me this time for the responses.

Risk and benefits: The risk of being participated in this study is very minimal, but only taking few minutes from your time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for your institution on identification of factors that hinder good performance of hand hygiene practice and intervene accordingly to decrease prevalence of hospital acquired infection and increase quality care provided by nurses.

Confidentiality: The data you will provide us will be confidential. There will be no information that will identify you in particular. The findings of the study will be general for the study population and will not reflect anything particular of individual person. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

Rights: Participation in this study is fully voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefit which you otherwise are entitled. You do not have to answer any question that you do not want to answer.

Contact address: If there are any questions or enquires any time about the study or the procedures, please contact me:

Nefsu Awoke: Mobile number (+251)-932-480400

Email Address: nefsea@gmail.com

Institutional Health Research Ethics Review Committee: Phone Number (+251)-025-466-07-08, P.O.Box 235, Harari

Declaration of informed voluntary consent: I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues to confidentiality, the rights of participating and contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to stop the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to this study to be conducted with my initials (signature) as indicated below.

Name and signature of the participant: _____

Signature of data collector: _____ Date: _____

Thank you for your cooperation!

Annex III Study Questionnaire

Study questionnaire to assess Hand hygiene practice and associated factors among Nurses in governmental and private hospitals of Harari Regional, Eastern Ethiopia.

Instruction: Please put your response number in the adjacent column named "Code"

Part I Socio demographic characteristics

S/N	Questions	Response	Code
101	Name of Institutions	HFSUH	1
		Jugel Hospital	2
		SECL3 Hospital	3
		Police Hospital	4
102	Sex:	Male	1
		Female	2
103	How old are you? (in completed years)	_____	
104	What is your religion?	Orthodox Christian	1
		Protestant	2
		Muslim	3
		Other_____	4
105	What is your marital status?	Single	1
		Married	2
		Divorced	3
		Widowed	4
		Others_____	5
106	What is your education status?	Diploma	1
		BSc Nurse	2

		Masters	3
		Other_____	4
107	How many years did you work as a nurse?	_____	
108	In which ward are you currently working?	Medical	1
		Surgical	2
		Pedi	3
		Maternity (Obs and Gyn ward)	4
		OPD	5
		Other_____	6

Part II Knowledge about hand hygiene

S/N	Questions	Response	Code
201	Which of the following is the main route of cross-transmission of potentially harmful germs between patients in a health-care facility? (*circle one answer only*)	Health-care workers' hands when not clean	1
		Air circulating in the hospital	2
		Patients' exposure to colonised surfaces (i.e., beds, chairs, tables, floors)	3
		Sharing non-invasive objects (i.e., stethoscopes, pressure cuffs, etc.) between patients	4
202	What is the most frequent source of germs responsible for health care-associated infections? (*circle one answer only*)	Germs already present on or within the patient	1
		The hospital environment	2
203	What is the minimal time needed for alcohol-based hand rub to kill most germs on your hands? *(circle one answer only)*	20 seconds	1
		3 seconds	2
		1 minute	3
		10 seconds	4
204	Which of the following hand hygiene actions prevents transmission of germs *to the patient*?		
	a) Before touching a patient	Yes	1
		No	2
	b) Immediately after a risk of body fluid exposure	Yes	1
		No	2

	c) After exposure to the immediate surroundings of a patient	Yes	1
		No	2
	d) Immediately before a clean/aseptic procedure	Yes	1
		No	2
	e) Before touching a patient	Yes	1
		No	2
205	Which of the following hand hygiene actions prevents transmission of germs *to the health-care worker*?		
	a) Before touching a patient	Yes	1
		No	2
	b) Immediately after a risk of body fluid exposure	Yes	1
		No	2
	c) After exposure to the immediate surroundings of a patient	Yes	1
		No	2
	d) Immediately before a clean/aseptic procedure	Yes	1
		No	2
206	Which of the following statements on alcohol-based hand rub and hand washing with soap and water are true?		
	a) Hand rubbing is more rapid for hand cleansing than hand washing	True	1
		False	2
	b) Hand rubbing causes skin dryness more than hand washing	True	1
		False	2
	c) Hand rubbing is more effective against germs than hand washing	True	1
		False	2
	d) Hand washing and hand rubbing are recommended to be performed in sequence	True	1
		False	2
207	Which type of hand hygiene method is required in the following situations?		
	a) Before palpation of the abdomen	Rubbing	1
		Washing	2
		None	3
	b) Before giving an injection	Rubbing	1
		Washing	2
		None	3
	c) After emptying a bedpan	Rubbing	1
		Washing	2
		None	3
	d) After removing examination gloves	Rubbing	1
		Washing	2
		None	3
	e) After making a patient's bed	Rubbing	1
		Washing	2
		None	3

	f) After visible exposure to blood	Rubbing	1
		Washing	2
		None	3
208	Which of the following should be avoided, as associated with increased likelihood of colonisation of hands with harmful germs?		
	a) Wearing jewellery	Yes	1
		No	2
	b) Damaged skin	Yes	1
		No	2
	c) Artificial fingernails	Yes	1
		No	2
	d) Regular use of a hand cream	Yes	1
		No	2

Part III Other factors			
301	Did you receive formal training in hand hygiene in the last three years?	Yes	1
		No	2
302	Do you routinely use an alcohol-based hand rub for hand hygiene?	Always	1
		Intermittently	2
		Rarely	3
		Never	4
303	Do you know the presence of Infection prevention committee?	Yes	1
		No	2
304	Which of the following factors you think caused for poor adherence to recommended hand hygiene practices *(Circle possible factors/ choosing more than one choice is possible)*	Irritations and dryness Hand washing agents	1
		Shortage of sinks/ inconveniently located	2
		Lack of soap and hand washing agents	3
		Often too busy or insufficient time	4
		Wearing of gloves	5
		Lack of knowledge, experience and education	6
		Forgetfulness	7
		Others_____	8

Part IV Self reported practice of Hand hygiene

Instruction: Put √ sign column named Always, Most of the time, sometimes and Never which describes your correct practice toward hand hygiene.

S/N	Hand hygiene practice	Always	Intermittently	Sometimes	Never
		3	2	1	0
401	Before having direct contact with patients				
402	After having direct contact with patients				
403	Before any non-surgical invasive procedure like inserting urinary or peripheral vascular catheters				
404	After contact with any object in patient's immediate surrounding				
405	If hands are visibly soiled with dirt, body fluid, excretion or blood				

Thank you for your cooperation!

Questionnaires on ward Infrastructure survey

S/N	Questions	Response	Code
1	Is hand washing sink available at your ward?	Yes	1
		No	2
2	Is water regularly available?	Always	1
		Intermittently	2
		Rarely	3
		Never	4
3	Is soap available at all sinks?	Always	1
		Intermittently	2
		Rarely	3
		Never	4
4	Are disposable towels available at all sinks?	Always	1
		Intermittently	2
		Rarely	3

		Never	4
5	Is an alcohol-based hand rub available at your ward?	Always	1
		Intermittently	2
		Rarely	3
		Never	4
6	Are posters illustrating indications for hand hygiene displayed in multiple areas of the ward?	Yes	1
		No	2
7	Are audits on hand hygiene compliance periodically performed on this ward?	Yes	1
		No	2
8	If yes, how frequently?	At least once a year	1
		At least once every 2 years	2
		Less frequently	3
9	Does every health-care worker have easy access to hand rub pocket bottles?	Always	1
		Intermittently	2
		Rarely	3
		Never	4
		Not applicable	5

Thank you for your cooperation!