ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF EMERGENCY MEDICINE

ASSESSMENT OF KNOWLEDGE, ATTITUDE, AND PRACTICE OF HAND HYGIENE AMONG NICU NURSES WORKING IN PUBLIC HOSPITALS, ADDIS ABABA, ETHIOPIA, 2020

BY: AKLIL BIRHANE

A THESIS SUBMITTED TO THE DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL CARE NURSING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTER'S IN EMCCN

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This is to certify that the thesis entitled "Assessment of knowledge, attitude and practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.'' is submitted in partial fulfillment of the MSc with specialization in "Emergency medicine and critical care nursing" to the Graduate Program of the College of Health Sciences of Addis Ababa University and has done by Aklil Birhane ID No: GSR/8973/11 under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the Department.

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Declaration

I hereby declare that this MSc thesis is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis have been duly acknowledged.

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ACRONYMS AND ABBREVIATIONS

AAHB: Addis Ababa Health Bureau

AAU: Addis Ababa University

ABHR: Alcohol-Based Hand Rub

CDC: Centers for Disease Control and Prevention

FMOH: Federal Ministry of Health

HH: Hand Hygiene

HW: Hand Wash

HCAIs: Health Care-Associated Infections

HCPs: Health Care Professionals

HCWs: Health Care Workers

HICs: High-Income Countries

ICU: Intensive Care Unit

KAP: Knowledge, Attitude, Practice

LMICs: Low- and Middle-Income Countries

MRSA: Methicillin-Resistant Staphylococcus Aureus

NICUs: Neonatal Intensive Care Units

TASH: Tikur Anbessa Specialized Hospital

USA: United State of America

WHO: World Health Organization

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ABSTRACT

Background: Hand hygiene is one of the effective measures for infection prevention and control. HCAIs are the primary causes of illness and death in NICUs. It has been estimated that 30-40% of HCAIs are related to contamination of HCW hands especially nurses have a contact for a long time with neonates. Thus, this study is intended to provide information on the level of knowledge, attitude, and practice of hand hygiene among NICU nurses.

Objective: To assess knowledge, attitude, and practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

Materials and methods: Institutional based cross-sectional study design was conducted and purposive sampling was used for selecting hospitals. All 120 NICU nurses working in five public hospitals under AAHB from February 18 to March 25, 2020, were included in this study. Data were collected through a self-administered questionnaire and observational checklist which consists of four sections. A pretest was carried out in TASH and data was collected by trained health professionals' under the supervision of a trained supervisor. The collected data were entered using Epi Data version 4.6.0.2 and analyzed using SPSS version 25 software. Descriptive statistics (frequency, percentage, and mean) and bivariate logistic regression analysis were used. Final results were presented using texts, pie-charts, tables, and graphs.

Results: A total of 114 NICU nurses with a response rate of 95% have participated. This study showed that the majority of the NICU nurses 96(84.2%) had moderate, 15 (13.2%) had good and 3(2.6%) had poor knowledge. Level of attitude majority of nurses 88(77.2%) had moderate, 23(20.2%) had good, and 3(2.6%) had poor. Most of them 93(81.6%) had poor, 21(18.4%) had moderate and 00(0.0%) had a good practice on hand hygiene. There was no significant association between dependent variables (KAP) and socio-demographic variables.

Conclusions and recommendations: Based on the study findings it can be concluded that majority of them had moderate knowledge and attitude but they had poor practice regarding hand hygiene. Therefore, it is recommended to give training on hand hygiene guidelines including monitoring the practice regularly.

Keywords: Attitude, Hand Hygiene, Knowledge, Neonate, Nurses, Practice

CHAPTER 1.INTRODUCTION

1.1. Background

Hand hygiene is one of the effective measures for infection prevention and control (1). The first study in hand hygiene was done at a maternity hospital in Vienna, Austria, in 1847(2). Proper hand hygiene can avoid the transmission of microorganisms and decrease the frequency of HCAIs. Despite evidence that HH prevents the spread of infections, Compliance with hand hygiene requirements in all settings during patient care continues to become ongoing challenges (1). Numerous other studies have confirmed that HCWs' hands become contaminated during routine care of patients and can spread infectious diseases from patient to patient. Increasing hand hygiene compliance by 1.5 – 2 folds would result in a 25-50-% reduction in the incidence of HCAIs (3).

The WHO has five recommended points in time when HH should occur to prevent transmission of HCAIs called “My 5 Moments for Hand Hygiene”. It emphasizes the following times: before contact with a patient, before performing a clean/aseptic procedure, after performing a procedure, after touching a patient and after touching the patient’s surroundings (2). Hand hygiene aims to eliminate soil, dirt, and debris and decrease microorganisms. Hand hygiene can be done using ABHR or by washing hands with water and soap (1).

Health Care-Associated Infection’s worldwide problem remains unknown due to the difficulty to collect reliable data. It continues to be a mysterious, cross-cutting issue that has not yet been solved by any organization or nation (4). According to the 2009 WHO guideline, HCAI in developed countries accounts for 5-15% of hospitalized patients and can affect 9-37% of those admitted to an ICU (2). Patients in LMICs are affected by rates of HCAIs at least 2-fold higher than in HICs (5).

The problem of HCAI is greatly severe in high-risk populations, such as neonates. Newborns are one of the high-risk peoples in unindustrialized countries and the infection rates are three to twenty times greater than in industrialized countries (4). Neonates in NICUs are highly prone to infection because of the immaturity of their immune systems and improving HCAI control is a priority for NICUs (6). Many pieces of evidence exist that HCAI can be prevented and the load can be decreased by 50 % or greater (4). Adherence to all the principles and procedures of aseptic techniques could reduce the occurrence of NICU HCAIs (7).

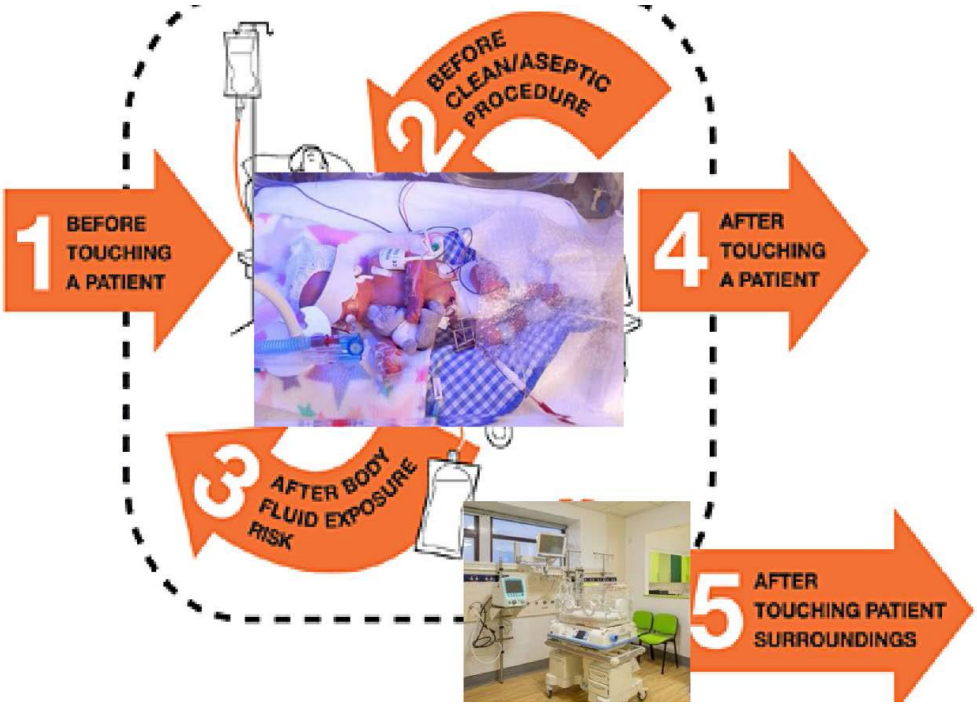

Figure 1: WHO's Five Recommended Moments for Hand Hygiene

1.2. Statement of the problem

Poor hand hygiene is one of the factors contribute to the existence of HCAIs in neonates (6). Hand hygiene is a key infection prevention strategy that is simple to perform, yet HCW compliance is often low per average of approximately 40% based on WHO analysis. It has been estimated that 30-40% of HCAIs are related to contamination of HCW hands (8) and microorganisms can stay for 2-60 minutes on HCWs hands (9).

HCAIs caused by poor hand hygiene is the main reason for increasing illness, mortality, and health care expenses among hospitalized patients throughout the globe (9). Risk factors for HCAI in acute-care settings in LMIC are related to further of other determinants that are more broadly associated with poverty, such as a lack of basic hygiene and limited resources (4). Adherence to hand hygiene practices in NICUs has the potential to reduce hospital stay length, long-term morbidity, multi-resistant pathogens, medical care costs, and HCAI-related mortalities (10).

Observational studies conducted in Geneva, Switzerland in hospitals, Contaminated HCWs hands were associated with the occurrences of infections in neonates. Another investigation in Cleveland Metropolitan General Hospital confirmed that infants cared for by nurses who did not wash their hands after handling an index infant colonized by Staphylococcus aureus acquired the organism much more often and faster than infants cared for by nurses who clean their hands between contacts with infants. In Royal Women's Hospital Brisbane, Australia the outcome of hand cleansing on HCAI rates widespread of MRSA in a NICU was eradicated 7 months after the introduction of a new hand disinfectant agent while continuing all other infection control measures (2).

According to a project done in TASH NICU among HCPs despite the accessibility of water and alcohol, there was a high neonatal death rate due to sepsis. It was noticed that there was a huge practice gap on HH (11). The study done among HCP’s in Gondar University Hospital regarding HH practice was found to be low and only 16.5% had good (12). Hand hygiene practice an observational study was done among nurses in Hiwot Fana Specialized University Hospital the finding was too poor that 81.3 % was not practicing. The reasons for not practicing HH were

majorly mentioned as lack of training, lack of conveniently located sink, and lack of time to perform HH (13).

HCAIs are the primary causes of illness and death in NICUs (14). The HCAIs rate in NICUs has increased in the previous numerous years; most reports from the western world show that the incidence ranges from 6%-25% (15). In Ethiopia, the neonatal mortality rate was 28 per 1000 live births in 2013, and around forty-four percent of the childhood, deaths happen in the first 28 days of life. Over 2/3 of childhood deaths are caused by few and easily preventable conditions; mainly infections caused by lack of hand hygiene (16). Advances in NICUs have led to the growing existence of smaller and sicker infants, however, HCAIs remain to be a severe problem (17).

The quality of healthcare is primarily under the influence of KAP towards the hand hygiene of staff. Moreover, nurses are one of HCWs responsible for providing care of neonates who have contact for a long time. Although there are several published literature across the developing world including Ethiopia on level of knowledge, attitude, and practice towards hand hygiene, it is barley available to find a study conducted on NICU nurses. Thus, this study is primarily intended to provide information on the level of knowledge, attitude, and practice of hand hygiene among NICU nurses working in public hospitals under AAHB.

1.3. Significance of the study

This study will help assess the knowledge, attitude, and practice of hand hygiene among NICU nurses. It will be evidence for further intervention on prevention and control of HCAIs in NICUs and help full to indicate at what area to act to minimize morbidity, mortality, and unnecessary excess medical costs of neonatal infection in the country. The study will have a positive impact on developing appropriate strategies to promote hand hygiene.

The outcome of the study will be an input for policymakers, public hospitals that have NICU and NICU nurses to contribute to the improvement of HCAI prevention and implementation on hand hygiene in the working environment. Furthermore, it will help as baseline information for further studies.

CHAPTER 2.LITERATURE REVIEW

2.1. The knowledge of hand hygiene

According to a study done amongst Jordanian nurses, they obtain a moderate knowledge of 55.32%. About 43% of nurses were aware that HCWs' hands when not clean is the foremost route of cross-transmission and only 48.3% of them were aware of the main source of germs are the germs existing on or within the patient. HW and HR are not recommended to be performed in sequence disagreed by 19.3%. About 44.4% of participants knew that the minimum time needed for ABHR is 20 seconds and 42.1% of nurses were alert that regular use of hand cream is not related to the settlement of germs (18).

A cross-sectional study conducted among nurses in Kerman city, Iran: most of the nurses 29% were working in intensive units (ICU, CCU, and dialysis), and the result shows the most nurses had good knowledge of 74.5% (19). Based on a study done among NICU Nurses' in Tabriz University most nurses obtained good 68.1% levels of knowledge (20). In the Western India study amongst nursing ICU staff, the majority of them had a good 62% (21). A study on 5 moments of HH among nursing staff and nursing students tertiary care hospital at Karad's knowledge score was moderate 74% among the whole study participants (22).

In Anuradhapura Teaching hospital, a Sri Lanka study done among ICU staff 75% of them were nursing staff and 2 nurses were from NICU. Majority of the respondent staffs 72.5% had moderate knowledge of HH. Most of the 92.5% knew of that HCWs' hands when not clean is the foremost route of cross-transmission and only 25 % of them were aware of the main source of germs are the germs existing on or within the patient. HW and HR are not recommended to be performed in sequence disagreed by 40%. About 35% of participants were alert that the minimum time needed for ABHR is 20 seconds and 67.5 % believed that the use of hand cream is not related to the settlement of germs (23).

In Africa, a study conducted in a Teaching Hospital, Ghana among HCWs majority were 54 nurses. Their knowledge levels were 11.1 % good, 50.0% moderate, and 38.9% poor. About 56.1% of them were aware that HCWs' hands when not clean is the foremost route of cross-transmission and only 27.4% of them were conscious of the main source of germs are the germs

existing on or within the patient. HW and HR are not recommended to be performed in sequence disagreed by 30.8%. About 8.7% of participants were aware that the minimum time needed for ABHR is 20 seconds and 64.7% believed that that regular use of hand cream is not related to a settlement of germs. (24)

In Ethiopia according to study was done on HH among Healthcare Staff in ICU of Aabet Hospital, Addis Ababa 71.1% nurse were participants in the study, and the majority 94.7% of the participants had good and moderate knowledge on Hand hygiene practice (25).

2.2. The attitude of hand hygiene

A cross-sectional study done amongst nurses in hospitals of Kerman city, Iran**:** result showed that good attitude 70.5% (19). A Study among residents and nursing staff at tertiary health care of Bhopal City revealed that the majority of the nurses 70.0% agreed that they felt guilty if they fail to perform and 56% agreed that they felt frustrated when others fail to perform HH (26). In Western India study amongst nursing ICU staff attitude score was 81% good, moderate 19%, and 00% poor (21).

According to a study done on 5 moments of HH among the nursing staff and nursing students, tertiary care hospital at Karad nursing staff had poor attitude 12% (22). In Anuradhapura Teaching hospital, Sri Lanka study done among ICU staff 47.5% had good attitudes, 42.5% had moderate attitudes and 10% showed poor attitudes. About 12.5 % agreed wearing gloves reduces the need for HH and 60% agreed that they felt guilty if they fail to perform HH. Regarding the attitude towards others HH, 37.5% agreed that they felt frustrated when others fail to perform HH (23). In Africa based on the study conducted in a tertiary hospital, South West Nigeria among HCPs results shows that 96.7% had a good attitude (27).

2.3. The practice of hand hygiene

A cross-sectional study conducted among nurses in hospitals of Kerman city, Iran: result shows that nurses had good practice 87.5% (19). In the video surveillance audit of HW practices among HCWs in Gujarat's NICU, 37.3% were good among 1081 video recordings,48.2% were

moderate, and 14.5% were poor (10). In Western India study amongst nursing, ICU staff practice scores were 54% good, moderate 46%, and 00% poor hand hygiene (21).

A study on 5 moments of HH amongst nursing staff and nursing students tertiary care hospital at Karad shows that 93% practiced after contact of patient surrounding, 88% practiced after contact of patient, and 86% practiced HH after performing a procedure or exposure to body fluids (22). A study conducted in selected Hospitals of Sangli Miraj Kupwad Corporation among NICU Nurses 55 % had good and 45% were having moderate HH practice (28). In Anuradhapura Teaching hospital, Sri Lanka study was done among ICU staff majority 62.5% was seen to have poor HH practices (23).

In Africa a study was done in a tertiary hospital, South West Nigeria among HCPs 69.5% of the respondents had good, 28.8% had moderate and 1.6% had poor HW practice. HW after touching patient 97.7% was greater than before touch 61.4%. A majority 82.5% of participants dry their hands after washing and mostly used hand-drying methods were allowing their hands to air dry 29.5% (27).

In Ethiopia an observational study conducted among nurses who were working in inpatient department on HH practice in Hiwot Fana Specialized University Hospital, Harari Regional State: the top hand hygiene practice 22.9% was detected before clean\aseptic procedure, 21.6% practiced after performing a procedure/exposure to body fluids, 19% practiced after touching Patient and 17.9% practiced after touching patient surrounding (13). A study was done on HW among HCPs in Dubti Referral Hospital, the most HCPs 56.0% had a poor practice of HW (9).

The same study was conducted on HW among HCPs in Shenen Gibe Hospital 68.08% of them had good but 31.92% of them had a moderate and poor practice of HW. The study discovered that 48.9% of the study population used air for drying (29). According to the study done in HH among Healthcare Staff in ICU of Aabet Hospital, Addis Ababa majority of the 94.7% practiced after performing a procedure or exposure to body fluids, 78.9% practiced after contact of the Patient and 74.3% practiced after contact of the Patient surrounding (25).

2.4. Socio-demographic variables associated with KAP

A study done in NICU nurses Iran multivariable analysis showed that there was a statistical relationship between knowledge of participants about hand hygiene and age, work experiences, and training of participants in neonatal units (P< 0.05) (20). In a study conducted at Mashhad Iran among HCPs, there was no significant association in the knowledge level of the participants who had received formal training in hand hygiene and those who had not (p=0.68). Besides, the knowledge score was not associated with age (p=0.12) and gender (p=0.84) (30).

According to a study done among Jordan nurses, there was no statistically significant variation between males and females is related to knowledge and attitudes. Generally, there were no statistically significant outcomes between (knowledge/attitude) and (age, years of experience) (18). A study conducted in Saudi Arabia among HCPs' knowledge score was not affected by the participants' work experience (p=0.4). Attitude toward hand hygiene was not interrelated with the participants' gender, work experience, or training. Besides, age was correlated with attitude regard to hand hygiene (p=0.04). There was no association between the frequency of practicing hand hygiene and the participants' gender, age, and work experience. However, there was a significant association between such practices and participants' training in hand hygiene in the last 3 years (p=0.02) (31).

CHAPTER 3.OBJECTIVE

3.1. General objective

- To assess knowledge, attitude, and practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

3.2. Specific objectives

1. To assess knowledge of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

2. To assess attitude of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

3. To assess practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

CHAPTER 4.MATERIALS AND METHODS

4.1. Study area

The study was conducted at five public hospitals under AAHB in Addis Ababa, which is the capital city of Ethiopia. The city consists of a total of 98 public health centers and 15 public hospitals. The 6 Hospitals are under AAHB, 6 hospitals are under FMOH and the remaining 3 hospitals are under self-administration. The following are hospitals under AAHB: Gandhi Memorial Hospital NICU was established in 2002 E.C. and it has 50 beds. It serves an average of 2375 neonates per year. The numbers of staff working in the NICU are 24 nurses, 3 General practitioners, 1 Neonatologist, and 2 public health. Minilik II Hospital NICU was established in 2010 E.C. and it has 37 beds. It serves an average of 1417 neonates per year. The numbers of staff working in the NICU are 27 nurses, 3 General practitioners, and 1 Neonatologist (Personal communication).

Ras-Desta Damtewu Memorial Hospital NICU was established in 2009 E.C. and it has 30 beds. It serves an average of 960 neonates per year. The numbers of staff working in the NICU are 26 nurses, 3 General practitioners, and 1 Neonatologist. Turunesh Beijing Hospital NICU was established in 2004 E.C. and it has 22 beds. It serves an average of 980 neonates per year. The numbers of staff working in the NICU are 21 nurses, 2 General practitioners, 1 pediatrician, and 1 Neonatologist. Zewuditu Memorial Hospital NICU was established in 2001 E.C. and it has 31 beds. It serves an average of 1506 neonates per year. The numbers of staff working in the NICU are 22 nurses, 3 General practitioners, 1GP pediatrician, 1 Neonatologist, and 1 public health (Personal communication).

Yekatit 12 hospital medical college was the sixth hospital under AAHB and it was excluded from this study because COVID-19 ethical clearance was not given. The reasons for selecting the five hospitals under AAHB were: all hospitals had NICU, to get a result from similar setup, due to sufficient sample size, some studies were conducted in public hospitals under FMOH, might be helpful input to decrease numbers of HCAIs referrals to public tertiary care hospitals, due to inadequate time and resource.

4.2. Study period

The study was conducted from February 18 -March 25, 2020.

4.3. Study design

The institutional-based cross-sectional study design was conducted.

4.4. Population

4.4.1. Source population

All nurses who work in Addis Ababa five public hospitals under AAHB.

4.4.2. Study population

All NICU nurses who work in five public hospitals under AAHB in the study period.

4.5. Inclusion and exclusion criteria

4.5.1. Inclusion criteria

NICU nurses who work at the time of the study period and willing to participate were included in this study.

4.5.2. Exclusion criteria

NICU Nurses who were in annual leave (4 nurses) and involuntary to participate (2 nurses) were excluded in this study.

4.6. Sample size determination and sampling procedure

Purposive sampling was used for selecting hospitals and all NICU nurses working in five public hospitals under AAHB in the study period were included in the study.

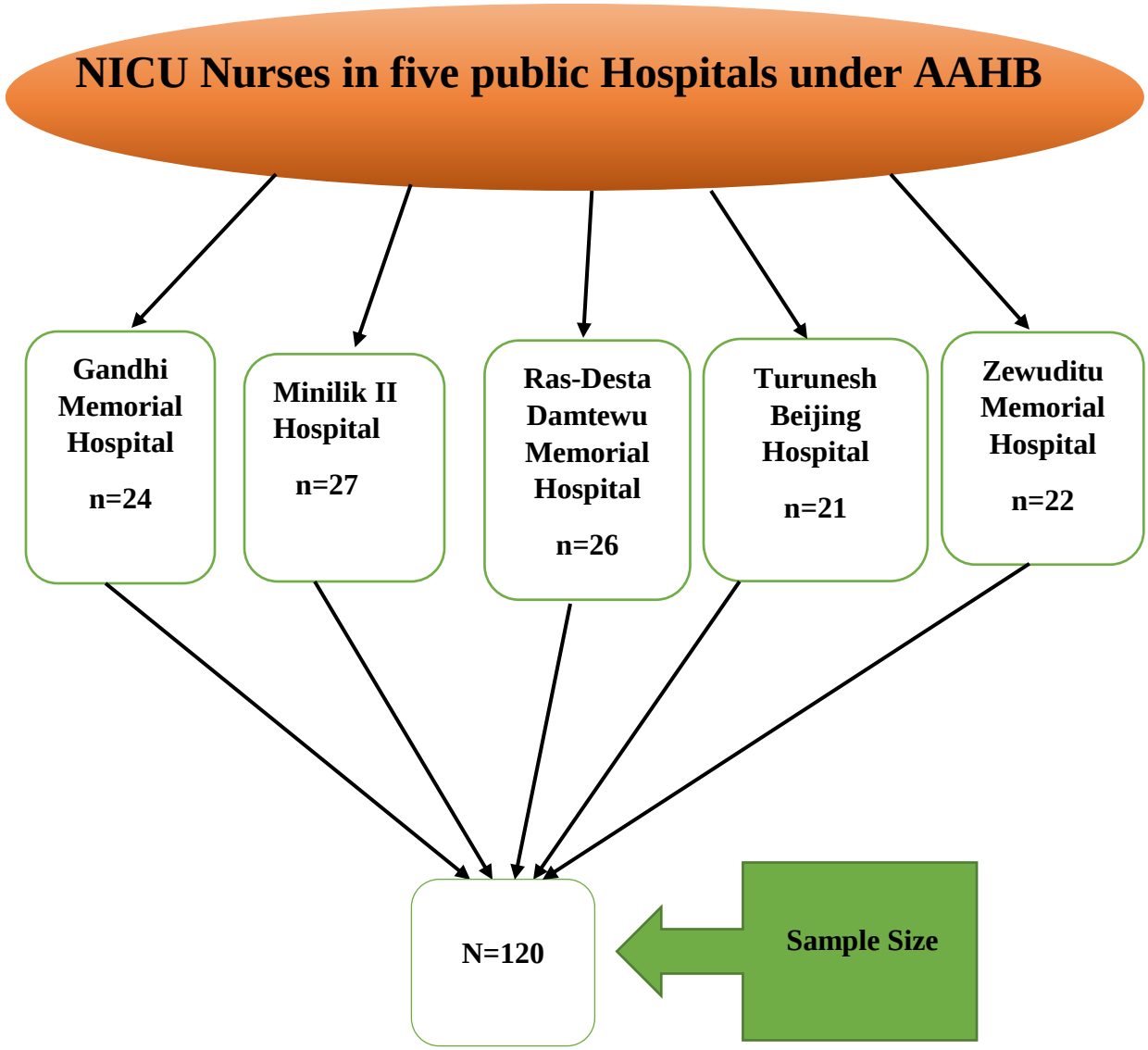

Figure 2: Schematic presentation of NICU Nurses in five public hospitals under AAHB

4.7. Operational definitions

- **Hand hygiene** is a general term referring to any action of hand cleaning using ABHR or hand washing.
- **Alcohol-based hand rub** is a fast-acting of hand cleaning using an alcohol-containing preparation.
- **Hand washing** is the process of mechanically removing dirty from hands using soap and clean water.
- **Knowledge** is defined as having an understanding of hand hygiene.
- **Attitude** is defined as the way one thinks and feels about awareness and approach to activities in the health care environment that relate to the needs and practice of hand hygiene.
- **Practice** is defined as an act of performing hand hygiene according to a set standard.

Instrument

✓ **Level of Knowledge:** The knowledge was assessed by 26 questions that contain 13 Yes/No, 4 True/False, and 9 multiple choices. Each response was scored as zero (if incorrect) and one (if correct). Levels of measurement used were **Good knowledge-**a score of more than 75%. If the participant answered > 19/26 questions. **Moderate knowledge-** a score of 50-74 %. If the participant answered 13-19/26 questions. **Poor knowledge -** a score of less than 50%. If the participant answered < 13/26 questions (22).

✓ **Level of Attitude:** The attitude was assessed through 10 questions which contain 5 positives and 5 negative questions with a five-point Likert scale. Each response for positive questions was given a specific weight which ranges from one (for strongly disagree) to five-point (for strongly agree). While negative questions were reversely coded from one (for strongly agree) to five-point (for strongly disagree). Levels of measurement used were **Good Attitude-**a score of more than 75%. If the participant answered ≥ 38/50. **Moderate Attitude-** a score of 50-74 %. If the participant answered 25-37/50. **Poor Attitude-** a score of less than 50%. If the participant answered < 25/50 (22).

- ✓ **Level of Practice:** The practice was assessed by 9 questions of an observational checklist which contains 6 Yes/No and 3 multiple choices. Each performance was scored as zero (if incorrect) and one (if correct). Levels of measurement used were **Good Practice-** a score of more than 75%. If the participant performed > 6 /9 questions. **Moderate Practice-** a score of 50-74 %. If the participant performed 5-6/9 questions. **Poor Practice-**a a score of less than 50%. If the participant performed < 5/9 questions (22).

4.8. Study variables

4.8.1. Dependent variables

- ✓ Knowledge, Attitude, and Practice of hand hygiene.

4.8.2. Independent variables

- ✓ Age, Gender, Educational status, Work experience, and Training.

4.9. Data collection and procedure

Data was collected through a structured; semi-structured self-administered questionnaire and observational checklist which consists four sections: socio-demographic characteristics, knowledge section was assessed using standard questions from WHO revised 2009 edition "Hand Hygiene Knowledge Questionnaire", adapted questionnaire from similar studies was used to assess attitude (22), WHO hand hygiene (32) and adapted (25,27) observational checklist tool was used to assess practice. Data collection was done by 5 health professionals' as data collectors and 1 health professional as a supervisor.

4.10. Data quality assurance

A pretest was carried out on 5% (6) of the sample size one month before the actual data collection in Tikur Anbessa Specialized Hospital which was out of study population to check the validity and reliability of data collection tools. Necessary modifications were made based on the findings for its clarity, understandability, and completeness. Also for data collectors and supervisor one-day short training was given before the data collection period to enhance the quality of data, to ensure that all have some information about the study tools and to follow the same survey procedures. Besides, during the actual data collection process, the supervisor was

cross-checked consistency completeness and well-filled with data. The data was cleaned for inconsistencies and missing values before data analysis.

4.11. Data process and analysis

The collected data was first coded, cleaned, and entered using Epi Data version 4.6.0.2 statistical software. Then the data was exported, processed, computed, and analyzed using SPSS version 25 software. Descriptive statistics (frequency, percentage, and mean) was used and bivariate logistic regression analysis was computed with p-value <0.25. The magnitude of association was measured using the crude odds ratio (COR) at 95% CI. The final result was presented using texts, pie-charts, tables, and graphs.

4.12. Ethical consideration

Permission and approval to carry out the research was obtained from the Addis Ababa University College Health Science ethical clearance committee through the department of Emergency Medicine and City government of Addis Ababa health bureau ethical clearance committee. The research purpose, its benefits, and the procedures were explained for each respondent. The volunteer respondents then were signed informed consent and any respondent seeking further clarification was assisted. Any person unwilling to participate was not forced to do so and any person who wants to withdraw at any time during the study was free to do so. Confidentiality and privacy were strictly maintained.

4.13. Plan for dissemination of results

The results of this study will be disseminated to Addis Ababa University, Emergency Medicine and Critical Care Nursing Department, Addis Ababa Health Bureau, and the five public hospitals under AAHB (Gandi Memorial Hospital, Minilik II Hospital, Ras-Desta Damtewu Memorial Hospital, Turunesh Beijing Hospital, and Zewuditu Memorial Hospital). This will be done through the submission of reports and presenting results at appropriate seminars, workshops, and conferences. Besides Publication of the study results on the local /international journal will be considered.

CHAPTER 5.RESULTS

5.1. Socio-demographic characteristics

A total of 114 NICU nurses with a response rate of 95% have participated in this study. Majority 90(78.9 %) of them were belonging to the age group 26-35 and the mean age was 31.88. Most of the study participants 58(50.9%) had 6-10 years of work experience. Only 21.1% of them were males and the educational status of majority 106(93.0%) was BSc. About 56(49.1%) of the participants had training in hand hygiene in the last three years. ***See (Table 1) and (*****Figure 3*****)***

Table 1: Socio-demographic characteristics of NICU nurses working in five public hospitals under AAHB, Addis Ababa, Ethiopia, 2020

No	***Variables***	***Category***	***Frequency (%) N=114***	***Mean***
1	Age (Years)	≤ 25	3 (2.6)	31.88
		26-35	90(78.9)	
		36-45	14(12.3)	
		≥ 46	7(6.1)	
2	Work experience (Years)	0-5	39(34.2)	7.76
		6-10	58(50.9)	
		11-15	11(9.6)	
		≥ 16	6(5.3)	
3	Gender	Male	24(21.1)	
		Female	90(78.9)	
4	Marital status	Single	33(28.9)	
		Married	80(70.2)	
		Divorced	1(0.9)	
5	Religion	Orthodox	88(77.2)	
		Muslim	7(6.1)	
		Protestant	18(15.8)	
		Other (Catholic)	1(0.9)	
6	Educational status	Diploma	1(0.9)	
		BSc	106(93.0)	
		MSc and above	7(6.1)	

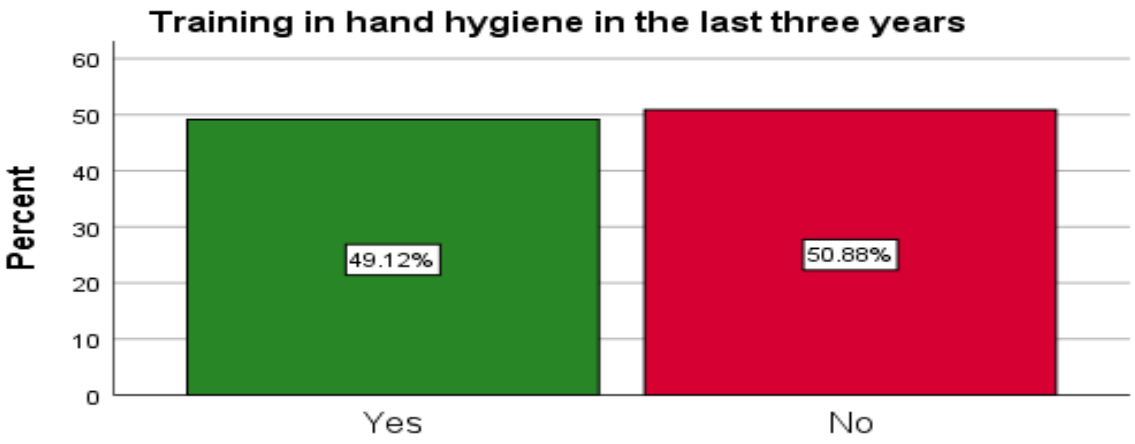

Figure 3: Training in hand hygiene in the last three years among NICU nurses

5.2. The knowledge of hand hygiene among NICU Nurses

This study showed that a majority of the NICU nurses 96(84.2%) had moderate knowledge and 15(13.2%) had good knowledge of hand hygiene. while 3(2.6%) had poor knowledge. ***See (Figure 4)***

Majority of nurses 78(68.4%) were aware of that HCWs' hands when not clean is the main route of cross-transmission of potentially harmful germs between patients and only 30(26.3%) of them were aware of germs already present on or within the patient is the most frequent source of germs responsible for HCAIs. About knowledge regarding alcohol-based hand rub and hand washing with soap and water, only 27(23.7%) were aware that hand washing and hand rubbing are not recommended to be performed in order. Only 29(25.4%) nurses were aware that a minimum of 20 seconds is needed for alcohol-based hand rub to kill most germs on hands. About 58(50.9%) nurses knew regular use of hand cream is not associated with an increased likelihood of colonization of hands with harmful germs. ***See (Table 2)***

Table 2: Frequencies and percentages of correct answers knowledge of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020

No	*Questions(answers)*	*Freq. (%)*
K1	Do you routinely use an alcohol-based hand rub for hand hygiene? **(Yes)**	99(86.8)
K2	Which of the following is the main route of cross-transmission of potentially harmful germs between patients in a health-care facility? **(Health-care workers' hands when not clean)**	78(68.4)
K3	What is the most frequent source of germs responsible for healthcare-associated infections? **(Germs already present on or within the patient)**	30(26.3)
	Which of the following hand hygiene actions prevents transmission of germs to the patient?	
K4	Before touching a patient **(Yes)**	113(99.1)
K5	Immediately after the risk of body fluid exposure **(Yes)**	89(78.1)
K6	After exposure to the immediate surroundings of a patient **(No)**	32(28.1)
K7	Immediately before a clean/aseptic procedure **(Yes)**	103(90.4)
	Which of the following hand hygiene actions prevents transmission of germs to the health-care worker?	
K8	After touching a patient **(Yes)**	110(96.5)
K9	Immediately after the risk of body fluid exposure **(Yes)**	105(92.1)
K10	Immediately before a clean/aseptic procedure **(No)**	40(35.1)
K11	After exposure to the immediate surroundings of a patient **(Yes)**	101(88.6)
	Which of the following statements on alcohol-based hand rub and hand washing with soap and water are true?	
K12	Hand rubbing is more rapid for hand cleansing than hand washing **(True)**	83(72.8)
K13	Hand rubbing causes skin dryness more than hand washing **(False)**	58(50.9)
K14	Hand rubbing is more effective against germs than hand washing **(False)**	68(59.6)
K15	Hand washing and hand rubbing are recommended to be performed in sequence **(False)**	27(23.7)
K16	What is the minimal time needed for alcohol-based hand rub to kill most germs on your hands? **(20 seconds)**	29(25.4)
	Which type of hand hygiene method is required in the following situations?	
K17	Before touching the patient **(Rubbing)**	49(43.0)
K18	Before giving an injection **(Rubbing)**	56(49.1)
K19	After changing a diaper **(Washing)**	103(90.4)
K20	After removing examination gloves **(Rubbing/Washing)**	112 (98.3)
K21	After making a patient's bed **(Rubbing)**	23(20.2)
K22	After visible exposure to blood **(Washing)**	106(93.0)
	Which of the following should be avoided, as associated with an increased likelihood of colonization of hands with harmful germs?	
K23	Wearing jewelry **(Yes)**	93(81.6)
K24	Damaged skin **(Yes)**	92(80.7)
K25	Artificial fingernails **(Yes)**	93(81.6)
K26	Regular use of hand cream **(No)**	58(50.9)

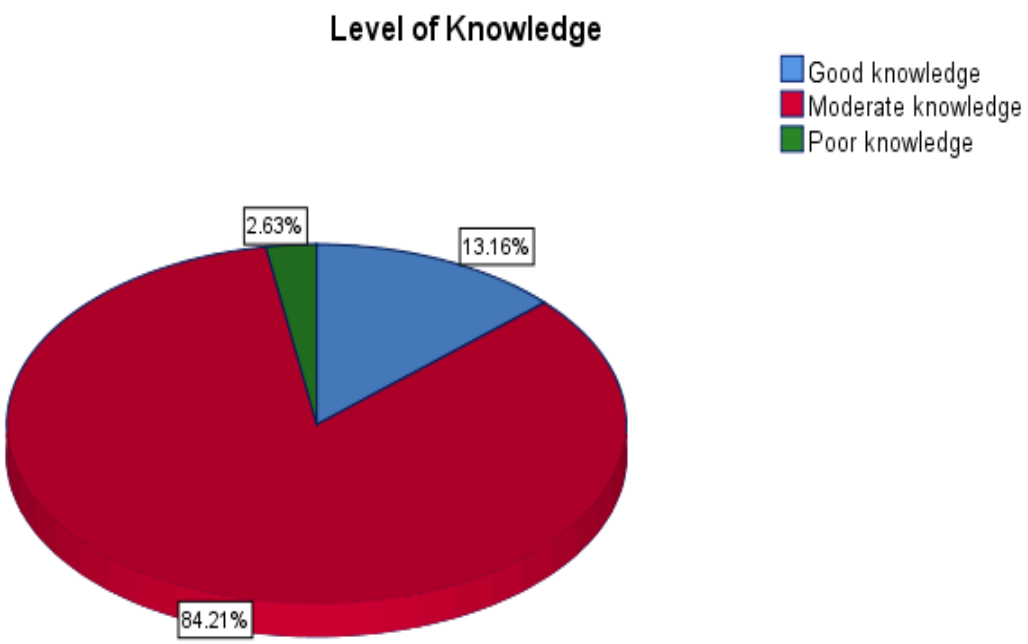

Figure 4: Percentage of the level of knowledge among NICU nurses

5.3. The attitude of hand hygiene among NICU Nurses

This study showed that a majority of the NICU nurses 88(77.2%) had a moderate attitude, 23(20.2%) had a good attitude, and the remaining 3(2.6%) had a poor attitude on hand hygiene. ***See (Figure 5)***

The majority of the nurses 38(33.3%) agreed on the negative attitude that wearing gloves reduces the requirement for hand hygiene. Equal numbers of participants 58(50.9%) agreed that they felt guilty if they fail to practice hand hygiene and felt frustrated when others fail to perform HH. ***See (Table 3)***

Table 3: Frequencies and percentages of the attitude of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020

No	*Questions*	*Strongly agree N (%)*	*Agree N (%)*	*Neutral N (%)*	*Disagree N (%)*	*Strongly disagree N (%)*
A1	I follow to correct hand hygiene practices at all times.	52(45.6)	50(43.9)	4(3.5)	6(5.3)	2(1.8)
A2	I have sufficient knowledge about hand hygiene.	46(40.4)	52(45.6)	4(3.5)	10(8.8)	2(1.8)
A3	Sometimes I have more important things to do than hand hygiene.	24(21.1)	38(33.3)	12(10.5)	34(29.8)	6(5.3)
A4	Emergencies and other priorities make hygiene more difficult at times.	25(21.9)	63(55.3)	10(8.8)	14(12.3)	2(1.8)
A5	Wearing gloves reduces the need for hand hygiene.	14(12.3)	38(33.3)	15(13.2)	31(27.2)	16(14.0)
A6	I feel frustrated when others fail to perform hand hygiene.	16(14.0)	58(50.9)	18(15.8)	15(13.2)	7(6.1)
A7	I am unwilling to ask others to engage in hand hygiene.	6(5.3)	35(30.7)	20(17.5)	37(32.5)	16(14.0)
A8	Newly qualified staff should not be properly instructed about hand hygiene in their training.	10(8.8)	34(29.8)	11(9.6)	41(36.0)	18(15.8)
A9	I feel guilty if I fail to perform hand hygiene.	26(22.8)	58(50.9)	7(6.1)	19(16.7)	4(3.5)
A10	Hand hygiene can be practiced in the current setup.	36(31.6)	59(51.8)	9(7.9)	8(7.0)	2(1.8)

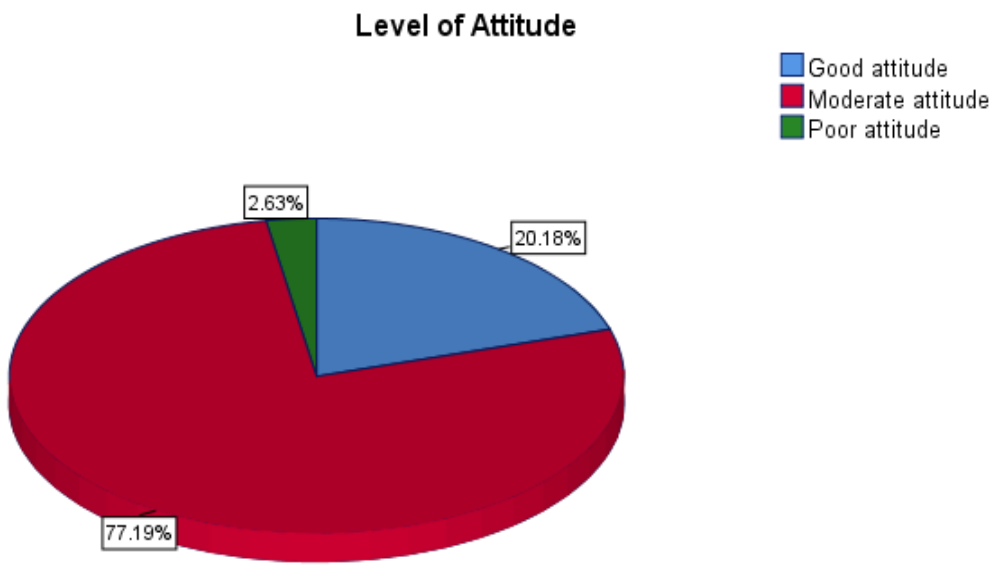

Figure 5: Percentage of the level of Attitude among NICU nurses

5.4. The practice of hand hygiene among NICU Nurses

This study showed that a majority of the NICU nurses 93(81.6%) had poor practice, 21(18.4%) had moderate practice and 00(0.0%) had a good practice on hand hygiene. ***See (Figure 6)***

Five moments regarding hand hygiene actions most of the nurses 78(68.4%) practiced hand hygiene after performing a procedure or exposure to body fluids, 45(39.5%) practiced hand hygiene after touching Patient, 15(13.2%) practiced hand hygiene after touching patient surrounding, 13(11.4%) practiced hand hygiene before aseptic/clean procedure and only 7(6.1%) practice hand hygiene before touching patient. About 26(22.8%) participants were used 20-30 seconds for ABHR and 18(15.8%) participants used 40-60 seconds for HW. ***See(Table 4)***

Table 4: Frequencies and percentages of correct answers practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

No	*Questions(answers)*	*Freq. (%)*
P1	Did she/he practice hand hygiene before touching the patient? **(Yes)**	7(6.1)
P2	Did she/he practice hand hygiene before the aseptic and clean procedure? **(Yes)**	13(11.4)
P3	Did she/he practice hand hygiene after performing a procedure or exposure to body fluids? **(Yes)**	78(68.4)
P4	Did she/he practice hand hygiene after touching the Patient? **(Yes)**	45(39.5)
P5	Did she/he practice hand hygiene after touching the patient's surroundings? **(Yes)**	15(13.2)
P6	What is the time she/he used for alcohol-based hand rub? **(20-30 seconds)**	
	< 20 seconds	41(36.0)
	20-30 seconds	26(22.8)
	> 30 seconds	9(7.9)
	Not used	38(33.3)
P7	What is the time she/he used for hand washing with soap and water? **(40-60 sec)**	
	< 40 seconds	19(16.7)
	40-60 seconds	18(15.8)
	> 60 seconds	6(5.3)
	Not used	71(62.3)
P8	Did she/he dry hands after washing? **(Yes)**	23(53.5)
P9	What type of hand drying methods did she/he use? **(All except Common towel)**	
	Hand drying on air	22(95.7)
	Personal handkerchief	1(4.3)

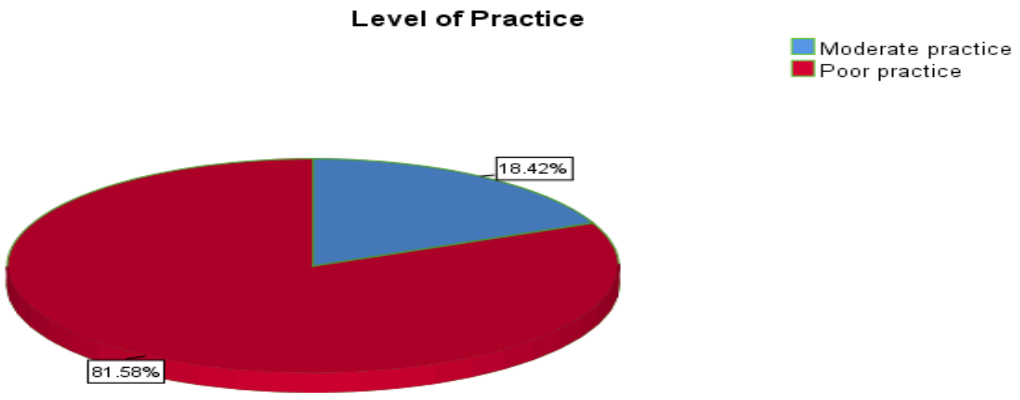

Figure 6: Percentage of the level of practice among NICU nurses

5.5. Socio-demographic variables associated with KAP

At Bivariate logistic regression analysis, the socio-demographic variables were not shown a significant association with the knowledge and practice. It was having a P-value of greater than 0.25. On the other hand, the only gender was having an association with attitude (P-value=0.094). Females had 8 times a good attitude than males. There was no significant association between dependent variables (KAP) and socio-demographic variables. ***See (Table 5, Table 6 and Table 7)***

Table 5: Socio-demographic variables associated with knowledge of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

Variables	**Categories**	**Knowledge**		**COR (CI 95%) (Lower, upper)**	**P-value**
		Poor	**Good**		
Gender	Male	0	24	.000 (.000)	0.998
	Female	3	87	1	1
Educational status	Diploma	0	1	1.000(.000)	1.000
	BSc	3	103	.000(.000)	0.999
	MSc and above	0	7	1	1
Training	Yes	0	56	.000 (.000)	0.997
	No	3	55	1	1
Age	≤ 25	0	3	1.000(.000)	1.000
	26-35	3	87	.000(.000)	0.999
	36-45	0	14	1.000(.000)	1.000
	≥ 46	0	7	1	1
Work experience	0-5	2	37	.000(.000)	0.999
	6-10	1	57	.000(.000)	0.999
	11-15	0	11	1.000(.000)	1.000
	≥ 16	0	6	1	1

Table 6: Socio-demographic variables associated with the attitude of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

Variables	**Categories**	**Attitude**		**COR (CI 95%) (Lower, upper)**	**P-value**
		Poor	**Good**		
Gender	Male	2	22	.124(.011, 1.426)	**0.094***
	Female	1	89	1	1
Educational status	Diploma	0	1	1.000(.000)	1.000
	BSc	3	103	.000(.000)	0.999
	MSc and above	0	7	1	1
Training	Yes	3	53	.000(.000)	0.997
	No	0	58	1	1
Age	≤ 25	0	3	1.000(.000)	1.000
	26-35	3	87	.000(.000)	0.999
	36-45	0	14	1.000(.000)	1.000
	≥ 46	0	7	1	1
Work experience	0-5	1	38	.000(.000)	0.999
	6-10	2	56	.000(.000)	0.999
	11-15	0	11	1.000(.000)	1.000
	≥ 16	0	6	1	1

COR=*P<0.25

Table 7: Socio-demographic variables associated with the practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

Variables	**Categories**	**Practice**		**COR (CI 95%) (Lower, upper)**	**P-value**
		Poor	**Good**		
Gender	Male	21	3	.571(.153, 2.129)	0.404
	Female	72	18	1	1
Educational status	Diploma	1	0	.000(.000)	1.000
	BSc	86	20	1.395(.159, 12.248)	0.764
	MSc and above	6	1	1	1
Training	Yes	48	8	.577(.219, 1.522)	0.266
	No	45	13	1	1
Age	≤ 25	3	0	.000(.000)	0.999
	26-35	74	16	1.297(.146, 11.532)	0.815
	36-45	10	4	2.400(.215, 26.822)	0.477
	≥ 46	6	1	1	1
Work experience	0-5	31	8	1.290(.132, 12.658)	0.827
	6-10	50	8	.800(.082, 7.767)	0.847
	11-15	7	4	2.857(.241, 33.902)	0.406
	≥ 16	5	1	1	1

CHAPTER 6.DISCUSSION

The first main finding of this study showed that the knowledge level of the majority of the NICU nurses 84.2% had moderate knowledge which was examined according to WHO hand hygiene guidelines. Comparing this result with previous studies done on the knowledge in other countries the following were found: this study was similar with the study done in Jordanian nurses', Karad, Sri Lanka and Ghana (55.32%,74%,72.5%, and 50.0%) respectively (18,22–24). The findings of this study were having 97.4% good and moderate knowledge and this was comparable with the study done in Aabet Hospital 94.7%, Addis Ababa (25).

This study result was lower when we compare it with the study done in Kerman city of Iran, NICU nurses in Iran, and ICU in Western India was the finding of the majority was good (74.5%, 68.1%, and 62%) respectively (19–21). Possible explanations for these differences included the majority of the nurses were working in different critical areas and increased numbers of sample size (19). Nurses with at least 3 months' work experience were involved in the study and only 15 items were used to assess knowledge (20). A small sample size of only 48 participants was included (21).

In this study, 68.4% of the participants answered correctly when they were asked about the main route of transmission of potentially harmful germs between patients. This study was higher than the study done in Jordanian nurses and Ghana but considered lower than the study conducted in Sri Lanka (43%, 56.1%, and 92.5%) respectively (18,23,24). The possible reason could be that different ICU staff members were included in the study (23). This study result indicated that the majority of this study participants were aware that when their hands become dirty is the main source of cross-transmission of infection.

Only 26.3% of NICU nurses knew that the most frequent source of germs responsible for HAI were the germs already present on or within the patient. This result was similar to the study done in Sri Lanka and Ghana but consider lower comparing to study done in Jordanian nurses (25%, 27.4%, and 48.3%) respectively (18,23,24). The reason could be majority 92.8% of Jordanian nurses were trained comparing to this study 49.1% and this might help them to be aware of it (18). This study finding indicated that nurses think that most sources of germs for HAI are other than the patient.

Besides, 23.7% of this study participant thought that HR and HW are not recommended to be performed in sequences. This was similar to the study done in Jordanian nurses but considered lower than a study conducted in Sri Lanka and Ghana (19.3%, 40%, and 30.8%) respectively (18,23,24). The reason might be both of the sites of these studies where teaching hospitals usually will have the opportunity to be involved in different educational programs (23,24). Also, 25.4% of this study participants knew that hand rubbing for 20 seconds was recommended to remove most germs from their hands which are consistent with the WHO guidelines. However, this study result was considered higher than the study done in Ghana, lower than study in Jordanian nurses and Sri Lanka (8.7%, 44.4%, and 35%) respectively (18,23,24).

The reasons could be that a large number of nurses were participated in the study (18) and ICU staffs were the study participants (23). This study finding showed that NICU nurses lack the necessary knowledge about the appropriate use of HR and HW. Furthermore, 50.9% of participants knew the regular use of hand cream was not associated with germs colonization. This was similar when we compare to the previous study in Jordanian nurses but lower than a study done in Sri Lanka and Ghana (42.1%,67.5%,64.7%) respectively (18,23,24). The reason might be both of the sites of these studies where teaching hospitals (23,24). This study finding indicated that the remaining half of this study participant believed that hand cream could colonize a germ which is not correct.

The second main finding of the study was the majority 77.2% of the NICU nurses had a moderate attitude. This result was lower compared to study done in Kerman city of Iran, Western India, Sri Lanka, and Nigeria where the majority of participants had a good attitude (70.5%, 81%,47.5%, and 96.7%) respectively (19,21,23,27). The possible reasons could be that in this study only NICU nurses were assessed with 5 Likert scales having 10 items but in Nigeria, study participants were HCPs assessed with only 5 items (27). However, the finding was higher by having only 2.6% poor comparing to study in Karad were 12% of nurses had a poor attitude. The reason could be that nurses from different departments were included in the study (22).

The majority 33.3% agreed for the negative attitude that wearing gloves reduces the requirement of HH. This study result was lower than the study in Sri Lanka 12.5% (23). The result indicated

that NICU nurses believe wearing gloves can replace HH. Most of the nurses agreed that they felt guilty if they fail to perform HH by 50.9%. This study result was lower than the study done in India and Sri Lanka (70.0% and 60%) respectively (23,26). Besides, 50.9% of nurses felt frustrated when others fail to perform HH. This result was similar to a study done in India but higher than study in Sri Lanka (56% and 37.5%) respectively (23,26). This study showed that NICU nurses were equally concerned with themselves and others' feelings regarding HH attitude.

The third main finding of the study was that majority of the NICU nurses 81.6% had poor practice. This study result was similar compared to the study done in Sri Lanka, Hiwot Fana, and Dubti (62.5%, 81.3 %, and 56.0%) respectively (9,13,23). It was considered lower than a study conducted in Kerman city of Iran, west India, NICU in India, Nigeria, Shenen Gibe were a majority of them had good (87.5%, 54%,55 %, 69.5%, and 68.08%) respectively (19,21,27–29) and 48.2% moderate in NICU Gujarat's (10). The major reasons for not practicing HH in this study participants could be lack of training, conveniently located sink, hand hygiene agents, and lack of time (13). Another reason could be the data collection tool used in this study that is an observational tool that showed the real gap since it is a standard tool for assessment of practice.

According to WHO's 5 recommended moments for HH most of the nurses 68.4% practiced after performing a procedure or exposure to body fluids. Comparing to other studies this result was higher than the study done in Hiwot Fana, lower than the study was done in Karad and Aabet Hospital (21.6%, 86% and 94.7%) respectively (13,22,25). About 39.5% practiced HH after touching the Patient. This finding was higher than the study in Hiwot Fana, lower than a study in Karad, Nigeria, and Aabet Hospital (19%, 88%, 97.7%, and 78.9%) respectively (13,22,25,27).

Only 13.2% practiced HH after touching patient surrounding and this was similar to study done in Hiwot Fana 17.9% (13). Besides, it was lower than the study done in Karad and Aabet Hospital (93% and 74.3%) respectively (22,25). These findings indicated that nurses were more concerned to protect themselves than the neonates. Only 22.8% of participants used 20-30 seconds for ABHR and 15.8% of participants used 40-60 seconds for HW based on WHO guidelines (2).

In this study, socio-demographic variables had no significant association with dependent variables (KAP). These findings were comparable with the study done in Mashhad Iran, Jordan nurses, and Saudi Arabia (18,30,31).

A study done in NICU nurses Iran there was a statistical relationship between knowledge of participants regarding hand hygiene and age, training, and work experiences of participants in neonatal units ($P< 0.05$) (20).The possible reasons for having variation could be the mean experience of NICU nurses in Iran was 67.88 higher than this study 7.76. Only 15.9% of participants have not participated in the training which was lower with this study 50.88%. The sample size of the study was higher (N=150) comparing to this study (N=120). According to the study done at Saudi Arabia age was associated with attitude regarding hand hygiene ($p=0.04$) and practice had a significant correlation with training ($p=0.02$) (31). The reasons for this difference could be that study participants were HCPs' and most of them were trained 67.1%.

CHAPTER 7.STRENGTH AND LIMITATION OF THE STUDY

7.1. Strength of the Study

- An observational tool was used for data collection of assessing the practice of hand hygiene.
- The data was collected using a WHO structured self-administered for assessing knowledge and observational checklist for assessing practice.
- Data collectors were health professionals.

7.2. Limitation of the Study

- During this study, there may be observational bias.
- The data collectors had to wait for long hours to observe the practice.
- There was financial constraint while conducting the Study.
- The instrument used for categorizing the NICU nurses into different levels of knowledge, attitude, and practice was higher compared to other studies.

CHAPTER 8.CONCLUSIONS AND RECOMMENDATIONS

8.1. Conclusions

The present study aimed to assess NICU nurses' knowledge, attitudes, and practice toward hand hygiene. Based on the study findings the following can be concluded that the majority of the nurses had a moderate level of knowledge and attitude regarding hand hygiene. But they had a poor practice which was comparatively lower and observational tools could show the gap regarding hand hygiene practice.

8.2. Recommendations

To AAHB and Concerned bodies:

- Give training and retraining programs on hand hygiene guidelines.
- Monitoring and supervision of the practice regularly to maintain the hand hygiene practice after providing training.

Five public hospitals under AAHB:

- Establish and empower the infection prevention team in each NICU.
- Acknowledgment and rewarding individuals for their best practice.
- Facilitating training related to hand hygiene collaboration with AAHB and concerned bodies.
- Creating awareness and motivating NICU nurses to practice hand hygiene through different mechanisms in the working area.

To NICU nurse:

- Be concerned about HCAIs prevention and controlling methods especially hand hygiene practice.
- Enhance their level of knowledge and attitude especially practices of hand hygiene.
- Practice WHO’s five recommended moments for hand hygiene with appropriate duration to prevent neonates and themselves from HCAIs.
- Nurses, who had better knowledge, attitude, and practice, should also teach their respective colleagues.

To researchers:

- Further study on hand hygiene is recommended to be done at the national level.

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ANNEXES I: Study Information sheet

My name is _____. I am here today to collect data on the assessment of knowledge, attitude, and practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020. The study is being conducted by Miss Aklil Birhane from Addis Ababa University, Emergency medicine, and critical care nursing department from the post-graduate program. Your honest and genuine participation by responding to the question prepared is very important and highly appreciated.

Title: Assessment of knowledge, attitude, and practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

Purpose of the study: This study is planned to assess knowledge, attitude, and practice of hand hygiene among nurses working in the NICU that will be helpful for further intervention on prevention and control of healthcare-associated infections in NICUs.

Procedure: We invite you to take part in this study. If you are willing to participate in this study, you will fill the attached questionnaire. We would expect you to complete the questionnaire yourself, based on the time given. The completion time is about 10 to 15 minutes.

Risks and benefits of the study: By participating in this study and answering the questions, you will get a chance to assess yourself and it will be helpful for us to assess the level of Knowledge, Attitude, and practice of hand hygiene among NICU nurses. Your participation in this study will not involve any risks to you.

Rights: Your participation in this study is voluntary and you have the right to refuse to participate. If you change your mind about participating during the study, you have the right to withdraw at any time. The decision not to participate or to withdraw will not affect any other benefits to which you would be entitled. If there is anything that is unclear or you need further information, we shall be delighted to provide it.

Confidentiality: Please do not write your name and provide as sincere answers as you possibly could. The information that you provide during the study will be kept confidential. Only the principal investigator will have access to the questionnaires and the information that you provide. If you have any questions during filling the questionnaire you can ask.

If you have a question about the study, the address of the principal investigator is:

AKLIL BIRHANE

P.O. Box. 9086, Addis Ababa, Ethiopia **Tell:** +251924861395 **Email address**: momloveya09@gmail.com

ANNEXES II: Informed consent form

I have got sufficient information thorough description of the study entitled "Assessment of knowledge, attitude, and practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020." by reading the information sheet.

I know that I can refuse to participate in the study without penalty or loss of benefit to which I would have been otherwise entitled. I have the right to withdraw from this study any time I want, without any negative impact on me. I understood that Miss Aklil Birhane is the contact person if I have questions about the study or my rights as a study participant. Hereby, I voluntarily participate in this study.

Signature: _____ Date: _____

ANNEXES III: Self-administered Questionnaire and Observational Checklist

Assessment of knowledge, attitude, and practice of hand hygiene among NICU nurses working in public hospitals, Addis Ababa, Ethiopia, 2020.

Date of data collection _____ Questionnaire SN _____

Data collector's name _____ Supervisor's name _____

Please read the following questions very carefully and then answer them by encircling, filling, or using √ tick symbol in the space provided.

Section 1: Socio-demographic characteristics

No	Questions	Answer
101	Age (years)	_____
102	Gender	A. Male B. Female
103	Marital status	A. Single C. Divorced B. Married D. Other
104	Religion	A. Orthodox C. Protestant B. Muslim D. Other_____
105	Educational status	A. Diploma C. MSc and above B. BSc
106	Work experience	_____
107	Training in hand hygiene in the last three years	A. Yes B. No

Section 2: Questions for the assessment of knowledge on hand hygiene

No	Question and Answer
201	Do you routinely use an alcohol-based hand rub for hand hygiene? ☐ Yes ☐ No
202	Which of the following is the main route of cross-transmission of potentially harmful germs

	between patients in a health-care facility? ***(tick one answer only)*** A. ☐ Health-care workers' hands when not clean B. ☐ Air circulating in the hospital C. ☐ Patients' exposure to colonized surfaces (i.e., beds, chairs, tables, floors) D. ☐ Sharing non-invasive Objects (i.e., stethoscopes, pressure cuffs, etc.) between patients
203	What is the most frequent source of germs responsible for healthcare-associated infections? ***(tick one answer only)*** A. ☐ The hospital's water system B. ☐ The hospital air C. ☐ Germs already present on or within the patient D. ☐ The hospital environment (surfaces)
204	Which of the following hand hygiene actions prevents transmission of germs <u>to the patient</u>? A. Before touching a patient ☐ Yes ☐ No B. Immediately after the risk of body fluid exposure ☐ Yes ☐ No C. After exposure to the immediate surroundings of a patient ☐ Yes ☐ No D. Immediately before a clean/aseptic procedure ☐ Yes ☐ No
205	Which of the following hand hygiene actions prevents transmission of germs <u>to the health-care worker?</u> A. After touching a patient ☐ Yes ☐ No B. Immediately after the risk of body fluid exposure ☐ Yes ☐ No C. Immediately before a clean/aseptic procedure ☐ Yes ☐ No D. After exposure to the immediate surroundings of a patient ☐ Yes ☐ No

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 ☐ False B. Hand rubbing causes skin dryness more than hand washing ☐ True ☐ False C. Hand rubbing is more effective against germs than hand washing ☐ True ☐ False D. Hand washing and hand rubbing are recommended to be performed in sequence ☐ True ☐ False
207	What is the minimal time needed for alcohol-based hand rub to kill most germs on your hands? ***(tick one answer only)*** A. ☐ 20 seconds B. ☐ 3 seconds C. ☐ 1 minute D. ☐ 10 seconds
208	Which type of hand hygiene method is required in the following situations? A. Before touching the patient ☐ Rubbing ☐ Washing ☐ None B. Before giving an injection ☐ Rubbing ☐ Washing ☐ None C. After changing diaper ☐ Rubbing ☐ Washing ☐ None D. After removing examination gloves ☐ Rubbing ☐ Washing ☐ None E. After making a patient's bed ☐ Rubbing ☐ Washing ☐ None F. After visible exposure to blood ☐ Rubbing ☐ Washing ☐ None
209	Which of the following should be avoided, as associated with an increased likelihood of colonization of hands with harmful germs? A. Wearing jewellery ☐ Yes ☐ No B. Damaged skin ☐ Yes ☐ No C. Artificial fingernails ☐ Yes ☐ No D. Regular use of a hand cream ☐ Yes ☐ No

Section 3: Questions for the assessment of attitude on hand hygiene

Each Likert item will be rated on a 1-5 response scale; where strongly agree=5, agree=4, neutral=3, disagree=2, strongly disagree=1 for positive and reverse for negative questions.

No	Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
301	I follow to correct hand hygiene practices at all times.					
302	I have sufficient knowledge about hand hygiene.					
303	Sometimes I have more important things to do than hand hygiene.					
304	Emergencies and other priorities make hygiene more difficult at times.					
305	Wearing gloves reduces the need for hand hygiene.					
306	I feel frustrated when others fail to perform hand hygiene.					
307	I am unwilling to ask others to engage in hand hygiene.					
308	Newly qualified staff should not be properly instructed about hand hygiene in their training.					
309	I feel guilty if I fail to perform hand hygiene.					
310	Hand hygiene can be practiced in the current setup.					

Thank you very much for your time!

Observational Checklist

Please fill the following observational checklist using √ a tick symbol on the space provided.

Section 4: observational checklist for the assessment of practice on hand hygiene

No	Questions	Answer	Remark
401	Did she/he practice hand hygiene before touching the patient?	☐ Yes ☐ No	
402	Did she/he practice hand hygiene before the aseptic and clean procedure?	☐ Yes ☐ No	
403	Did she/he practice hand hygiene after performing a procedure or exposure to body fluids?	☐ Yes ☐ No	
404	Did she/he practice hand hygiene after touching the Patient?	☐ Yes ☐ No	
405	Did she/he practice hand hygiene after touching the patient's surroundings?	☐ Yes ☐ No	
406	What is the time she/he used for alcohol-based hand rub?	☐ < 20 seconds ☐ 20-30 seconds ☐ > 30 seconds ☐ Not used	
407	What is the time she/he used for hand washing with soap and water?	☐ < 40 seconds ☐ 40-60 seconds ☐ > 60 seconds ☐ Not used	If the answer is "Not used" skip Q 408 and 409
408	Did she/he dry hands after washing?	☐ Yes ☐ No	If the answer is "No" skip Q 409
409	What type of hand drying methods did she/he use?	☐ Common towel ☐ Hand dryer ☐ Hand drying on air ☐ Disposable paper towel ☐ Personal handkerchief	