COLLEGE OF MEDICINE AND HEALTH SCIENCE

DEPARTMENT OF MIDWIFERY

MEDICAL INSTRUMENT PROCESSING PRACTICE AND ASSOCIATED FACTORS AMONG MATERNITY CARE PROVIDERS IN PUBLIC HEALTH FACILITIES OF HAWASSA CITY ADMINISTRATION, SIDAMA, ETHIOPIA, 2023

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NOVEMBER, 2023

HAWASSA, ETHIOPIA

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A THESIS SUBMITTED TO HAWASSA UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCE DEPARTMENT OF MIDWIFERY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN CLINICAL MIDWIFERY

NOVEMBER, 2023

HAWASSA, ETHIOPIA

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 the sources of materials used for this thesis have been duly acknowledged.

Name ----------

Signature----------

ADVISORS' APPROVAL SHEET

This is to certify that the thesis entitled "medical instrument processing practice and associated factors among maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia 2023: institution-based cross-sectional study'' is submitted in partial fulfillments of the requirements of a degree of Master of science in clinical midwifery, the Graduate programs of Department of Midwifery, has been carried out by Ashenafi Assefa ID PGCMR 0002/14, under my supervision.

Therefore we recommend that the student has fulfilled the requirements and hence here by can submit the thesis to the department.

Name of major advisor	Signature	Date
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Name of co-advisor	Signature	Date
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ABBREVIATION

CDC	Center of Disease prevention and Control
FDA	Food and Drug Administration
FMOH	Federal Ministry of Health
HAIs	Health care Associated Infections
HCWs	Health Care Workers
HIV	Human Immune Deficiency Virus
HLD	High Level Disinfection
IRB	Institutional Review Board
MIP	Medical Instrument Processing
PPE	Personal protective equipment
SSI	Surgical Site Infection
SPSS	Statistical Package for Social Science
USA	United State of America
WHO	World Health Organization

ABSTRACT

Introduction: Globally, every year, millions of people are affected by avoidable health-care-associated infections. Deficiencies in medical instrument processing contribute to a significant portion of these infections. Rusting of equipment due to procrastination and prolonged use of the same solution in cleaning them after use were some of the problems that have been recognized on the ground at different healthcare facilities. Despite these shortfalls, only a few prior studies practically assessed the actual medical instrument processing practices of health care workers in Ethiopia. Therefore, the aim of this study is to assess medical instrument processing practices and associated factors among maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia, 2023.

Method: An institutional-based cross-sectional study was done among maternity care providers in public health facilities in Hawassa city, from 1st July to 30th August/2023. All (402) maternity care providers in all public health facilities under the study area were enrolled in this study. Both an interview administered structured questionnaire and an observational checklist were used for data collection. After collection in the Kobo toolbox, the data was exported to Excel and then imported to version 25 of SPSS for analysis. Binary logistic regression was done to identify the association between each independent variable and the outcome variable.

Result: A total of 398 maternity care providers participated in the study, with a response rate of 99%. Among the total respondents, 48.7% of the participants had performed safe practices in medical instrument processing. The odds of safe medical instrument processing practices were 3.678, 3.035, and 3.318 times higher among health care workers who were being trained on medical instrument processing, had access to guidelines on medical instrument processing, and were knowledgeable about medical instrument processing compared to their counterparts (AOR =3.678, 95% CI (1.971–9.67), (AOR =3.035, 95% CI (1.44–6.574), and (AOR =3.49, 95% CI: 2.067–5.895), respectively.

Conclusion: Generally, the health care providers had a practice gap in medical instrument processing. The result is lower than the national guideline standard. Therefore, stakeholders should take action to correct factors contributing to the practice gap.

Key-words: Medical instrument processing, maternity care providers, Decontamination, Sterilization

INTRODUCTION

1.1. Back ground of the study

Medical instrument processing is a valid process used to treat a medical device that has been previously used or contaminated to make it safe for a subsequent single use. These processes are designed to clear contaminants by cleaning and to inactivate microorganisms through disinfection or sterilization(FDA, 2017). Medical devices are used in healthcare for the diagnosis, prevention, treatment, and monitoring of diseases and injuries, and after use, they may be contaminated with microorganisms or debris (Rahayu and Kartidjo, 2016). In situations of insufficient processing of these objects, indirect transmission and subsequent development of healthcare-associated infections(HAIs) can occur (Krause, 2021).

Failure of sterilization or disinfection of a medical device that comes into contact with the patient during a treatment or operation procedure has an associated risk of disease transmission (Joshi et al., 2019). Sterilization and decontamination of medical devices play a very important role in the prevention of HAIs. The most frequent HAIs brought on by improper sterilization or decontamination techniques are surgical site infections (SSI), hepatitis B and C, HIV infection, urinary and vascular catheter-associated infections(WHO, 2016). Since HAI is a major concern for both health care providers and patients' safety, reusable medical instruments need to pass through sterilization activities in order to control infection transmission by these instruments (Rahayu and Kartidjo, 2016, Joshi, 2019). Disinfecting and sterilizing the equipment by using disinfectant and sterilization methods is essential for ensuring that medical and surgical equipment does not transmit pathogens to patients (Rutala and Weber, 2016).

Different national and international guiding documents have recommended standard practices for each procedure of instrument processing in order to achieve an internationally accepted sterility assurance level for critical medical devices. If any of the recommended practices are not followed, the risk of getting a non-sterile medical device after the completion of the reprocessing cycle increases (Panta et al., 2020). Modern standards for disinfection and sterilization practices have broadly evolved from the classification scheme introduced by Earle Spaulding in 1957

(Rutala and Weber, 2016). Spaulding proposed the minimum levels of disinfection required for a device based on potential infection risk, which include critical (highest risk) items, semi- critical (intermediate risk) items, and noncritical (lowest risk) items that require sterilization, high-level disinfection, and low-level disinfection, respectively (Chang, 2018). So, Spaulding classification schemes, health care policies, and manufacturer recommendations must be involved to identify whether cleaning, disinfection, or sterilization is indicated for items because it is not necessary to sterilize all patient-care items (Rutala and Weber, 2016).

Sterilization is the process of eliminating all forms of living microorganisms, including spores (Rahayu and Kartidjo, 2016). Adequate sterilization or disinfection practices depend on the thoroughness of the cleaning. So instructions to the user and details of the cleaning procedure should clearly communicate how to achieve thorough cleaning because cleaning can vary depending on the complexity of the device(FDA, 2017). Preparing instruments for decontamination by removing the gross soil at the point of use immediately after the procedure is very important to prevent the formation of bio-film, as dried blood and other organic material could be corrosive to the instrument surfaces. Allowing blood or other bio-burden to dry on instruments could make it more difficult to remove and could compromise the effectiveness of the subsequent disinfection or sterilization (Cowperthwaite and Holm, 2015). Unless the manufacturer can validate effective cleaning without disassembly, devices with features that may result in contaminant retention or have features that make them difficult to clean may need to be disassembled in order to be cleaned easily and completely(FDA, 2017).

Instruments require appropriate handling and processing to minimize the risk of injury to staff, exposure to blood or body fluids for housekeeping, transportation, and reprocessing staff, and ensure that the medical instruments are not vectors of HAIs(Anne Caston-Gaa et al., 2018). The instrument processing process is complex and requires the facility to consistently follow the necessary steps to ensure the sterility of instruments at the point of use. Improper technique can result in the use of contaminated instruments in surgery, which could have serious consequences, including surgical site infections. Deviating from best practices, which make an instrument free of any pathogens, or failing to comply with basic rules can lead to infection. Moreover, sterilization practices that do not abide by national or international guidelines facilitate the risk of infection (PERÇİN, 2016). Decontamination, cleaning, and sterilization (HLD, the only

acceptable alternative when sterilization is not feasible or equipment is not available) are the basic practices recommended to reduce disease transmission from soiled instruments and other reusable items(FMOH, 2012, Sahiledengle, 2018)).

Patient safety is determined by medical equipment that is appropriately and adequately reprocessed (i.e., cleaned, disinfected, and sterilized) (Seavey,2013). The provision of childbirth care by health professionals has a high probability of decreasing infection rates because of clean practices and sterile instruments. Lack of obedience to standards of care may deteriorate infection control practices and result in an increased risk of institutionally acquired puerperal sepsis(Hussein et al, 2011)**.** So medical devices that are involved in procedures within the mucous membrane or sterile body cavity, like delivery sets, are high-risk (critical) items, and they need sterilization in between uses(WHO, 2016).

1.2. Statement of the problem

Globally, every year millions of people are affected by avoidable infections in health care, with the most common complications affecting hospitalized patients and resulting in morbidity, mortality, and additional costs in many countries throughout the world(WHO, 2016). Healthcare-associated infections (HAI) affect 5%–10% of hospitalized patients, with 1.7 million HAIs per year resulting in 99 000 deaths and costing $20 billion per year in the USA (Alfred *et al.*, 2020). Deficiencies in sterile processing have been associated with surgical site infections, which account for 20% of HAIs (Dancer et al, 2012, CDC,2016). The potential exposure of over 3700 patients to HIV, hepatitis B, and C in New Jersey, USA, due to a number of highly publicized failures in reprocessing the contaminated instrument, has also resulted in public scrutiny and a loss of trust (FDA, 2017).

It has been identified that inadequate processing of reusable medical devices could be one of the factors contributing to the higher rates of SSIs (Panta, 2019). The Food and Drug Administration (FDA) received 80 reports of inadequate reprocessing, which resulted in 28 reports of infection that may have occurred from the inadequate reprocessing in January 2007–May 2010 (PSO Navigator, 2012).

Even though the cleaning of medical equipment ranks among the top 10 most common compliance issues, the Centers for Medicare and Medicaid Services (CMS) and the Joint

Commission report that one-third of hospitals have reprocessing deficiencies. The Food and Drug Administration has also identified cases in which instruments have been reused without being reprocessed and where contaminated instruments have been discovered in the operating room both prior to and after the procedure (WHO, 2016). CMS studied infection control practice at ambulatory surgery centers and identified that 28% of facilities have some type of lapse in medical equipment processing practice (Navigator, 2012). According to interventional study at Virginia Mason Medical Center, instrument processing errors occurred in 3.0% of surgical cases which decreased to 1.5% at the final follow-up(Blackmore *et al.,* 2013).

Sterile services department (SSD) or "decontamination sciences" have recognized as a specialty in their own right in most high-income countries. Medical devices processed outside the SSD are considered unsafe because the processes are not under the supervision of highly-trained staff of a similar caliber to those in the SSD. These days, the majority of high income nations use these guidelines. But in low- to middle-income countries, the SSD still falls under the nursing hierarchy and it is considered as an appendage of the operating theatre complex. In many low-resource settings inappropriate reuse of disposable medical devices is common practice and the procedures to clean and decontaminate these devices are inadequate and not standardized(WHO, 2016). Health care providers, clinicians, and hospital administrators are becoming increasingly concerned with the problem of preventable health care-associated infections, as infected medical devices are a common source of hospital-acquired infections and contribute to substantial morbidity and mortality (Guggenbichler, 2011).

Nursing and midwifery make up the largest proportion of the health care and clinical workforce, and they are unique in so far as their role in the provision of 24-hour care, the level of direct contact with patients, and the patient environment and equipment used to provide care (Gallagher , 2014). Of the two, maternity is a demanding and rewarding area of specialized work, and its workload may include multiple simultaneous emergencies and women and their babies with complex needs (Jessica et al, 2022). Because of such unpredictable emergencies, maternity care providers' medical instrument processing could not only be in accordance with the schedule, and this in turn might have an effect on medical instrument sterility.

Accordingly, among the HCWs, midwives and nurses have a critical role to play in efforts to prevent infection through the processing of instruments, and they are an important population to study for their level of knowledge, attitudes, and practices regarding instrument processing(Gallagher, 2014). Rusting of equipment due to procrastination and use of the same solution (failure to change the solution in the recommended time) to clean them after use were some of the problems that have been recognized in the ground at different health care facilities. Despite all these shortfalls, so far in Ethiopia, these issues have received only limited research attention. It was found that HCWs' medical instrument processing practices were 67.1% and 49.1% in the study done in Addis Ababa public health centers and Bale zone public hospitals(Sahiledengle, 2018, Sahiledengle,2019). But these studies assessed HCWs' medical instrument processing practices based on participants' self-reported data about their practice, and none of those studies included all types of health facilities(Sahiledengle, 2018, Sahiledengle,2019). Since there is no available information with regard to the issues of medical instrument processing by HCWs in the Sidama region; this study tried to assess the medical instrument processing practices of health care providers working in delivery, family planning, abortion, and pre-cervical cancerous lesion screening rooms in all public health facilities of Hawassa city administration by observation checklist, and each step of medical instrument processing except autoclaving was included. Therefore, the aim of this study is to assess medical instrument processing practices and associated factors among maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia.

1.3. Significance of the study

Nowadays, poor medical instrument processing practices are dreadful for both the medical community and the general community. On top of this, the risk of serious blood-borne viruses such as human immunodeficiency virus (HIV), HCV, and HBV among healthcare workers (HCWs) and staff who process surgical instruments and equipment is increasing(FMOH, 2012). So understanding the level of instrument processing practice and associated factors among maternity care providers has a significant contribution to controlling infection among HCWs and patients, and also it help to improve the shortfalls through investing in the right place to close the gap. The study findings help the Sidama region health bureau, Hawassa city administration health department and partner non-governmental organizations identify the gaps that need

intervention in medical instrument processing practices in order to take different remedial actions.

It helps managers and health care workers of public health facilities in Hawassa city administration find the magnitude of medical instrument processing in the maternity unit of their facilities and factors contributing to unsafe instrument processing practices. It helps them to develop different activities to solve the problem of medical instrument processing.

This study could be used as baseline information for researchers to conduct other related research on instrument processing knowledge, attitude, practice, and factors affecting.

2. LITERATURE REVIEW

2.1. Overview of medical instrument processing practice

Protecting both patients and staff against transmission of infection from medical devices and equipment contaminated with patients' body fluids is the focal area of intervention in health facilities. Study findings showed that there are 8 to 16 million new infections of Hepatitis B annually due to unsterile procedures in developing countries. Thus, the greatest risk results from the staff‘s direct contact with these life-threatening infections while they perform or assist with surgical procedures (physicians, nurses, and midwives). So processing surgical instruments through decontamination, cleaning, and either sterilization or high-level disinfection is the basic way of infection prevention recommended to reduce disease transmission from soiled reusable instrument items (FMOH, 2019)

2.2. Magnitude of medical instrument processing practice among maternity care providers

In a cross-sectional study done at Addis Ababa in ten public health centers, health care workers' self-reported medical instrument processing practice data showed that 67.1% (95%CI: 61.9, 71.6%) of participants performances were safe(Sahiledengle, 2018). Similar studies were conducted revealed that 49.1% [95% CI 43.2–54.9%] in Bale (Sahiledengle, 2019), 63.4% in Mekelle(Tewolde et al., 2019), 34% in Egypt (Elkady et al, 2022), and 25.9% (95% CI 21.0–30.8%) in Nepal (Panta et al., 2020).

Regarding decontamination with chlorine solution, a study done in Addis Ababa showed that 86.3% of respondents reported that they soak contaminated equipment in 0.5% chlorine solution before cleaning, and 44.8% of participants always put contaminated items in a 0.5% decontaminant chlorine solution for 10 minutes (Sahiledengle, 2018). Similar studies in Bale showed that 77.3% of respondents reported that they soak contaminated equipment in a 0.5% chlorine solution before cleaning (Sahiledengle, 2018). A study done in Addis Ababa showed that 98.2% of participants reported that they always thoroughly clean items before sterilization (Sahiledengle, 2018). All (100%) and 72.8% of participants of the study done in the Mekelle special zone were decontaminated the soiled instruments before cleaning using chlorine solution and labeled the date of sterilization for medical instruments, respectively (Tewolde et al., 2019).

A study done in Addis Ababa revealed that only 22.6% of HCWs wear all necessary personal protective equipment (PPE) like a mask, eyewear, apron, and heavy-duty utility gloves while performing instrument processing (Sahiledengle, 2018). A similar study done in Bale showed that 71.8% of participants wore all necessary personal protective equipment, whereas 21.4% and 87.2% of participants had worn goggles, eye shields, and heavy-duty gloves while performing instrument processing (Sahiledengle, 2019). Personnel's doing Instrument processing used gloves as personal protective equipment (PPE) during cleaning for most of the reprocessing cycles. Eye protection, face masks, and protective clothing were rarely used (Panta et al., 2020). According to the study done in Bangledesh, only 61.6% of healthcare staff wear PPE properly during instrument processing (Zaman et al, 2021). The study done in Bahir-dar city reported that 12%, 10.6%, and 9.4% of participants wore face masks, protective shoes, and eye goggles (Gulilat et al, 2014). The majority of the participants 'always' use gloves and gowns during procedures that require this protective equipment (Tewolde et al., 2019). But the other study done in Mekelle showed that only 10.4% of participants reported that they 'always' wore masks and goggles (Yemane, 2014). Regarding PPE, 9.6%, 8%, and 4% of participants had worn face masks, eye shields, and protective shoes, respectively, during medical instrument processing (Tewolde et al., 2019).

A study done in Addis Ababa showed that 89.6% of participants reported that they take one part concentrated solution and add it to nine parts water to prepare a 0.5% decontaminate chlorine solution (Sahiledengle, 2018). In the study done in Mekelle, almost all (93.2%) of participants prepared a chlorine solution by diluting 1 part chlorine 5% with 9 parts water (Tewolde et al., 2019).

2.3. Factors affecting medical instrument processing practice among maternity care providers

.2.3.1.Socio demographic factors

In a cross-sectional study conducted in Czech, it was recognized that a statistically significant relationship was achieved between knowledge and education, as well as age and workplace. It was found that HCWs with a university degree, a length of experience of 11–15 years, and who are in the age category of 30–39 years have higher knowledge (Krause, 2021). In a cross-sectional study done in Tikur Anbessa Hospital, there was no significant association between

sex, age, service year, and regular supervision and good infection prevention practices (Abebe, 2019).

2.3.2. Knowledge related characteristics

Numerous studies done in different places reported distinct results. A cross-sectional study done in Addis Ababa showed that 46.3% (95%CI: 40.9, 51.5%) of participants were knowledgeable on instrument processing (Sahiledengle, 2018), 70% in Nepal (Panta, 2017), 40% in Egypt (Elkady et al, 2022), and 61.8% (95%CI: 56.5, 66.9) in Asella (Wake, 2023).

According to a study done in Addis Ababa, 40.5% of participants recognized the Spaulding risk classification that serves as the basis for selecting the prevention practice or process to use. 97.9% of participants reported that sterilization is a process where all microorganisms, including bacterial spores, are killed (Sahiledengle, 2018)**.**

In a study done in Nepal, 80.0% (CI 95: 75.4–84.0) of the participants specified 121ºC as the recommended temperature for steam sterilization(panta et al, 2022). In a study done in Addis Ababa, only a small proportion (33.2%) of participants responded to the correct temperature (121 °C) for the steam sterilizer (Sahiledengle, 2018)**.** A similar study done in Bale Zone revealed that 61.9% of participants correctly answered that instrument processing is one of the basic components of standard precautionary practice, and 36.6% knew cleaning was the first step in instrument processing(Sahiledengle,2019). According to a study in Addis Ababa, 58.5% of participants reported that decontamination is the first step in instrument processing (Sahiledengle, 2018)**.**

A study done in Bale reported that the majority of the respondents (87.9%) were aware of the technique for preparing 0.5% chlorine solution (Sahiledengle,2019).

A cross-sectional study conducted in Addis Ababa reveals that HCWs who are knowledgeable regarding instrument processing are 2.81 times more likely to do safe IPP than those who are not knowledgeable (Sahiledengle, 2018). In a study done at Tikur Anbessa specialized hospital, the health professionals who were knowledgeable on infection prevention practice were 3.66 times more likely to do good infection practice than those who were not knowledgeable (AOR (95%

C.I.) = 3.66 (2.005, 6.704) (Abebe, 2019). According to the study done in Addis Ababa, HCWs who had good knowledge regarding infection prevention measures were 1.5 times more likely to have good infection prevention practices compared to their counterparts (AOR = 1.53, 95% CI: 1.05–2.22) (Biniyam et al, 2018).

2.3.3. Individual related factors

A similar study done in Nepal showed that infection prevention training is statistically significantly associated with the knowledge of the correct sterilization temperature, i.e., 121℃ (Gopal, 2022). Majority (79.5%) of health care workers had been vaccinated against the hepatitis B virus, according to a study done in Bangladesh (Zaman, 2021).

A study done in Bale showed 12.5% of participants had ever had training on medical instrument decontamination, whereas 76.6% received supportive supervision (Sahiledengle, 2019). A study done in Asella showed that 67.5% and 66.3 percent of participants got vaccination against hepatitis B and training on infection prevention (Wake, 2023). A study done in Nepal showed that 36.1% (95% CI 28.4%–44.5%) of the healthcare workers reported prior training in instrument processing practice(Panta, 2017). A study done in Nepal found that 36.1% of healthcare workers reported training in areas such as sterilization and disinfection (Panta, 2017). A study done in Egypt showed that only 10% of participants got training on instrument processing(Elkady and et al, 2022).

2.3.4. Institutional related factors

HCWs who participated in the study done in Canada complained that the reasons for noncompliance with standard instrument processing guidelines were an irregular supply of materials, the absence of an autoclave and other high-level disinfection equipment, and a lack of sufficient knowledge and technical skills towards the universal precaution procedures for 31%, 50%, and 20% of participants, respectively (Timilshina, et al, 2011). A study done in Asella showed that 54.9% of participants had guidelines on instrument processing in their working area (Wake, 2023). A study done in Turkey revealed that the major reason for inadequate cleaning is a lack of sufficient instruments in hospitals (PERÇİN, 2016). Participants working in areas where posters or guidelines were available were almost three times more likely to practice safe medical instrument processing than their counterparts (AOR = 2.675; 95% CI: 1.376, 5.200, p-

value = 0.004) (Sahiledengle, 2019). In a study done at Tikur Anbessa specialized hospital, the availability of guidelines makes the HCWs 1.926 times more likely to practice good infection prevention (AOR (95% C.I. = 1.962 (1.148–3.230))(Abebe, 2019).

2.3.5. Behavioral related factors

HCWs who had a positive attitude towards infection prevention were 2.39 times more likely to do safe IPP as compared to those who had a negative attitude towards infection prevention. HCWs who had high and moderate risk perceptions towards the transmission of an infection while working were 5.35 and 2.2 times more likely to have a safe IPP, respectively, as compared to those who had a low risk perception (Sahiledengle, 2018). 82.2% of HCWs with positive attitudes were wearing PPE before sterilization and disinfection procedures, according to a cross-sectional study done in Bangladesh (Zaman, 2021). A study done in Mekelle showed that 44.8% of participants had a positive attitude toward infection prevention with instrument processing (Elkady et al, 2022). A study done in Asella revealed that 65.4% (95% CI: 60.5–70.4) of participants had a positive attitude about instrument processing (Wake, 2023). Participants who had a positive attitude towards infection prevention practices were two times more likely to have good infection prevention practices compared to those who had a negative attitude towards infection prevention practices (AOR = 2.03, 95%CI: 1.26-3.26) (Biniyam et al, 2018). 80.8% of healthcare workers in primary and secondary hospitals indicated positive attitudes towards standards about decontamination of medical devices (panta et al, 2022).

2.5. Conceptual Framework

This conceptual framework suggests four levels of factors that influence medical instrument processing practice. Namely: Socio-demographic related factors, individual related, organization related and behavioral factors. Adapted (Sahiledengle, 2018, Sahiledengle, 2019).

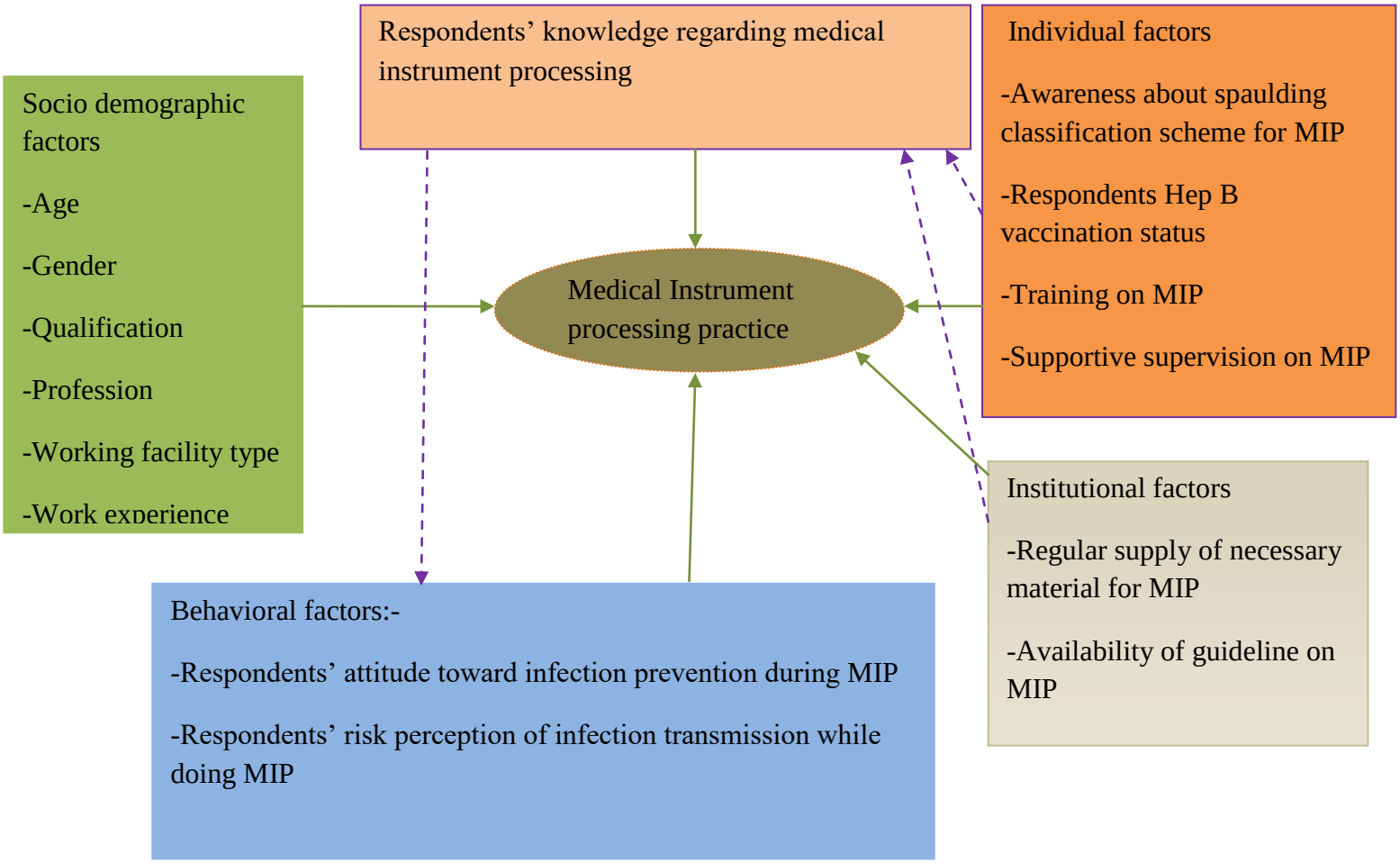

Figure 1: Conceptual framework for medical instrument processing practice and associated factors among maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia 2023.

3. OBJECTIVE

3.1. General objective

To assess medical instrument processing practice and associated factors among maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia, 2023

3.2. Specific objective

- To determine medical instrument processing practices among maternity care providers
- To identify factors associated with medical instrument processing practices among maternity care providers

4. METHODS AND MATERIALS

4.1. Study setting

This study was conducted among maternity care providers in the public health facilities of the Hawassa city administration. Hawassa is the administrative city of the Sidama regional state and is located 275 km south of Addis Ababa. According to the 2021 City Health Department estimation report, 394,057 people were living in Hawassa, and among them, 91,815 were women in the reproductive age group. Hawassa city has eight sub-cities and 32 kebeles, which have around 87 public and private health institutions. The city has four public hospitals (Hawassa University Comprehensive Specialized Hospital (HUCSH), Adare General Hospital (AGH), Tula Primary Hospital (TPH), and Furamotite Primary Hospital (FMPH)), 11 public health centers, four private primary hospitals, 17 health posts, and 52 private clinics. Hawassa University comprehensive specialized hospital, Adare general hospital, Tula primary hospital, and Fura motite primary hospital provide comprehensive essential obstetric care. The remaining 11 public health centers are providing basic essential obstetric care in the city (Hawassa City Health Department maternal and child health information database, unpublished data 2021).

4.2. Study design and period

An institutional-based cross-sectional study was employed from July 1 to August 30, 2023.

4.3. Population

4.3.1. Source population

All maternity care providers who were working in the public health facilities of Hawassa city administration

4.3.2. Study population

Maternity care providers who were working at delivery, abortion, family planning, and visual inspection with acetic acid rooms in public health facilities of Hawassa city administration

4.3.3. Study unit

Each maternity care provider in the public health facilities of Hawassa city administration

4.4. Inclusion and exclusion criteria

Inclusion criteria

Maternity care providers who have worked at least for the last 6 months in public health facilities

Exclusion criteria

Maternity care providers who did not volunteer to participate in the study

4.5. Sample size determination

. Using single population proportion formula for first objective

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

Z = 1.96 (CI=95%) d=5%

49.1%, from a previously done study at Bale Zone (Sahiledengle, 2019). So the total sample size for the first objective is 384.

The sample size for the second objective is calculated using EpiInfo version 7.2 STAC CALC for a cross-sectional study

Table 1: Summary of sample size calculation for variables associated with medical instrument processing practice among maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia 2023.

Variables	Proportion among non-exposed (%)	Ratio	AOR	sample size	Reference
Infection prevention practice	20.95	1:1	7.5	44	(Sahiledengle, 2019)
Presence of instructive poster or guideline	29.78	1:1	3.4	102	

By comparing each result, the higher sample size is 384 and 10% reserve for non-response rate (38). Therefore, the sample size estimation for this study is 422.

4.6. Sampling procedure and techniques

Hawassa city administration was purposely selected for this study, and all public health facilities in the city were included. The census method was employed to enroll the study participants. There are 15 public health facilities found in the Hawassa city administration, which are categorized into (1) tertiary hospitals, (1) general hospitals, (2) primary hospitals, and (11) health centers. According to data taken from the human resources office of health institutions, the total number of maternity care providers in Hawassa City public health facilities is 402. Since the source population (N = 402) under study is smaller than the sample population (N = 422), the census method was applied, and all maternity care providers in the study area were included as study participants.

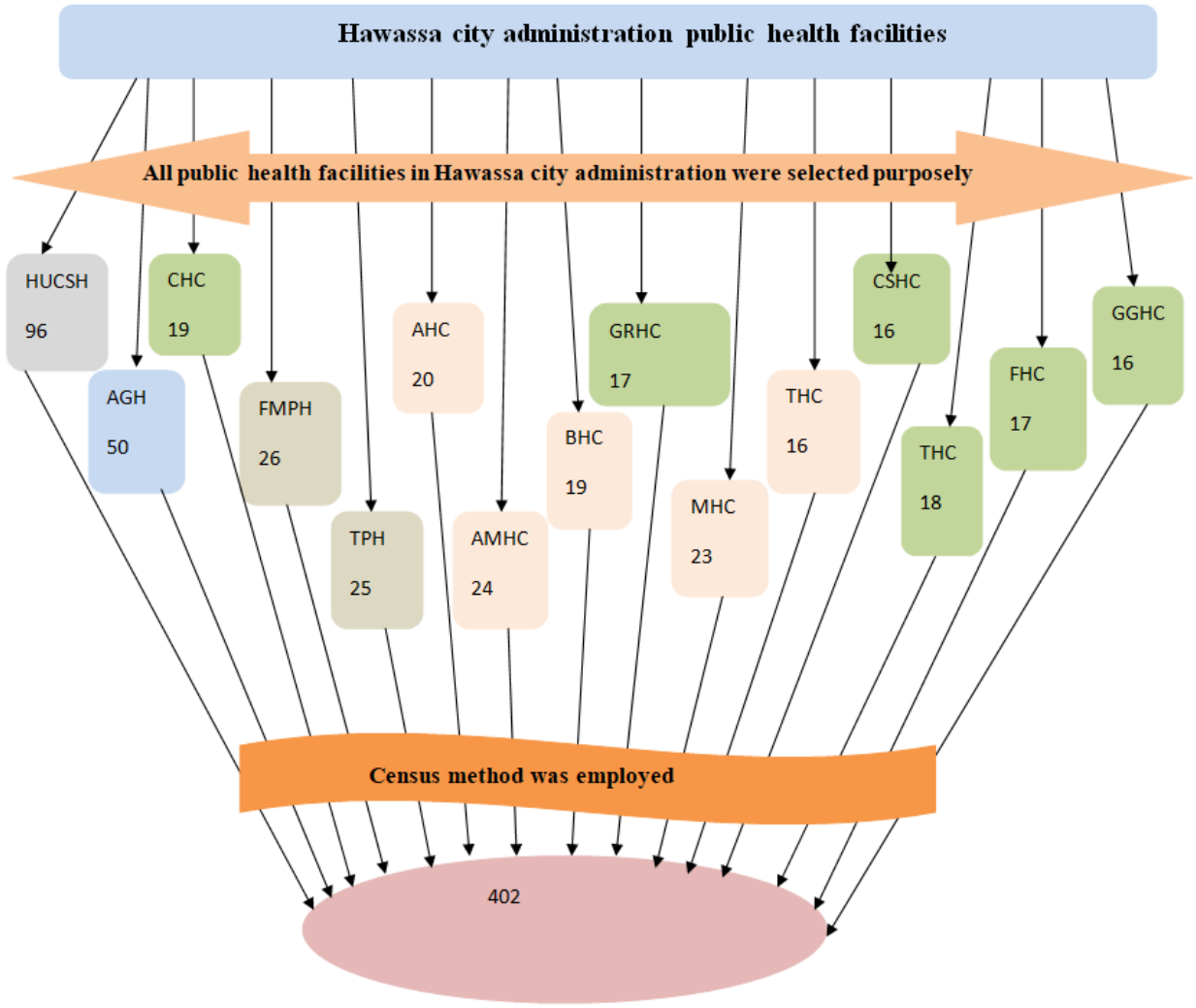

Figure 2: Schematic representation of sampling procedure on medical instrument processing practice and associated factors among maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia 2023.

4.7. Data collection tool and procedures

Both an interview-administered structured questionnaire and an observational checklist were used to collect the data from each study participant. The tool was designed in English (Kobo Toolbox), adapted from different literature and national guidelines(Sahiledengle, 2018; Sahiledengle, 2019; Azmi, 2021; Panta et al., 2022,; FMOH, 2019). It consists of independent variables: socio-demographic factors, individual and health institutional-related factors, behavioral factors, and the dependent variable, medical instrument processing practice.

Health care providers' medical instrument processing practices were assessed by using an observational checklist in covert surveillance. The data collection procedure was started by observation of participants' practices, followed by verbal informed consent, and finally an interview. Participants who volunteered to participate in the study were interviewed and included as respondents of the study. Data was collected by six BSc midwives, and data collection procedures were supervised by two MSc midwives after two days of training about informed consent and data collection procedures. The principal investigator supervised the overall procedure of the data collection and made respondents free to withdraw consent and discontinue participation without any form of prejudice.

4.8. Study variables

4.8.1. Dependent variable

- ✓ Medical instrument processing practice among maternity care providers

4.8.2. Independent variables

- Socio-demographic factors
  - ✓ Age
  - ✓ Gender
  - ✓ qualification
  - ✓ Work experience
  - ✓ Profession
  - ✓ Facility type
- Behavioral related factors
  - ✓ Health care providers attitude towards infection prevention during MIP
  - ✓ Health care providers Perception of risk towards infection transmission while working with medical instruments

- Institutional factors

✓ Presence of poster/ infection prevention and patient safety guidelines

✓ Regular supply of necessary material for medical instrument processing

- Individual factors

✓ Awareness of Spaulding classification scheme of potential infection risk.

✓ Training on medical instrument processing

✓ HCWs' HBV vaccination status

✓ Received supportive supervision on medical instrument processing

- Knowledge related characteristics of HCWs

4.9. Operational difination

Maternity care providers - Midwives and nurses working in maternity service units.

Safe medical instrument processing practice – Sixteen questions were prepared to measure health care providers' practices regarding medical instrument processing. Maternity care providers who scored greater than or equal to the mean value (10.49) were considered to have "safe practice. But those who score below the mean value are considered to have "unsafe practices"(Sahiledengle.,2018).

Knowledgeable on MIP - Seven questions were prepared to measure knowledge of MIP among maternity care providers. Health care providers who responded equal to or above the mean value were considered knowledgeable on MIP and otherwise not knowledgeable(Sahiledengle, 2018).

HCPs' attitude towards infection prevention during MIP - It was assessed by five-point Likert-type scale options ranging from strongly agree to strongly disagree. HCWs who scored ≥ 80% (20–25) were considered to have a positive attitude towards infection prevention. Otherwise, those who score ≤ 79 (5-19) are categorized as having a negative attitude(Sahiledengle, 2018).

HCPs' perception of risk towards transmitting an infection during MIP - This was assessed using five-point Likert-type scale options ranging from very high risk to not sure. HCWs who scored ≥ 80% (16-20) of perception questions were categorized as having high risk perception towards transmitting an infection while working, and those who scored 61–79% (13–15) and ≤ 60% (4–12) were categorized as having moderate and low risk perception (Sahiledengle, 2018).

4.10. Data management and analysis plan

4.10.1. Data analysis plan

The collected data was checked for completeness and then coded, cleaned on Excel, and exported to SPSS version 25 for analysis. Descriptive statistics such as mean, standard deviation, and percentage are generated to describe the respondent's socio-demographic characteristics. The descriptive data is presented by using frequency, tables, figures, mean, and standard deviation. Bivariable logistic regression was used to identify candidate variables for multivariable logistic regression. The overall goodness-of-fit and multicolinearity were checked by using the Hosmer-Lemeshow goodness-of-fittest (0.267) and variance inflation factor (< 10 for all items), respectively. Those variables with a p-value of <0.25 in bivariable logistic regression were added to the multivariable logistic regression to control the confounder, and p-values <0.05 at a CI of 95% were considered to be significantly associated factors. Finally, the result of the study is presented in tables, figures, and texts based on the data obtained.

4.11. Data Quality assurance/ quality control management techniques

To maintain data quality, the questionnaire (English version) was translated into Amharic. Two days of training were given to the data collectors on the objective, relevance of the study, confidentiality of information, respondent's rights, and informed consent. A week before data collection, the principal investigator has done a pre-test on 5% of the final sample size of maternity care providers working in the Dilla University referral hospital to check the clarity, length, and completeness of the questionnaires and the observation check list. Based on this, a necessary correction was made accordingly. In addition, the data collection tool was tested for internal consistency (reliability) using Cronbach's alpha test. The resulting Cronbach's alpha value of 0.811 was obtained. The whole process was facilitated and checked thoroughly by the principal investigator. To be sure of the completeness, accuracy, and consistency of the questionnaire, meetings were held each day of the data collection.

During these sessions, thorough checking was done before receiving the filled-out questionnaires from each data collector, which helped to cross-check their performance and improve proper data collection.

4.12. Ethical consideration

Ethical clearance was obtained from the Hawassa University College of Medicine and Health Sciences Institutional Review Board with Ref. No. IRB/355/15/. The study permission and support letter were written by the Hawassa City Administration Health Department. Additionally, a formal letter of cooperation was obtained from the administrative office of each health facility. After participants were given a thorough explanation of the study's objectives and potential benefits, verbal informed consent was taken. Those who agreed with consent only participated in the study, and the confidentiality of respondents was maintained throughout the research process by giving a code to each participant. Personal privacy was respected. The respondents were given the right not to participate in the study or withdraw from it at any time or stage.

4.13. Dissemination of the result

The study findings will be distributed to the relevant organizations and stakeholders. The plan of diffusion of the research result includes: presentation at Hawassa University College of Health and Medical Science Research Defense and at other sites of research conferences. The report paper will also be disseminated to the Hawassa city administration health department and respective hospital medical director offices for input to improve their service. Finally, efforts will be made for the publication of the research in a reputable peer-reviewed journal.

5. RESULT

5.1. Socio-demographic characteristics of the study participants

A total of 398 health care providers participated in the study, with a response rate of 99%. The mean age of the respondents was 29.57 years, with SD±3.757. The majority of respondents, 340 (85.4%) were female. See Table 2.

Table 2: Socio-demographic characteristics of maternity care providers in Hawassa city administration public health facility, Sidama, Ethiopia, 2023 (N=398)

Variable	Category	Frequency	Percentage (%)
Sex	Male	58	14.6
	Female	340	85.4
Age	<30	211	53
	≥30	187	47
Profession	Midwife	289	72.6
	Nurse	109	27.4
Qualification	Diploma	114	28.6
	First degree and above	284	71.4
Working	Primary level facility	253	63.6
Facility type	Secondary level facility	50	12.6
	Tertiary level facility	95	23.8
Experience	<3	43	10.8
	3-6	262	65.8
	>6	93	23.4

Keynote a: classification of Age (Sahledingle, 2018) b: classification of work experience (Sahledingle, 2019) c: Facility type classification (FMOH, current Ethiopian health care tier system)

5.2. Individual characteristics of the study participants

One-third (143 (34.9%)) of participants were aware of the Spaulding classification scheme for potential infection risk. Only 46 (11.6%) of the maternity care professionals reported they took in-service training on medical instrument processing, whereas 310 (77.9%) received supportive supervision in the last two years. Only 157 (39.4%) respondents were immunized against the hepatitis B virus.

5.3. Institutional characteristics of the study participants

About 351 (87.2%) participants were getting regular supplies of necessary material for medical instrument processing, whereas national guidelines on medical instrument processing were available for 329 (82.7%) participants. But 47 (11.8%) and 69 (17.3%) participants did not get both of them, respectively.

5.4. Health care providers' knowledge characteristics towards medical instrument processing.

The majority of care providers, 395 (99.5%), knew that instrument processing is part of standard precautionary practice. Only 20 (5%) respondents correctly knew that 3% hydrogen peroxide is Currently Preferable chemical for HLD. See table 3

Table 3: Health care providers' Knowledge towards medical instrument processing among maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia, 2023 (N= 398)

Variable	Category	Frequency	Percentage
Is instrument processing part of standard precaution practice	Yes	395	99.2
	No	3	0.8
First step of instrument processing practice	Cleaning	136	34.2
	Decontamination with 0.5% chlorine solution	260	65.3
	Sterilization	2	0.5
How can 0.5% chlorine solution prepared from 5% liquid concentrated chlorine?	By mixing 5 part water & 5 part chlorine solution	76	19.1
	By mixing 9 part water & 1 part chlorine solution	315	79.1
	By mixing 10 part water & 1 part chlorine solution	7	1.8
Currently Preferable chemical for HLD?	0.5% chlorine	378	95
	3% hydrogen peroxide	20	5

Table 3...cont...

Variable	Category	Frequency	Percentage
Which can Kill all microorganisms including bacterial spores?	Decontamination	19	4.8
	High level disinfection	133	33.4
	Sterilization	246	61.8
Correct temperature for steam sterilization?	100^{o}c	196	49.2
	121 ^{o}c	172	43.2
	160 ^{o}c	30	7.5
What category do surgical instrument fall under?	Critical	233	58.5
	Semi-critical	165	41.5
Over all participants knowledge on MIP	Knowledgeable	178	44.7
	Not knowledgeable	220	55.3

5.5. Health care providers' attitude towards infection prevention while processing medical instruments

When respondents asked if they believe that decontamination of medical devices reduces the risk of infection in patients and healthcare workers; 170(42.7%) indicated "strongly agree"; 227 (57%) indicated "agree''; and 1 (0.3%) indicated "strongly disagree". The overall interpretation points to strongly agree (mean= 4.42, standard deviation= 0.524). In finding out their belief that the instrument processing practice deserves the same attention as other key patient care activities; 3(0.8%) indicated "strongly agree"; 7(1.8%) indicated "agree''; 3 (0.8%) indicated "Undecided"; 220 (52.2%) indicated "disagree"; and 165 (41.5%) indicated "Strongly Disagree". The overall interpretation points to strongly disagree (mean = 4.35, standard deviation= 0.663). When respondents were asked if they believe that cleaning instruments before sterilization is not necessary if they are not soiled visibly, 23 (5.8%) indicated "agree"; 11 (2.8%) indicated "undecided"; 188 (47.2%) indicated "disagree"; and 176 (44.2%) indicated "strongly disagree". The overall interpretation points to strongly disagree (mean = 4.30, standard deviation = 0.783). When respondents were asked if they believe that every patient attending healthcare facilities must be considered potentially HIV positive, 40(10.1%) indicated "strongly agree"; 171 (43%)

indicated "agree"; 121 (30.4%) indicated “undecided”; 64 (16.1%) indicated “disagree”; and 2 (0.5%) indicated “strongly disagree." The overall interpretation points to agree (mean = 3.46, standard deviation = 0.896). When respondents were asked if they believe that health care providers should always follow standard guidelines when processing medical instruments, 165 (41.5%) indicated “strongly agree”; 225 (56.5%) indicated "agree"; 2 (0.5%) indicated “undecided”; 4 (1%) indicated “disagree”; and 2 (0.5%) indicated “strongly disagree”. The overall interpretation points to strongly agree (mean = 4.37, standard deviation = 0.605).

Regarding the overall participants attitude about infection prevention while processing medical instruments, about 304 (76.4%) (95%CI, 71.9-80.5) of the respondents had positive attitude while 94 (23.6%) had negative attitude towards infection prevention during MIP.

5.6. Risk Perception of maternity care providers toward infection transmission while working.

In finding out the participants risk perception of infection transmission while processing medical instruments, majority of participants answered, high risk for RPQ1, moderate risk for RPQ2, high risk for RPQ3 and very high risk for RPQ4. See table 4

Table 4: Participants risk perception toward infection transmission while processing medical instruments among of maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia, 2023(N= 398)

Variables	Not sure	Mild risk	Moderate risk	High risk	Very high risk
RPQ1	2(0.5%)	61(15.3%)	136(34.2%)	153(38.4%)	46(11.6%)
RPQ2	42(10.6%)	91(22.9%)	145(36.4%)	88(22.1%)	32(8%)
RPQ3	8(2%)	33(8.3%)	98(24.6%)	132(33.2%)	127(31.9%)
RPQ4	0%	4(1%)	36(9%)	132(33.2%)	226(56.8%)

Key:-

RPQ1- The risk of infection for HCWs if they do instrument processing without using personal protective equipment

RPQ2 - The risk of hospital acquired infection to health care provider if they failed to obey hand washing principles before and after instrument processing procedure

RPQ3 - The risk of sharp material injury to health care workers if they use gloves other than heavy duty for surgical instrument cleaning

RPQ4 - The risk of hospital acquired infection for patients if surgical instruments are not reprocessed in between the uses based on guideline

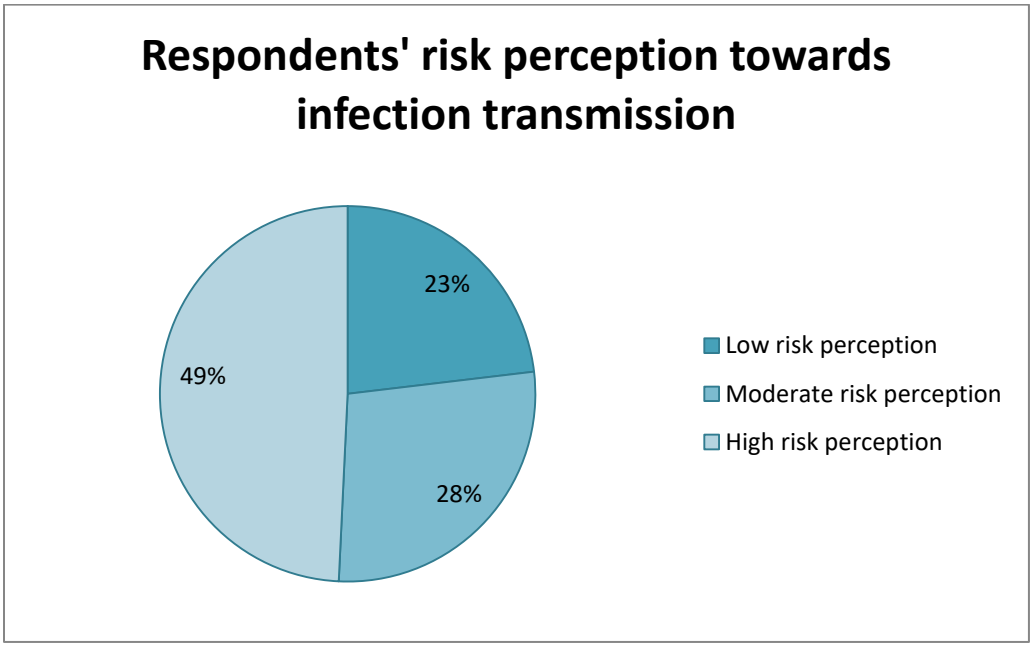

Figure 3: Overall risk perception toward infection transmission while processing medical instruments among of maternity care providers in public health facilities of Hawassa city administration, Sidama, Ethiopia, 2023

5.7. Practice of maternity care providers regarding medical instrument processing.

Among the total participants, 57 (14.3%) wore all the apron, heavy duty glove, eye goggles, and facemasks; 120 (30.2) put on three of them; 126 (31.7%) wore two; 76 (19.1) wore only one; and 19 (4.8%) wore none of the above personal protective equipment while processing medical instruments. Nearly two-thirds (61.6%) of participants rinsed instruments with water immediately after use (point of use cleaning). Half (50.3) of the participants soaked medical instruments in a 0.5% chlorine solution after use. About 227 (57%) participants washed their hands soon after completing instrument processing practice. See figure 4 & table 5 (annex 4)

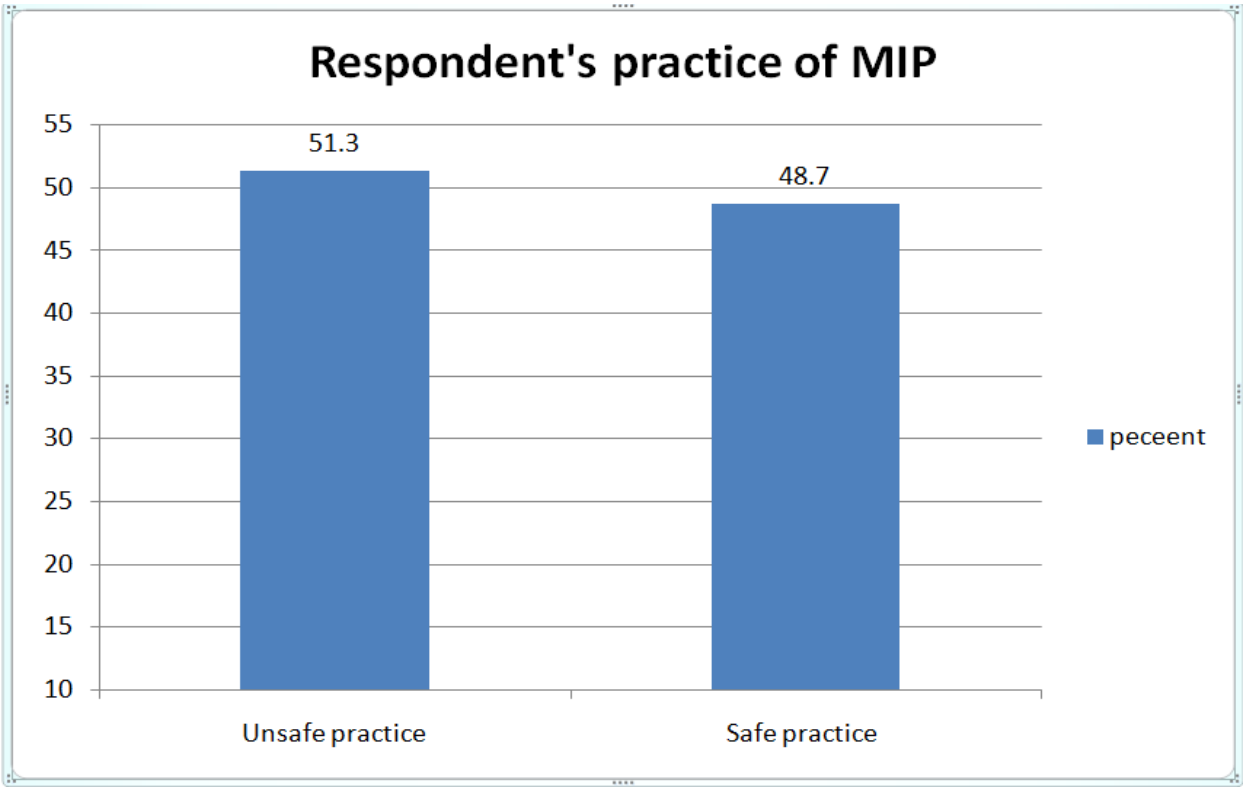

Figure 4: Overall medical instrument processing practices among maternity care providers in Hawassa city administration public health facilities, Sidama, Ethiopia, 2023

5.8. Factors associated with instrument processing practice

Bivariable logistic regression analysis and cross tabulation were performed. HCWs' profession, qualification, working facility type, regular supply of necessary materials for instrument processing, availability of guidelines, awareness of the Spaulding classification scheme for instrument processing, Hep B vaccination status of health care providers, being trained on instrument processing, high and moderate risk perception of infection transmission while doing instrument processing, having a positive attitude toward infection prevention during medical instrument processing practice, and being knowledgeable on instrument processing practice were found to be significantly associated with the maternity care providers instrument processing practices. Whereas multivariable logistic regression analysis showed that having a positive attitude toward infection prevention during instrument processing practice, being knowledgeable on instrument processing, the availability of guidelines, awareness of the Spaulding classification

scheme for potential infection risk, being trained on instrument processing, and having high and moderate risk perceptions of infection while doing instrument processing were statistically significant predictors of instrument processing practice. Participants who had a positive attitude towards infection prevention while processing medical instruments were 2.85 times more likely to practice safe instrument processing (AOR 2.85, CI 95% (1.461–5.557)). Being trained on instrument processing makes the participants 3.678 times more likely to do instrument processing practice in a safe manner compared to those untrained on it (AOR =3.678, 95% CI 1.39–9.67). The availability of guidelines on instrument processing makes the participants 3.076 times more likely to practice safe instrument processing compared to those who lack them (AOR =3.076, 95% CI (1.42–6.47)). The odds of safe instrument processing practice were 3.62 times higher among participants who had awareness about Spaulding classification for potential infection risk compared to their counterparts (AOR = 3.62, 95% CI = 2.08–6.29). The odds of safe practice of instrument processing were 2.53 and 5.39 times higher among participants who have moderate risk perception and high risk perception compared to those having low risk perception of infection transmission (AOR =2.679, 95%CI (1.157–5.52) and **(AOR** =5.788, 95%CI (2.614–9.92), respectively). Participants who were knowledgeable about instrument processing were 3.49 times more likely to practice safe instrument processing compared to those who were not knowledgeable (AOR =3.49, 95%CI: 2.067–5.895). See table 6.

Table 6: Bivariable and Multivariable logistic regression analysis of factors associated with medical instrument processing practice among maternity care providers in Hawassa city administration public health facilities, Sidama, Ethiopia 2023**.**

Variable		Practice		COR (CI=95%)	AOR (CI=95%)	P value
		Safe	Un safe			
Profession	Midwife	151(52.2)	138(47.8)	1.679(1.073-2.629)	1.26(0.693- 2.29)	0.449
	Nurse	43(39.4)	66(60.6)	1	1	
Qualification	Diploma	29(25.4)	85(74.6)	1	1	
	First degree and above	165(58.1)	119(41.9)	1.609(1.035-2.50)	1.302(0.737-2.3)	0.364
Working facility type	Primary health care level	109(43.3)	143(56.7)	1	1	
	Secondary health care level	31(62)	19(38)	2.141(1.148-3.991)	1.36(0.622-2.96)	0.442
	Tertiary health care level	54(56.2)	42(43.8)	1.687(1.05-2.710)	1.39(0.75-2.57)	0.293
Regular supply of necessary materials	Yes	182(51.9)	169(48.1)	3.141(1.578-6.251)	1.474(0.61-3.58)	0.391
	No	12(25.5)	35(74.5)	1	1	
Availability of guideline	Yes	181(55)	148(45)	**5.268(2.774-10.0)**	**3.035(1.42- 6.47)***	**0.004***
	No	13(18.8)	56(81.2)	1	1	
Awareness of spualding classification	Yes	99(69.2)	44(30.8)	**3.789(2.449-5.864)**	**3.62(2.08-6.29)****	**0.000****
	No	95(37.3)	160(62.7)	1	1	
Hep B vaccination status	Yes	84(53.5)	73(46.5)	1.37(0.916-2.051)	1.141(0.68-1.915)	0.615
	No	110(45.6)	131(54.4)	1	1	
Training on IP	Yes	38(82.6)	8(17.4)	**5.97(2.706-10.256)**	**3.678(1.39-9.67)***	**0.008***
	No	156(44.3)	196(55.7)	1	1	
Risk perception	High risk perception	132(67.3)	64(32.7)	**8.48(4.675-11.378)**	**5.39(2.614 - 9.92)****	**0.000****
	Moderate risk perception	44(40)	66(60)	**2.741(1.444-5.203)**	**2.53(1.157 - 5.52)***	**0.020***
	Low risk perception	18(19.6)	74(80.4)	1	1	
Attitude toward instrument processing	Positive attitude	175(57.6)	129(42.4)	**5.355(3.082-9.304)**	**2.85(1.46-5.57)***	**0.002***
	Negative attitude	19(20.2)	75(79.8)	1	1	
Knowledge on IP	knowledgeable	120(67.4)	58(32.6)	**4.082(2.682-6.213)**	**3.49(2.067-5.895)****	**0.000****
	Not knowledgeable	74(33.6)	146(66.4)	1	1	

Key: p value *p< 0.05 **P<0.01 COR-Crude Odds Ratio, AOR- Adjusted Odds Ratio 1-reference category

6. DISCUSSION

The result of this institutional-based cross-sectional study supported the existing evidence of a similar study, which found that being knowledgeable, having a positive attitude toward infection prevention during MIP, and having a high risk perception toward infection transmission during MIP were positively affecting factors of HCWs' medical instrument processing practices(Sahiledengle, 2018). On the other hand, it also contradicted the evidence of the same study, which reported that being trained in instrument processing, awareness of the Spaulding classification scheme for potential infection, and the availability of guidelines were not factors associated with medical instrument processing practices(Sahiledengle, 2018).

It was found that 48.7% of participants performed the safe practice of medical instrument processing. The finding is consistent with the study done in Bale (49.1%). The similarity could be due to number of trained HCWs on MIP. But the finding is lower than that of Addis Ababa, 67.1% (Sahiledengle, 2018) and Mekelle, 64.3% (Tewolde et al., 2019). This discrepancy could be due to differences in number of participants who got training and the update of national guidelines. On the other hand, it is higher than the finding of the study done in Egypt (34%) (Elkady et al, 2022). The discrepancy could be due to differences in sampling technique and composite scoring system.

About half (50.3%) of participants' instruments were soaked in a 0.5% chlorine solution before cleaning. The finding is lower than that of the study done in Mekelle 100% (Tewolde et al., 2019), Addis 86.3% (Sahiledengle, 2018), and Bale 77.3% (Sahiledengle,2019). The discrepancy could be due to the sample size and out date of this activity in the updated national guidelines for 2019. But still, it is not in line with the updated guidelines(FMOH, 2019). About 61.6% of participants rinsed instruments with clean water immediately after use, as much as was practical (point of use clean). This implies that nearly half of study participants were processing medical instrument based on old national guidelines(FMOH, 2012). This could be due to lack of access of updated national guideline and training on MIP.

Only 14.3% of participants wore all necessary personal protective equipment (an apron, facemask, eye goggles, and heavy-duty glove) while doing medical instrument processing. The finding is lower than that of Addis at 22.6% (Sahiledengle, 2018) and Bale at 71.8%

(Sahiledengle,2019). The discrepancy could be due to differences in study settings and data collection procedures.

About 56% of participants label medical instruments with the date of sterilization. The finding is lower than that of the study done in Mekelle, 72.8% (Tewolde et al., 2019) and Bale, 65.6% (Sahiledengle,2019). The discrepancy might be due to differences in sample size and study setting.

About 94.2% of participants cleaned medical instruments thoroughly with soap and water before sterilization. The finding is consistent with that of the study in Addis 98.2 (Sahiledengle, 2018).

About 95.2% of participants wore at least one piece of personal protective equipment while processing medical instruments. The finding is higher than that of a study done in Addis Ababa (Abebe, 2019). About 85.2% and 26.1% of participants wore facemasks and eyeglasses while they performed medical instrument processing. The finding is higher than that of the study done at Addis Ababa (Abebe, 2019). The discrepancy could be due to professional composition and good trained resulted due to Corona pandemics.

About 97.5%, 72.6%, and 84.4% of participants dismantled or opened instruments with multiple parts to brush the grooves, teeth, and joints of items, cleaned the instruments under the surface of the water in order to prevent splashing, and inspected instruments to check for residual impurities before sterilization or disinfection.

About 47% and 56% of participants removed the items from the HLD bucket using sterile forceps or gloves after disinfection and labeled each pack of instruments with the date of sterilization. The finding is lower than the national guideline(FMOH, 2019). About 57% of participants washed their hands after the instrument reprocessing procedure. The findings are lower than the national guideline. The discrepancy might be due to a lack of training and adherence to guidelines.

Having a high and moderate risk perception makes health care workers 5.788 and 2.679 times more likely to practice safe medical instrument processing, respectively. This is supported by a study done in Addis (Sahiledengle, 2018).

Participants' knowledge of instrument processing is a predictor of instrument processing practice. Being knowledgeable about instrument processing made them 3.318 times more likely to practice instrument processing in a safe way. It is analogous to studies done in Addis Ababa (Sahiledengle, 2018), (Biniyam et al, 2018) & (Abebe, 2019). Those participants who had awareness about Spaulding classification for potential infection risk were 3.53 times more likely to practice safe medical instrument processing. This could be due to a positive relationship between health knowledge and health practice(J Dowell , 2015).

The availability of guidelines on instrument processing makes health care workers 3.076 times more likely to practice safe medical instrument processing. This is supported by studies done in Bale (Sahiledengle, 2019) and Addis (Abebe, 2019).

Being trained in instrument processing makes health care workers 3.678 times more likely to perform safe medical instrument processing practices. It is consistent with the study done in Addis Ababa (Negash et al, 2018). On the other hand, it is contrary to the study done in Addis Ababa (Sahiledengle, 2018). The contradiction might be due to the difference in the duration since the participants got training and updates to national guidelines(FMOH, 2019).

A positive attitude towards infection prevention while processing medical instruments makes health care workers 2.85 times more likely to practice safe medical instrument processing. This finding is in line with that of a study done in Addis Ababa (Sahiledengle, 2018) & (Biniyam et al, 2018).

Strength and Limitation of the study

Strength

The practical part of the study incorporated an observational checklist.

The study included HCWs working in all types of public health facilities.

Limitation

The study did not evaluate the autoclaving practices thoroughly.

7. CONCLUSSION AND RECOMMENDATION

7.1. Conclusion

This institutional based cross-sectional study tried to assess medical instrument processing practice and associated factors in all public health facilities of Hawassa city administration, Sidama, Ethiopia, and it revealed that the health care provider had a practice gap. The result is lower than the national guideline standard. The availability of guidelines on medical instrument processing, having in-service training on medical instrument processing, having a positive attitude towards infection prevention while processing medical instruments, high and moderate risk perceptions of participants' regarding infection while doing instrument processing, and being knowledgeable on medical instrument processing were found to be significantly associated with the medical instrument processing practices of HCWs.

7.2. Recommendation

Based on the finding of this study the following recommendation will be forwarded.

Hawassa city administration health department and Sidama regional health bureau

The city health department, in collaboration with concerned stakeholders (non-governmental organizations), should strengthen and provide training on medical instrument processing.

They should develop a protocol to close the practices gap in medical instrument processing.

Health Institution

The managing bodies of health institutions should enhance health care workers motivation to participate in medical instrument processing duties through dedication.

The managing bodies of health institutions should monitor whether the updated guidelines are used, and they should held program of orientation between trained and untrained HCWs.

Health care provider

Trained health care providers should provide orientation for untrained health care providers.

Health care providers should update themselves by referring to updated national guidelines.

Researcher: Researchers should do research on medical instrument autoclaving practice.

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ANNEXES

Annex-I: Study Information sheet

Principal investigator: Ashenafi Assefa

Title of the research: medical instrument processing practices among maternity care providers in Hawassa city public health facilities, Sidama, Ethiopia 2023: Institution-based cross-sectional study.

Greetings: Good mooring / afternoon my name is _____I am currently a member of data collector on behave of Ashenafi Assefa Clinical Midwifery student in department of midwifery, college of medicine and health science at Hawassa University. He is conducting a research for the partial fulfillment of a second degree on the title mentioned above. Fortunately, you are chosen to participate in this study. The choice is made randomly. Before you decide whether or not to participate in this study, I would like to explain the study's objective, any risks, benefits, procedure, and what is expected from you.

The Objective of the study: The study will assess medical instrument processing practice among maternity care providers in public health facilities in Hawassa city administration, Sidama, Ethiopia 2023.

Procedure: The study involves an interview-administered structured questionnaire with a set of questions that you are going to be interviewed with, and an observational checklist was already filled out to minimize bias, but all the information can be used only if you agree. After giving consent, you answer the relevant questions that I am going to ask you. It'll take roughly fifteen minutes to complete.

The Benefit of the study: There is no direct benefit to study participants, but the result of the study will be disseminated to all concerned stakeholders in order to improve quality of health service and prevention in infection transmission to/from health provider/patient

The risk of the study: There is no harm in participating in this study but part of your time (15 minutes) will be consumed to answer the questions.

The Rights of participants: completely free to take part or not in this study. If you decide that you do not want to be part of the study, you are welcome. If you feel you cannot continue with the study, you are also free to stop at any moment. You can ask any inquiry that is unclear to you.

Confidentiality: All your information will be strictly confidential and will be kept safe and secure. Your name should not appear anywhere on the questionnaire to maintain your privacy.

Persons to Contact:

Ashenafi Assefa: Principal investigator

E-mail; ashuka2022@gmail.com

Phone number: +251926130373

Would you like to participate in the study?

1- No (respond thank you) 2- Yes (take informed consent)

Annex-II: Informed consent

The objective, benefits, harms, procedures and confidentially of the study has been read and explained to me in the language I comprehend. I further understand that, taking part in this study and withdraw from participating in any time without having reason is purely voluntary. Therefore, I declare my volunteer's consent to participate in this study verbally.

Thank you for your co-operation!!!

Annex-III Questionnaire: English version

Part I: Socio demographic characteristics of the respondents

101. How old are you? _____

102. Your sex?_____

103. Educational status? 1. Diploma 2. First Degree 3.Master degree

104. Your profession? 1. Midwife 2. Nurse

105. Your Facility type? 1. Referal Hospital 2. General Hospital 3. Primary Hospital 4.Health center

106. How many years have you worked in this health facility? ----------

Part II: Institution related Characteristics

201. Do you get access to regular supply of necessary materials for instrument processing (Hydrogen perioxide, water, soap, PPE)? 1.Yes 2.No

202. Do you have standard infection prevention guideline/poster at your work place? 1.Yes 2.No

Part III**:** Individual related Characteristics

301. Do you aware about Spaulding classification scheme of medical equipments for potential infection risks? 1.Yes 2. No

302. Have you ever vaccinated against hepatitis B virus? 1.Yes 2. No

303. Have you received in-service training on instrument processing in the last two years? 1.Yes 2.No

304. Have you received supportive supervision regarding instrument processing within the last one year? 1.Yes 2. No

Part IV: Instrument processing knowledge Characteristics

401. Is instrument processing part of standard precaution practice? 1. Yes 2. No

402. What is the first step in instrument processing? 1. Cleaning 2. Decontamination with 0.5% chlorine solution 3. Sterilization

403. How do you prepare a 0.5% chlorine solution from 5% concentrated liquid chlorine?

1. By mixing 9 part of water & 1 part chlorine solution 2. By mixing 10 part of water & 1 part chlorine solution 3. By mixing 5 part of water & 5 part chlorine solution

404. Which solution is preferable for high level disinfection of reusable equipments currently?

1. 0.5% chlorine 2. 3 % hydrogen peroxide

405. Which method can kill all living microorganisms including bacterial spores?

1. Decontamination 2. High level disinfection 3. Sterilization

406. Which one is correct temperature for steam sterilization? 1. 100ºC 2. 121ºC 3. 160°C

407. Which category do surgical instruments fall under?

1. Semi-critical 2. Critical 3. Non-critical

Part V: Attitude of maternity care providers towards infection prevention during medical instrument processing.

S. no	Variables/questions	SD	D	NAND	A	SA
501.	Decontamination of medical devices reduces the risk of infection in patients and healthcare workers.	1	2	3	4	5
502.	Instrument processing practice does not deserve the same attention to other key patient care activities.	1	2	3	4	5
503	If an instrument is not soiled visibly, we do not need to clean it before sterilization.	1	2	3	4	5
504.	Every patient attending healthcare facilities must be considered potentially HIV positive(i'e medical devices that had been used for HIV positive patients do not need to be reprocessed differently)	1	2	3	4	5
505.	Health care providers always should follow Standard guideline when processing the medical instruments.	1	2	3	4	5

1= Strongly Disagree, 2= Disagree, 3= Neither agree nor disagree, 4= Agree, 5= Strongly Agree

Part VI: Perception of maternity care providers toward infection transmission while medical instrument processing.

601.	What do you think about healthcare associated infection to health care workers in case of doing instrument processing without using personal protective equipment?	1	2	3	4	5
602.	What do you think about healthcare associated infection to health care workers if they fail to obey hand washing principles before and after instrument processing procedure?	1	2	3	4	5
603**.**	What do you think about the sharp material injury to health care workers if they use gloves other than heavy duty for surgical instrument cleaning?	1	2	3	4	5
604	What do you think about hospital acquired infection for patients if surgical instruments are not reprocessed in between the uses based on guideline?	1	2	3	4	5

1= Not sure, 2= Mild risk, 3= Moderate risk, 4= High risk, 5= Very high risk

Thank you for your co-operation!!

Part VII: Observational checklist to assess maternity care providers' practices of medical instrument processing (encircle the choice)

S.no	Variables/Questions	Response	
701.	Does health care provider engaged in instrument processing activities wear Eye goggle?	Yes	No
702.	Does health care provider engaged in instrument processing activities wear Facemask?	Yes	No
703.	Does health care provider engaged in instrument processing activities wear apron?	Yes	No
704.	Does health care provider engaged in instrument processing activities wear Heavy duty glove?	Yes	No
705.	Does health care provider rinse instruments with clean water immediately after use as much as practical?	Yes	No
706.	Does health care provider thoroughly cleaned instruments with soap and water?	Yes	No
707.	Does health care provider places reusable equipments in 0.5% Chlorine solution after use?	Yes	No
708.	Does health care provider dismantle/open instruments with multiple parts to brush the grooves, teeth, and joints of items?	Yes	No
709.	Does health care provider Clean the instruments under the surface of the water in order to prevent splashing?	Yes	No
710.	Does health care provider cleans the brush he/she used for equipment cleaning at the end of the cleaning process?	Yes	No
711.	After cleaning, Does health care provider inspected instruments to check residual impurities before sterilization/disinfection?	Yes	No
712.	Following high level disinfection, does health care provider remove the items from HLD bucket using sterile forceps or gloves?	Yes	No
713.	After cleaning, Does health care provider wraps instruments together as per their function for sterilization?	Yes	No
714.	Does health care provider label each pack of instrument with Name/Function?	Yes	No
715.	Does health care provider label each pack of instrument with date of sterilization?	Yes	No
716.	Does health care provider wash her/his hand after instrument reprocessing procedure?	Yes	No

Annex -IV

Table 5: Observational checklist to assess the practice of instrument processing among maternity care providers in Hawassa city administration public health facilities, Sidama, Ethiopia, 2023

Observational checklist items		Frequency	Percentage
Does health care provider wear Eye goggle?	Yes	104	26.1
	No	294	73.9
Does health care provider wear Facemask?	Yes	339	85.2
	No	59	14.8
Does health care provider wear apron?	Yes	257	64.6
	No	141	35.4
Does health care provider wear Heavy duty glove?	Yes	216	54.3
	No	182	45.7
Does health care provider rinse instruments with clean water immediately after use as much as practical (point of use clean)?	Yes	245	61.6
	No	153	38.4
Does health care provider thoroughly cleaned instruments with soap and water?	Yes	375	94.2
	No	23	5.8
Does health care provider places reusable equipments in 0.5% Chlorine solution for after use?	Yes	200	50.3
	No	198	49.7
Does health care provider dismantle/open instruments with multiple parts to brush the grooves, teeth, and joints of items?	Yes	388	97.5
	No	10	2.5
Does health care provider Clean the instruments under the surface of the water in order to prevent splashing?	Yes	289	72.6
	No	109	27.4
Does health care provider cleans the brush he/she used for equipment cleaning at the end of the cleaning process?	Yes	90	22.6
	No	308	77.4

Table 5…cont…

Observational checklist items		Frequency	Percentage
After cleaning, Does health care provider inspected instruments to check residual impurities before sterilization/disinfection?	Yes	336	84.4
	No	62	15.6
Following high level disinfection, does health care provider remove the items from HLD bucket using sterile forceps or gloves?	Yes	187	47
	No	211	53
After cleaning, Does health care provider wraps instruments together as per their function for sterilization?	Yes	372	93.5
	No	26	6.5
Does health care provider label each pack of instrument with Name/Function?	Yes	328	82.4
	No	70	17.6
Does health care provider label each pack of instrument with date of sterilization?	Yes	223	56
	No	175	44
Does health care provider wash her/his hand after instrument reprocessing procedure?	Yes	227	57
	No	171	43

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HAWASSA UNIVERSITY
COLLEGE OF MEDICINE AND
HEALTH SCIENCES
Institutional Review Board

Ref. No: IRB/355/15
Date: 29/06/2023

Name of Researcher(s): Asbenafi Assefa, Dubale Dulla (MSc, asst. prof.), Terefe Woyo (MSc)

Topic of Proposal: ***Instrument processing practice and associated factors among obstetric care providers in Hawassa coadministration public health facilities, Sidama, Ethiopia, 2023***

Dear researcher(s),
The Institutional Review Board (IRB) at the College of Medicine and Health Sciences of Hawassa University has reviewed the aforementioned research protocol with special emphasis on the following points:

1. Are all principles considered?
   - 1.1. Respect for persons: Yes ☑ No ☐
   - 1.2. Beneficence: Yes ☑ No ☐
   - 1.3. Justice: Yes ☑ No ☐
2. Are the objectives of the study ethically achievable? Yes ☑ No ☐
3. Are the proposed research methods ethically sound? Yes ☑ No ☐

Based on the aforementioned ethical assessment, the IRB has:

A. Approved the proposal for implementation ☑ Approval period -29 June 2023 to 28 June 2024
B. Conditionally Approved ☐ Essential Approved: Protocol Version No. 1
C. Not Approved ☐ Follow up report expected in 6 months

Obligation of the PI:

1. Should comply with the standard international and national scientific and ethical guidelines
2. All amendment and changes made in protocol and consent form needs IRB approval
3. The PI should report SAE within 3 days of the event
4. End of study, including manuscript should be reported to the IRB

Yours faithfully,

Hawassa University College of Medicine & Health Sciences Institutional Review Board

Dr. Embialle Mengistie (Ph.D. Associate Prof.)
Chairperson, Institutional Review Board

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