



Institute of Health

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Department of Environmental Health Science and Technology

Hand Hygiene Status and Its Associated Factors among Housemaids
Working in Communal Living Residences in Jimma city, Southwest
Ethiopia

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Institute of Health
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Ethiopia

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Statement of Declaration

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university, and that all sources of materials used for the thesis have been fully acknowledged.

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Abstract

Background: hand hygiene is a milestone, cost-effective and convenient means to prevent the transfer of pathogens. Little is known about hand hygiene status and its associated factors among housemaids working in dwellings.

Objective: The study aimed to assess hand hygiene status and its associated factors among housemaids working in communal living residences in Jimma city, Southwest Ethiopia.

Methods: Cross-sectional study was conducted among 230 housemaids from April to June 2022. Sample was allocated each residence proportionately to their population size and a simple random sampling technique was applied to select the study participants. Hand hygiene status and relevant characteristics were collected by face-to-face interviews using a semi-structured questionnaire and observational checklist. Hand swabs were collected following sterile conditions for the segregation of commensal microbes. Swabs were inoculated aseptically using streak-plating methods on mannitol salt agar, MacConkey agar, salmonella-shigella agar, and Eosin Methylene Blue Agar and then incubated at 37°C for 24h for bacterial isolation. In addition, a set of biochemical tests was applied to examine bacterial species. Data was entered into Epidata v3.1 then exported to SPSS v26 for analysis. Binary logistic regression was used to analyze the associated factors. P -value ≤ 0.05 was considered statistically significant.

Results: Two hundred twenty-three housemaids were interviewed with a response rate of 97%. The proportion of hand hygiene status was 83% (95%CI: 77.6-87.9). However, the prevalence of one or more bacterial isolates that tested positive was 72.6% (95%CI: 66.4-78). The overall good hand hygiene status was 57(25.6%). Its associated factors were occupational status of households being merchant (AOR=.030, 95%CI: .020, .402), fingernail status (AOR=1.764, 95% CI: 2.190, 3.424), big effort required to perform good hand hygiene (AOR=3.790, 95% CI: 1.732, 2.694), very effectiveness of head of household (AOR=1.865, 95% CI: 1.242, 1.963) and *S.aureus* (AOR=.104, 95%CI: .015, .776).

Conclusions: Hand hygiene status was poor (74.4%) which needs improvement. Households of housemaids should be concerned about their employee's hand hygiene as well housemaids should follow all necessary steps to keep their hand hygiene wisely.

Keywords: Bacterial isolate, hand hygiene status, handwashing practices, housemaids

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Lists of Abbreviations and Acronyms

ABHR:	Alcohol-Based Hand Rubber
AOR:	Adjusted Odd Ratio
CD:	Communicable Disease
CDC:	Centers for Disease Control and Prevention
CI:	Confidence Interval
COD:	Crude Odd Ratio
DF:	Degree of freedom
EMB:	Eosin Methylene Blue
FBD:	Food-Borne Disease
HH:	Hand Hygiene
HHP:	Handhygiene Practice
HHS:	Hand Hygiene Status
HW:	Hand Washing
HWP:	Hand Washing Practice
JMP:	Joint Monitoring Programme
JU:	Jimma University
KIA:	Kliger Iron Agar
MOs:	Microorganisms
MSA:	Mannitol Salt Agar
NCCLS:	National Committee for Clinical Laboratory Standards
PBIs:	Presence of Bacterial Isolate(s)
SCA:	Simon Citrate Agar
SIM:	Sulfide Indole Motility
SOP:	Standard Operating Procedure
SPSS:	Statistical Package for Social Science
SSA:	Salmonella-Shigella Agar
UoGRH:	University of Gondar Referral Hospital
UNICEF:	United Nations Children’s Fund
WHO:	World Health Organization

Chapter One

1. Introduction

1.1. Background information

Hand hygiene (HH) is the mechanism or process of removing debris, soil, and microbes (1). It also refers to an action taken by an individual for cleansing hands (2). It is performed via handwashing (HW) with soap and water, antimicrobial soap, or antiseptic agents and hand rubbing with an alcohol-based hand rub (ABHR) (1).

Communicable diseases continued to be the major contributor to global morbidity and mortality (3,4). A variety of pathogens was transmitted by the fecal-oral route (5). Diarrhoeal diseases and acute respiratory infections were the leading causes of childhood mortality, with more than two-third of these deaths occurring in low-income countries [Africa and Southeast Asia] (6). Sixty-two percent and 31% of all deaths in Africa and South-Asia are due to infectious diseases respectively (7).

Housemaid plays a critical role in ensuring food safety and the prevention of diseases resulting from ready-to-eat foods (8). Unclean hands among housemaids could cause contamination through the spread of pathogens between hands and surfaces and to food products (9). Furthermore, the hands of housemaids would commonly be contaminated with food-borne pathogens (10). This contamination of hands might result from contact with feces, body fluids, and inanimate objects; and is a common mode of transmission for gastrointestinal and respiratory infections (5).

Contaminated hands could be the principal source of food contamination (11). It could be a vehicle for spreading FBD agents through cross-contamination of food and among key factors in the transmission of diseases to the immediate consumers (12). Hence, microbial contamination of food from housemaids could be a public health problem (13) that could be prevented by HH (14). Due to this, HH practices of the housemaid were often recognized as a contributory factor that causes food-borne illness (15). As regards, practicing proper HH could be highly effective in limiting the transmission of disease-causing pathogens from housemaids to those they served(16).

Hand hygiene (HH) is a milestone, effective, and has achieved the reputation of being a convenient means for preventing communicable diseases (CDs) (17). It is also the simple

act of cleaning hands that can save lives and reduce illness (18). It also doesn't need clever technology (19). Practicing improved HH can effectively reduce gastrointestinal and respiratory tract infections by up to 50% [the two leading causes of childhood morbidity and mortality] around the world (20). The simple act of washing hands with soap can cut diarrhea risk by almost 50%, and respiratory tract infection by 33.3% of fecal-oral disease (21). Good HH can reduce outbreaks of pathogen transmission and food-borne illness and minimize the spread of antibiotic resistance micro-organisms (MOs) (22). As result recognizing the promotion of the improvement in the cleanliness of hands is an important measure for public health (23).

According to WHO guidelines, HW remains the most effective measure to interrupt the mode of transmission of MOs from one's hand to one own mouse or one's hand to the other's hand (2). In addition, handwashing is recognized to be a convenient, effective, and cost-effective means of preventing or interrupting the transmission of disease in community settings as well as at the individual level (24). Indeed Burton and colleagues revealed that there was a difference in the effectiveness of destruction of potential microbes by HW with water, non-antimicrobial soap, or water only (23). In developing countries including Ethiopia, the most common form of hygiene is considered to be HW (25). Consequently, it is recognized as the leading measure to prevent cross-transmission of MOs, and an important measure to minimize the incidence or prevent the spread of diseases caused by infectious (18). Keeping proper HH via regular and proper HW habits is crucial in the prevention of the majority of communicable diseases. Therefore, hand hygiene is a primary measure of well-being and development (20).

1.2. Statement of the problem

Housemaids working at home such as in a kitchen chopping vegetables, kneading flour, etc., could be the source of contamination and can transmit disease-causing pathogens through contaminated hands (26). During the preparation and serving of food products, they play a key role in hygienic-sanitary control and may be responsible for the promotion of FBD episodes (27). Since they are one of the main contributors to FBD (28).

Foodborne disease is defined as “any disease usually either infectious or toxic in nature, caused by agents that enter the body through ingestion of food or drink that could be due to microbial pathogens” (29). As stated by Banik and colleagues, it happened after those disease-causing microbes entered the food supply chain (28). They are caused by a variety of pathogens transmitted by the fecal-oral route, including *E.coli*, *Shigella*, *Salmonella spp.*, *V.Cholerae*, *Streptococcus pneumonia*, and others (30). The repeated occurrence of the FBD has led to an increase in global concern for food handlers (31).

A considerable portion of infectious diseases is transmitted by contaminated hands which continued to be a major of concern public health problem across the globe. Accordingly, diarrhea was responsible for 8% of deaths among under-five holding a major part in countries of South Asia and sub-Saharan Africa (32). In 2020 WHO indicated that an estimated 600 million people in the world fall ill and 420,000 die after consuming contaminated food each year resulting in the loss of 33 million healthy life years (29). Children specifically under-five remain particularly vulnerable carrying a 40% burden of disease with 125,000 deaths (29). Another report by UNICEF and WHO in 2021 indicated that half a million people die each year from diarrhea or acute respiratory infections that could be prevented with good HH (18).

Developing countries probably bear most of the burden of FBD and most of the known burden comes from biological hazards (33). In Ethiopia, 60 to 80 percent accounts communicable diseases of which diarrhea is the leading cause of under-five mortality, accounting for 23% of all under-five deaths-more than 70,000 children a year (34). A systematic review and meta-analysis revealed that the prevalence of diarrhea was 22% among under-five children in Ethiopia (35). Another study revealed that there was a high prevalence of food-borne bacterial contaminants (36). This indicated high-intensity infections with FBDs and other fecal-oral pathogens (37).

As regards, improvement and promotion of HH conditions and practices play a pivotal role (38). In addition, other studies conducted disclosed that there was a need for improvement in HH (39,40). Although most studies focused on HH compliance, handwashing practice, attitude, and knowledge and most of them were conducted in health care settings and schools (17,22), they didn't show that hand hygiene status (HHS). In addition to this, evidence indicated that there were bacterial contaminations among food handlers (40,41). Furthermore, still, no research had been done yet that indicated contribution of housemaids to contamination and their HHS.

However, many factors affect HHS. In many developing countries including Ethiopia, there is a low degree of HW with soap/other products needed for HH (42). According to UNICEF and WHO report in 2021, about 38% of households in Ethiopia have not HW facility at home (18). In addition, sociodemographic characteristics such as education status/training, income status, and referent pressure were significantly affecting HH (43,44). Moreover, microbial contamination of hands is another contributing factor. The reason is due to the uncleanliness of fingernails and improper HW practices (45).

Despite HH being a milestone, effective, convenient, and simple; there is limited data about HHS and its associated factors among housemaids working in dwellings across the globe as well as in developing countries including Ethiopia. Although there is a high communicable diseases burden like diarrhea and food-borne diseases (34), still now in Ethiopia, there is no clear information that shows the contribution of housemaids to food-borne illnesses and the like. Therefore, showing the level of HHS among housemaids who are directly involved in domestic work such as food preparation will show their contribution to foodborne disease transmission. However, little was known about HHS and its associated factors among housemaids. As regards, the present study aimed to assess HHS and its associated factors among housemaids working in communal living residences in Jimma city.

1.3. Significance of the study

Assessment of HHS and its associated factors among housemaids in the communal residence can play a crucial role in the early detection of risk factors and would help the responsible bodies to wider understanding of the potential predicting factors of HHS to minimize resulting negative effect such as various contagious diseases early; because the place where those workers engaged was so crowded that they are more likely to spread the disease.

Besides, the work of housemaids involves the use of water. During the cleaning and washing activities, they also use soap in most cases. Thus, the HHS of housemaids might indicate the real community HHS and communicable disease burden. Information generated also directs the focus of the responsible bodies to address the issues that need immediate intervention/measures before affecting the public need which the communities are challenged due to HH practice.

In addition, this study contributes to the achievement of sustainable development goal six which calls for the large community to achieve access to hygiene for all by 2030 since HH was one of the most important elements of these.

However, HHS and its associated factors at the individual level would have a cumulative impact on the community level. As result, information provided through the assessment of HHS and its associated factors at the individual level would be a baseline for further study on HHS in larger community settings. Therefore, the findings from this study would provide the basic and essential information for decision-makers, and baseline data for further researchers interested in the field of study.

Chapter Two

2. Literature Review

2.1. Hand hygiene

Proper HH is well known to mitigate associated risks in the best way unless the contamination results in FBD (46). In the same way, good HH can reduce outbreaks of pathogen transmission and food-borne illness and minimize the spread of antibiotic resistance micro-organisms (MOs) (22). Therefore, HH is considered cheap, essential, and the most effective means of preventing cross-contamination regardless of the setting (47). It is also recognized as the leading measure to avoid cross-transmission of MOs as cited by (48). It is aimed to limit the microbial counts on the skin and remove dirt, and prevent cross-transmission of pathogens (49).

According to CDC, proper HH is the act of wetting hands with clean running water, followed by the vigorous rubbing of lathered hands for at least 20s, rinsing them under clean running water, and finally drying the washed hands with a clean tissue, towel, or air drier (50). However, HH at critical times is very important to protect one's self and their family or others from getting sick, and it includes washing hands with soap and water before handling food, after going to the toilet, before/after eating, after handling raw food, after changing the baby diaper, after handling garbage/waste, or cleaning the baby bottom, after sneezing, after handling money, after touching animals and after touching body parts (22).

Hand hygiene is monitored globally by the JMP using globally agreed-upon definitions and methods (18). Improvement and promotion of hygienic conditions and practices play a pivotal role to prevent fecal-oral infections (38). Washing hands with soap at times of public health significance primarily after contact with feces, but also before handling food or feeding an infant is effective in reducing the occurrence of diarrhea in poor settings (51), and also plays a role in reducing acute respiratory infections.

Handwashing is the single most preventive measure for reducing the spread of contagious diseases (52). However, several studies had reported that there was an association between improvements in HH and reductions in an isolate of commensal from hand swabs as well as disease caused due to those microbial (53).

Moreover, disease intervention studies suggest that the risk of infectious intestinal disease can be reduced by up to 31% through HH (54). In addition, a recent systematic review on HWP and its effect on diarrheal diseases suggests that interventions through promoting HW with soap lead to a 40% reduction in the risk of diarrhea (55). Furthermore, Burton and colleagues indicated the presence of potential bacteria of fecal origin with no HW on 44% of study participants and a reduction of pathogen i.e. 23% and 8% for those who washed their hands with water alone and with plain soap and water respectively (23). Similarly, a study conducted in eastern Ethiopia showed that HW with soap and water can reduce diarrheal disease by 35% or more (56). However, in many developing countries including Ethiopia, there is a low degree of HW with soap or other products needed for HH. Based on the study conducted in 54 countries in 2015 found that on average, 38.7% of households practiced HW with soap (42).

Recognition of promotion in the improvement of HH is an important measure for public health (23). Consequently getting people to wash their hands with soap is, therefore, a promising strategy for promoting health (57) and keeping hands free from any disease-causing agents. Washing hands with detergents or soap strategies is the simple act of cleaning hands to save costs and lives and reduce illness or stop the expansion of infectious diseases or reduce the burden of global disease (18).

2.1.1. Techniques of hand hygiene

Effective HH involves the removal of visible dirt, soiling, debris, and the reduction of microbial colonization of the skin (58). Types of pathogens that can contaminate hands resident (colonizing or normal) and transient (contaminating) (22). The transient flora colonizes the superficial layers of the skin, is more amenable to removal by routine HW and is more infectious while the resident flora associated with the deeper layers of the skin are more difficult to remove and generally are less likely to be pathogenic and difficult to remove via HW compared to transient flora (2). *Corynebacteria* and *Negative staphylococci* are examples of resident flora while *S.aureus* and *Candida's species* is transient flora. Taking this information into consideration the preferred HH taken depends on the degree of contamination, the type of procedure, and the desired persistence of antimicrobial action on the skin (59).

Effective handwashing is the application of antiseptic (antimicrobial) soap or a plain (nonantimicrobial) onto wet hands; then vigorous rubbing together of both hands to form a lather, the tops of the hands, covering all the surface of the palms, between the fingers, the base of the fingers, back of the fingers, fingernails, fingers tips, thumb and wrists for at least 20seconds (2).

Equally, fingernails should be short while artificial fingernails; jewelry like a watch, rings, and bracelets that would lead to bacterial colonization underneath them should be rinsed thoroughly (60).

Drying hand with a clean towel, paper towel, or cloth is important to prevent cross-contamination because MOs thrive in a damp environment (50). Paper towels are effective for drying hands plus the friction created by their use enhances organism removal from the skin. The friction generated by vigorous hand rubbing with soap and hand drying with paper towels removes dirt and loosely adherent flora, i.e. most transient flora and a small portion of resident flora from hands (48).

Plain soaps are detergent-based products that can remove dirt, soil, and other organic materials. Combined water and plain soap can remove transient flora with minimal antimicrobial activity. However, an antiseptic handwash is performed with antimicrobial soap and water that remove or destroy transient MOs and reduce resident flora (59).

Alcohol-based hand rub is used when hands are not visibly soiled and HW facilities like a sink, plain soap, and water are not present (2,59). Alcohol hand-rub differs from HW because it acts on the MOs by denaturing their proteins and can eradicate all transient flora and most resident flora and takes less time (2,48,59). The process of ABHR starts by applying a sufficient amount of alcohol-based hand-rub products (liquid, gel, or foam) according to the manufacturer's recommendation. The effective concentration of alcohol should be 60% to 95% to kill bacteria (50); concentrations of greater than 95% are not recommended because they have less water which is essential for the protein denaturation of MOs, thus making them less potent (48).

Using ABHR immediately after or before HW could cause dermatitis as cited in (48). This is due to hypersensitivity at the site of any broken skin (abrasions, cuts) to alcohol or the presence of various additives in it (2). However, using ABHR after HW could reduce

irritation caused by detergents used for HW since the detergent on the skin is removed by it (60). The efficacy of HH preparation in killing bacteria is indicated in figure1 (59).

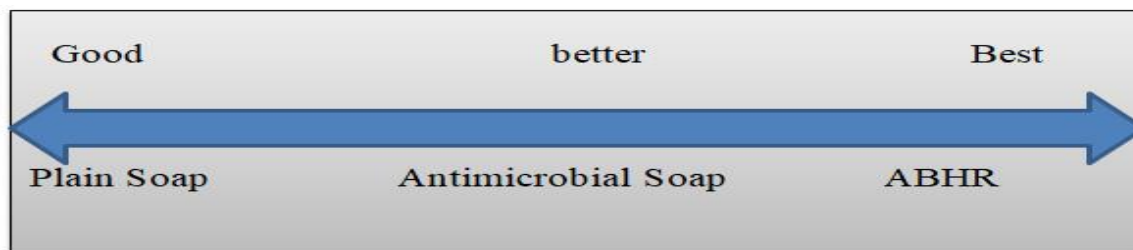


Figure 1: The efficacy of hand hygiene preparation in killing bacteria.

2.1.2. Contributing factors of hand hygiene

Hand hygiene is the first-line defense mechanism and the best strategy for the prevention of disease that could come from housemaids (61). It is affected by many factors.

One of the contributing factors is the lack of HW facilities and socio-demographic characteristics. It's estimated that three out of ten people, 2.3 billion globally, lack a facility with water and soap available to wash their hands at home, including 670 million who have no HW facility at all (18).

A study conducted in Iran indicated that the availability of HW solutions at all times, the correct sink location, continuing education (training), and administrative support and encouragement are effective for HH (62). Furthermore, a study conducted in Turkey showed that training was highly associated with HH (63). A narrative review in Sub-Saharan countries revealed that deficit in HW infrastructures (eg, lack of water, soap, hand sanitizers, and blocked/leaking sinks), and poorly positioned facilities (64). In addition, a study conducted in Nigeria indicated that the limiting factors to HW were the lack of materials such as soap, water, towels, and alcohol (65).

Some studies conducted in Ethiopia showed that availability and accessibility of water, soap and alcohol, and referent pressure were strongly associated with HHP (66). In addition, a study conducted in Addis Ababa, Ethiopia indicated that the functionality of the HW sink, availability of running water, and HH guidance were significantly associated with HHP (43). Similarly, studies conducted in Ethiopia revealed that socio-demographic characteristics were strongly associated with HHP (44). Furthermore, a study showed that income status, marital status, educational status, and occupational status were significantly

associated with the utilization of alcohol-based hand sanitizer (67). Handwashing practices and training were strongly associated with HHS (26).

The other contributing factor to HH is microbial contamination of the hands. A considerable portion of the world's diseases is communicable, over 60% cause infection that starts when hands are contaminated with disease-causing organisms in the feces (68). Most infectious diseases are transmitted mainly by contaminated hands (4). For instance, fecal-oral diseases occurred when infectious agents found in feces are ingested through fecal-oral route as a result of contaminated hands or by consumption of contaminated food or water (69). Due to this, it is a public health problem of major concern (70). A study indicated that there was an association between the uncleanliness of fingernails and the growth of microbial under fingernails and HH result in the transmission of fingernail microbial through water, food, finger, and nails contaminated with feces (71). Moreover, MOs mostly pathogenic can spread under the fingernail areas through contamination, and it became difficult to clean this part of the hand when compared to others (72).

However, the effectiveness of HW for the destruction of potential bacteria from hands by using water and non-antibacterial soap is more than only water (23). In addition, a study revealed that the effect of HH on microbial reduction is associated with the availability of HW facilities (45). The use of an ABHR resulted in significantly less frequent hand contamination (73). Therefore, practicing proper HH is very important to interrupt disease-causing pathogens from housemaids in the community setting (46).

Another factor that affects the HHS of housemaids is HW water quality. This is because little attention is given to the quality of water used to wash hands as well as the use of stored water because of a lack of continuous water supply of tap water (74). Hands washed with contaminated water pose a risk for higher levels of hand contamination (9). It also poses a risk of recontaminating hands with pathogens; for example, a *Shigella dysenteriae* outbreak in Zimbabwe was linked to shared HW water as cited in (75). Berhanu and his colleagues disclosed that HHS is significantly affected by the microbial quality of water used to wash hands (74). Water used to wash hands should be free from fecal coliforms and pathogenic MOs (76).

2.2. Conceptual framework of the study

The conceptual framework is illustrating demographic characteristics, hand washing practice, availability of HW facilities, bacterial isolates, and other contributing factors interrelating with HHS. It is developed by reviewing literature written by reading different articles published in different journals such as Heliyon, Lancet, *PLoS ONE*, *AJIC*, *PLoS Med*, *Trop Med Int Heal*, and others regarding HH and its contributing factors.

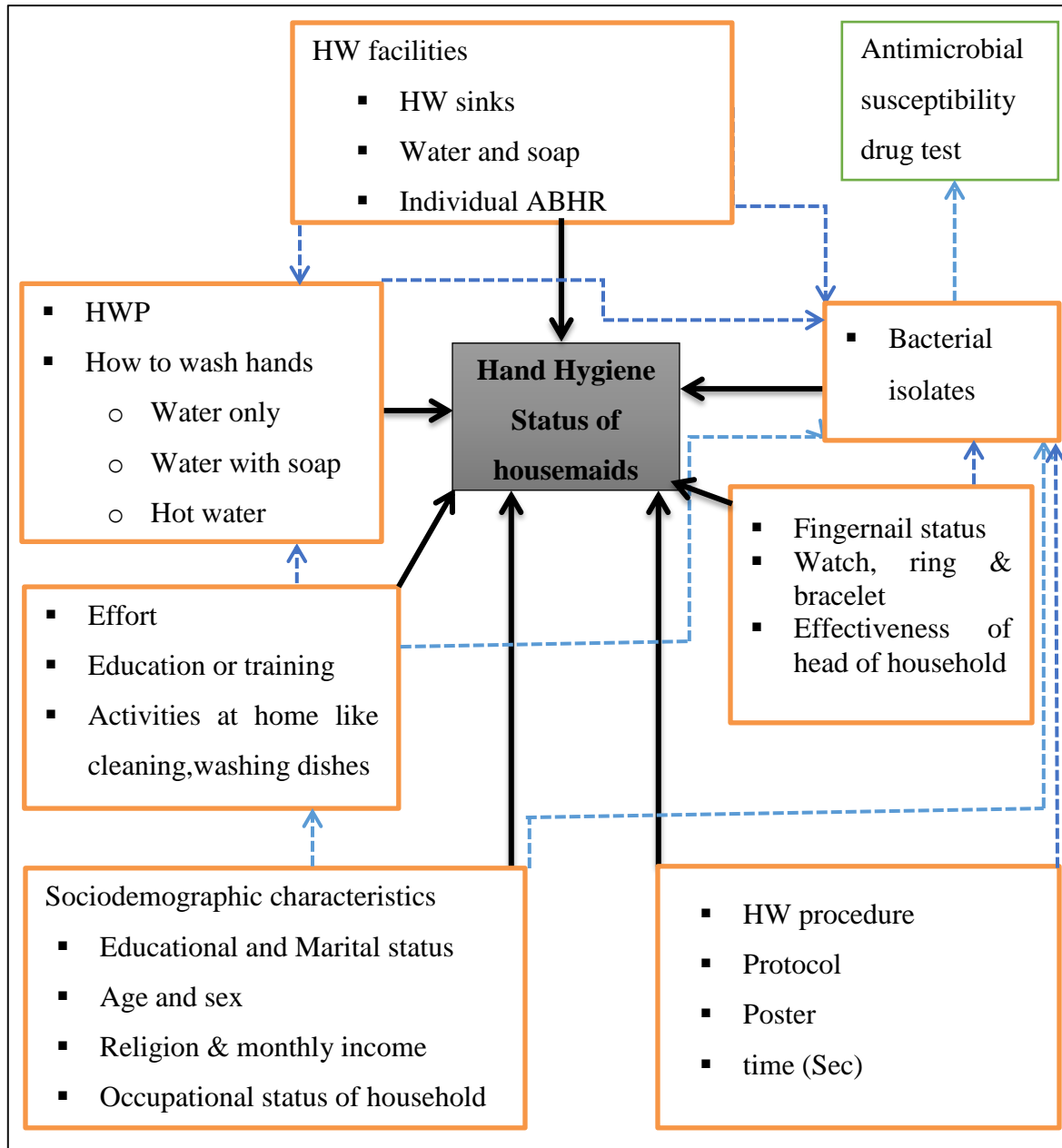


Figure 2: Conceptual framework indicating HHS and associated factors, 2022.

Chapter Three

3. Objectives

3.1. General objective

- To assess hand hygiene status and its associated factors among housemaids working in communal living residences in Jimma city, Southwest Ethiopia, 2022

3.2. Specific objectives

1. To assess hand hygiene status among housemaids
2. To determine hand washing practices among housemaids
3. To describe the associated predicting factors with hand hygiene status
4. To determine antimicrobial susceptibility for isolated bacteria

3.3. Research questions

1. What is the condition of hand hygiene status of housemaids working in communal living residences in Jimma city?
2. Do housemaids engaged in communal dwelling wash their hands at critical time?
3. What is/are bacterial contaminants in the hands of housemaids working in the communal dwelling?
4. What factors affecting hand hygiene status of housemaids?
5. Is a bacterium isolated is/are susceptible to antimicrobial drugs?

Chapter Four

4. Methods and Materials

4.1. Description of study area and period

The study was conducted in communal living residences in Jimma City; Southwest Ethiopia, from April-June, 2022. Jimma city is located 352km southwest of Addis Ababa. Jimma City geographical coordinates are 7°41' N latitude and 36°50' E longitudes, and also it has an average altitude of 1780m above sea level. The study area receives a mean annual rainfall of about 1530 millimeters that comes from the long and short rainy seasons. The mean annual minimum and maximum temperatures are 14.4°C and 26.7°C respectively with dominant warm and humid weather conditions (77). According to information obtained from Jimma City municipality in 2022, the city covers areas around 11,417 hectares and it is also divided into 17 Kebeles with a projected population of 425,816 of which 240,267 males and 185,549 females with total households of 37,878. City administrations built communal residences in different sites in 2007/2008GC in which around 1,355 households are there. In Jimma City, residences are owned by the City administration found in different sites (Bossa Addis [Bossa & Saarsafar], Ginjo [Hostel], Ginjo Guduru, and Bechobore [Dololo & Ajip]), and owned by Jimma University (residents of JU apartment, DEPO condominium, and KITO condominium) in which around 333 households are living. Based on inventory assessment at each household level and information gathered from the local administration such as kebele and Idir, at present, there are around a total of 455 recorded housemaids employed in communal living residences in Jimma city of which 90 were engaged in residences owned by JU while 365 were working residences owned by the city administration.

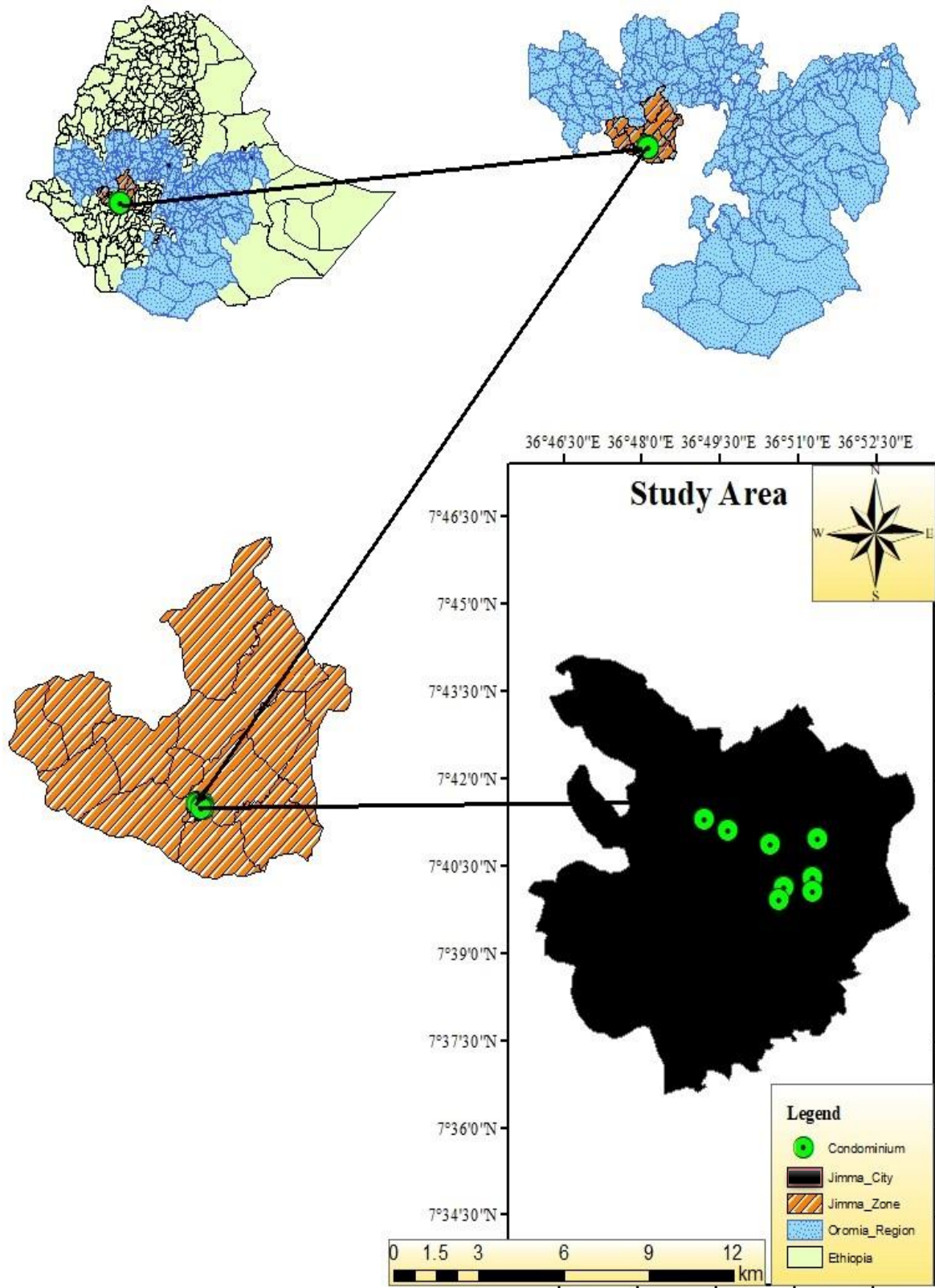


Figure 3: Map of Jimma City, Jimma zone, Ethiopia.

4.2. Study Design

A cross-sectional study design was employed.

4.3. Population

4.3.1. Source population

All housemaids who have been working in communal living residences in Jimma city.

4.3.2. Study population

The housemaids who have been running (engaged in work) in communal dwelling houses in Jimma city, and who could fulfill the eligibility standards and are available in the course of the records or data collection period were considered as the study population.

4.4. Inclusion and exclusion criteria

4.4.1. Inclusion criteria

All housemaids employed in communal living residences in Jimma city to serve other people or the members of the employer within the household in the last three months were included.

4.4.2. Exclusion criteria

Housemaids who've signs of communicable illnesses which include fecal-oral sickness like food-borne and being on treatment, and having pores and skin irritation, inflammation, and eczema or scar on their palms have been excluded.

4.5. Sample size determination and sampling technique

4.5.1. Sample size determination

The sample size was determined by applying the general formula for a single population proportion. By considering a 50% proportion of hand hygiene status ($p=0.5$) at 95% CI

$$n = (Z_{\alpha/2})^2 \left(\frac{p(1-p)}{d^2} \right) = n = \frac{(1.96)^2 * 0.5(1-0.5)}{(0.05)^2} = 384$$

Where n =sample size, $Z_{\alpha/2} = 1.96$ standard scores corresponding at 95%CI, d =level margin of error to be tolerated (5%), p = proportion of hand hygiene status. Since the total

number of sources population (N) was 455, the sample size to the population size was adjusted by using a correction formula, and the final sample size was calculated as follows:

$$n = \frac{n}{[1 + \frac{n}{N}]} = \frac{384}{[1 + \frac{384}{455}]} = 209$$

After considering a 10% (21) non-response rate the sample size was 230.

4.5.2. Sampling technique

All communal residences in Jimma city were included in the study. Data on housemaids employed in each residence was obtained from each household level and information gathered from the local administration such as kebele and Idir (90 were engaged in residences owned by Jimma University and 365 were working residences owned by the city administration). Housemaids employed at communal residences owned by Jimma city administration were listed as (Bossa Addis [29 in Bossa & 117 in Saarsafar], Ginjo [18 in Hostel], 47 in Ginjo Guduru, and Bechobore [76 in Dololo & 78 in Ajip]) and JU (44 in residents of JU apartment, 24 in Depo condominium, and 18 in Kito condominiums). The number of sample was allocated each residence proportionately to their population size. Finally, housemaids engaged in work in each residence were coded in numbers; then each study unit was selected randomly. Housemaids were interviewed till to allocated sample size achieved (see Fig.4).

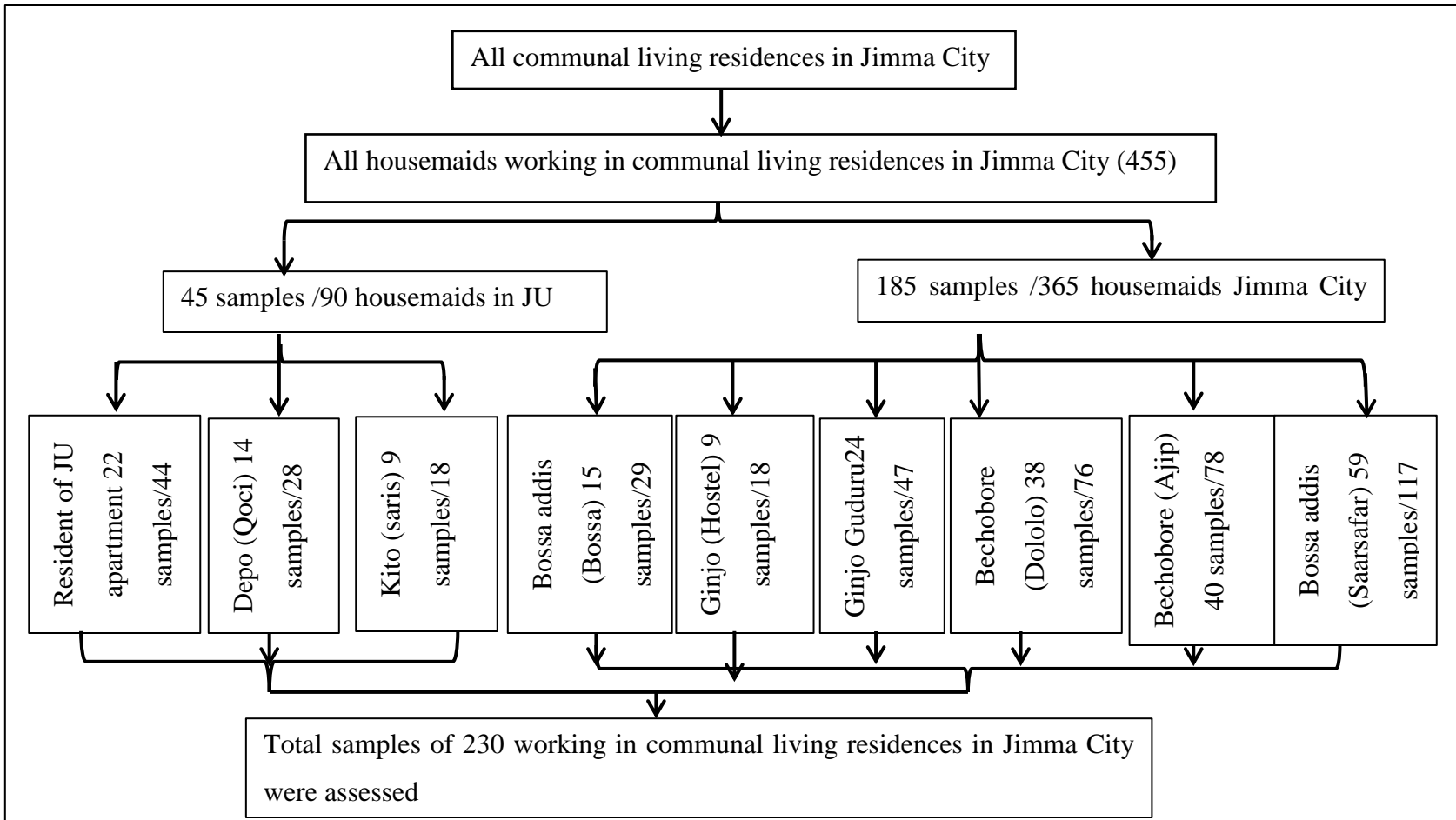


Figure 4: Schematic presentation of a sampling technique of the study.

4.6. Study variables

4.6.1. *Dependent variable*

- Hand hygiene status

4.6.2. *Independent variables*

- Socio-demographic characteristics
 - Sex
 - Religion
 - Age
 - Educational and marital status
 - Income
 - Occupational status of the household of housemaids
- Fingernail status
- Presence of HH poster and protocol
- Commensal microbes on the hands
- Efforts required to perform good HH
- Effectiveness of head of household to attach the fact to perform optimal HH
- Handwashing practices
 - Frequent HW
 - How to wash
 - Wearing watch, ring, and bracelets
 - Time in seconds (handwashing time)
 - Frequently HW with water and soap
 - Drying hands and use of clothes after washing hands
 - Follow five steps to wash hands
- Handwashing facilities
 - HW sink
 - Water
 - Soap
 - ABHR
- Activity in the house

4.7. Operational definitions

Bacterial isolates: are types of strain separated or identified through a series of procedures and investigation in the laboratory from hand swabs samples containing a mixed population of microbes that have the potential to cause disease (41).

Communal living residence: is defined as modern types of coliving as means of communal housing or condominium providing housing or accommodation in which people share in either shared or private suites in a communal setting, together with services which may include shared spaces, resources like kitchen/dining facilities, sanitary facilities and a set of values (78,79).

Hand hygiene (HH): refers to any measure/action taken for cleansing hands from extraneous matter by proper HW (2).

Hand hygiene status (HHS): refers to the current status of keeping HH for sake of protecting health (18).

- **Good HHS:** is a state where there is no microbial isolate on the hands of the study participants (80) .
- **Poor HHS:** is a condition when there is bacterial isolate on the hands of the study participants (81).

Handwashing practice (HWP): is the process of mechanically removing soil, debris, and MOs from the hands using plain water and soap or by hand-rubbing using ABHR (1).

Frequent HW: indicates that the habit of hygiene with prolonged exposure to water, soap, and ABHR/sanitizer to remove extraneous matter resulted from contact with any dirty matter such as touching hair, door, etc to protect one self and his/her family (82).

Housemaids: persons especially females or women employed to do housework or they are domestic workers who are servants employed to do housework (83).

4.8. Data collection techniques

4.8.1. Data on socio-demographic characteristic

Following written informed consent, socio-demographic characteristics including sex, age, religion, educational and marital status, and occupational status of household and monthly

income of housemaids were collected through face-to-face interviews using a pre-tested semi-structured questionnaire at communal residences in Jimma City, Southwest Ethiopia.

4.8.2. Data on hand hygiene, handwashing practice and related characteristics

Hand hygiene (HH), handwashing practices (HWP) and related characteristics, and commensal microbial data were collected by face-to-face interviews using a pre-tested semi-structured questionnaire, observational checklist, and laboratory investigation.

Relevant information on HH and related characteristics such as fingernail status, presence of HH poster and protocol, training/education about HH in last year, the effort required to perform good HH, the effectiveness of head of household to attach the fact to perform good HH and be reminded to do HH were collected by face-to-face interviews using a pre-tested semi-structured questionnaire and observational checklist.

Similarly, HWP and related characteristics such as frequent HW, how to wash hands, use of soap and water for frequent HW, following five steps to wash hands, pickling under finger dirt, removing watch, ring, and bracelets, HW time, need of drying after washing hands, use of towel/clothes to dry hands after washing, availability of HW sink, water and soap, and wall mounted/individual ABHR, HW before and after a meal, before meal preparation, after cleaning home and washing dishes, after touching garbage and doing laundry, after touching their own or others body parts and after using toilet were collected by face-to-face interviews using a pre-tested semi-structured questionnaire.

4.8.3. Laboratory data analysis and interpretation

4.8.3.1. Sample collections and transport

Sterile cotton swabs and 10ml saline containing sterile test tubes were prepared to collect and transport the samples. Though for the bacterial isolates from hand swabs, after the HW participant's dominant hand was sampled for microbial culturing and notification was not delivered in advance, and extra HH wasn't allowed during the hand rinse sample collection. Samples from each participant were collected by rubbing all over the surface of the dominant hand using sterile-moistened cotton-tipped swabs in the moistened state and then placed/soaked in labeled 0.85% saline solution containing sterile test tubes (40). Swabs samples were collected by three well-trained laboratory personnel in standard aseptic procedures. Soon after collection, samples were sent to the Microbiology

laboratory at the Department of Medical Microbiology in JU. Then in the laboratory, the samples were enriched in nutrient broth for 24 hrs to enhance the recovery of the isolates because the survival of bacteria collected can be affected by HW.

4.8.3.2. Sample culture technique

The common method to identify bacteria is through the use of selective media which can hinder or suppresses the growth of unwanted commensal microbes or the use of differential media which is easier to distinguish colonies of desired MOs from other colonies growing on the same plate (84).

The media used in this study were prepared according to the manufacturer's instructions. A loop full of each hand swabs sample enriched on nutrient broth was inoculated aseptically using streak-planting methods on mannitol salt agar (MSA) (TM MEDIA, TITAN BIOTECH LTD, Rajasthan, India) selective and differential for the isolation of *Staphylococcus aureus* and *Coagulase-Negative Staphylococci*; MacConkey agar (TM MEDIA, TITAN BIOTECH LTD, Rajasthan, India) for *Klebsiella species* and *Proteus species*; salmonella-shigella agar (SSA) (Oxoid LTD, Hampshire, England) for *Salmonella* and *Shigella* and Eosin Methylene Blue (EMB) Agar (HIMEDIA, HiMedia Laboratories Pvt.Ltd., Mumbai-400086, India) selective and differential for *Escherichia coli*, and then incubated at 37°C for 24 hours.

After an incubation period, the culture plates were examined for the growth of bacteria, and the morphology of the isolates was recorded. The bacterial isolates grown on culture media and identified by morphology were made to undergo biochemical tests for further proper identification of each bacterial isolate. The basis for the selection of bacterial species was pieces of literature that illustrate HH indicators of commensal microbes (18,28).

4.8.3.3. Biochemical tests

The single colony of bacteria grown on selective and differential media was then subcultured into nutrient agar to determine growth patterns and for further biochemical tests. Then after obtaining pure colonies, identification of bacterial isolates was done by using standard microbiology techniques like the morphology of its colonies and a battery (set) of biochemical tests like a response on catalase, coagulase, oxidase, Simon citrate

agar (SCA), urease, sulfide indole motility (SIM), Kliger Iron Agar (KIA), gas and hydrogen sulfide (H₂S) generation (40).

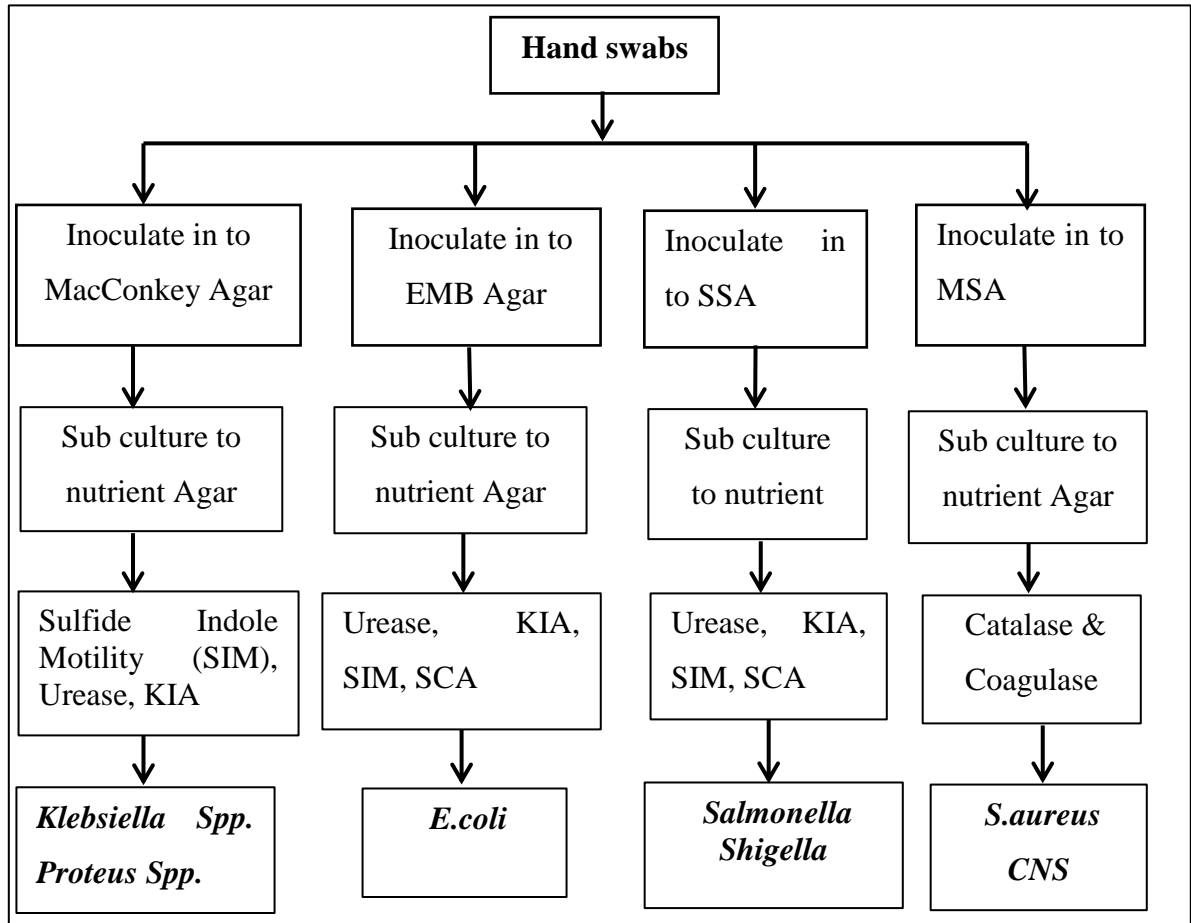


Figure 5: Laboratory flow chart showing bacterial isolations from hand swabs samples.

4.8.3.4. Antimicrobial susceptibility tests

Antimicrobial susceptibility tests were performed on Muller Hinton Agar (HIMEDIA, TITAN BIOTECH LTD, Rajasthan, India) by disc diffusion method. The following antimicrobial drugs were used to test susceptibility: Tetracycline (30µg), Ceftriaxone (30µg), Chloramphenicol (30µg), Gentamicin (10µg), Vancomycin (30µg) and Ceftazidime (30µg). The selections of drugs were based on availability and pieces of literature (40,85). The susceptibility profiles that mean sensitivity, intermediate, and resistance of the bacterial isolates were interpreted according to the NCCLSs (85).

4.9. Data quality management

The questionnaires were prepared in English language and translated into national languages Amharic and Afan Oromo by linguistic professionals in Bachelor of Arts in Amharic and Afan Oromo, and then back to English for reliability. Data collection tools were adopted from WHO and published articles (66,86,87) and pretested among 10% (23 housemaids) engaged in the community in the Jimma city before data collection, and state any correction was made after pre-test and or not. The orientation was given to data collectors and close supervision was carried out to ensure the data correctness, completeness, and consistency during data collection. Laboratory tests were strictly adhered to SOP (84) as well as before processing samples, for proper functioning of the instruments utilized were checked and the known strains of selected organisms (*S.aureus* ATCC12981 and *E.coli* ATCC25922) were used for comparison purposes amid distinguishing proof as far quality. The gathered data were checked for completeness and consistency. Then, coded and double entered into the Epidata version 3.1. Before analysis, preliminary analyses were carried out.

4.10. Data processing, analysis and interpretation

The data was edited, cleaned, and double-entered into Epidata version 3.1 and then exported to SPSS version 26 for further analysis. Descriptive analyses were summarized using frequency and percentage to present in texts, tables, and figures. Multicollinearity diagnostics were carried out to check the relationship between predicting variables with cut off VIF value <5% and tolerance >0.1. Confounding variables are managed or controlled through logistic regression and restriction of study participants. Linearity of logit for continuous variables ($\log(Y/1-Y) = \alpha_j + \beta_j x$) checked by using box-Tidwell test.

Binary logistic regression was used to assess the associated factors with the outcome variable. The variables with a p-value ≤ 0.25 were fitted into the multivariable analysis. Hosmer and Lemeshow statistical test was carried out to check the goodness of fitness and variables were selected through the backward stepwise (LR) selection technique. The odds ratio with a respective 95% CI was used to measure the strength of association. P-value ≤ 0.05 was considered statistically significant.

4.11. Ethical consideration

The research was conducted after ethical clearance was approved with reference number IHRPGS/437/22 from the Institutional Review Board (IRB) of the Institute of Health, Jimma University. In addition, permission was obtained from the responsible body of residential administration [JU and Jimma city administration] and each household. Furthermore; consent was sought from each study participant. The overall information obtained from the study participant and their privacy was kept strictly confidential using codes. Those participants' hand hygiene status and related findings would be linked to concerned bodies including the household. i.e. results would be forwarded and solutions would be recommended.

4.12. Dissemination of the study results

The result obtained from the study will be submitted in hard and soft copies and presented to the Department of Environmental Health Science and Technology, Faculty of Public Health, Institute of Health, Jimma University. In addition, it will be disseminated to scientific society through publication in peer-reviewed journals.

Chapter Five

5. Results

5.1 Socio-demographic characteristics

Of the total of 230 housemaids aimed in this study, 223 housemaids were interviewed with a response rate of 97%. All the study participants were females with a mean age of $21.08 \pm SD$ of (4.438), but the age of study participants was measured as the self-reported age. The majority, 187(83.9%) of the study participants were between the age of 18-30years. About 89(39.9%) and 74(33.2%) of the study participants were followers of Orthodox and Muslim respectively. About 159(71.3%) of the study participants were single regarding their marital status, and more than half (53.4%) of the study participants followed primary school. The majority, 152(68.2%) households of housemaids were government employees followed by merchants 59(26.5%) and other professional workers 12(5.4%) respectively. The mean monthly income of respondents was $693.05 \pm SD$ of (152.187) ETB (Table1).

Table 1: Socio-demographic characteristics of housemaids working in communal living residences in Jimma city, Southwest Ethiopia, 2022 (n=223).

Variables	Category	Frequency(N)	Percent (%)
Age	≤17 Years	27	12.1
	18-30 Years	187	83.9
	Others	9	4.00
Religion	Orthodox	89	39.9
	Muslim	74	33.2
	Protestant	59	26.5
	Others	1	0.40
Marital status	Single	159	71.3
	Married	63	28.3
	Others	1	0.40
Educational status	Others	7	3.10

	Primary school	119	53.4
	Secondary school and above	97	43.5
Occupational status	Government employees	152	68.2
	Merchant	59	26.5
	Other professional workers	12	5.40

Other occupational workers: drivers, NGO employees, housewives; **Occupational status:** Occupational status of households of housemaids

5.2. Hand hygiene status and related characteristics

According to this study, about 185(83.0%) of study participants replied that they keep their HH. More than three quarters, 172(77.1%) of the study participants trimmed their fingernails and 168(75.3%) had effective heads of household to attach the fact to perform optimal HH. About three quarter (75.8%) of the study participants responded that it's very important to be remembered/be reminded to do HH. More than two-third, 154(69.1%) of the study participants replied that to perform good HH requires a big effort. However, it should be noted that all households where housemaids were engaged hadn't posters and protocol levels for HH at all. About 222(99.6%) of the study participants didn't receive education or training for HH in the last year (Table2).

Table 2: Hand hygiene and related characteristics of housemaids working in communal living residences in Jimma City, Southwest Ethiopia, 2022 (n=223).

Variables	Category	Frequency(N)	Percent (%)
Keep hand hygiene	No	38	17.0
	Yes	185	83.0
Fingernail status	Not trimmed	51	22.9
	Trimmed	172	77.1
The effort required to perform good HH	No effort	69	30.9
	A big effort	154	69.1
Hears of a household to attach to the fact to perform optimal HH	Not effective	55	24.7
	Very effective	168	75.3
Need to be remembered or be reminded to do HH	Not importance	54	24.2
	Very importance	169	75.8

HH: Hand hygiene

5.3. Hand washing practices and HW facility-related characteristics

Two hundred two (90.6%) of the study participants responded that they wash their hands frequently. The majority, 185(83%) of the study participants wash their hands frequently with soap/other detergents, and 200(89.7%) of the study participants wash their hands including picking under their fingers dirty. Regarding washing hands with water and soap, about 191(85.7%) of the study participants replied that they wash their hands with water with soap followed by 11(4.90%) only with water. In addition, more than two-third, 152(68.2%) and 159(71.3%) of the study participants didn't follow five steps to wash their hands the right way and didn't remove their watch, ring, and bracelet during HW. Furthermore, more than half, 117(52.5%) of the study participants didn't wash their hands for at least 20 seconds every time. About 133(59.6%) and 120(53.8%) of the study participants replied that their hands need to be dried and use clothes to dry their hands after washing. Nearly 215(96.4%) of the study participants responded that HW prevents diseases. Of those about 209(93.7%) replied that HW can prevent CDs, especially diarrheal diseases (Table3).

Two hundred twenty-one (99.1%) households of the study had the availability of HW sink and soap, and water all the time. In addition, 133(59.6%) households of study participants had wall mount/ individual ABHR recorded during data collection (Table3).

Table 3: Handwashing practices and handwashing facility-related characteristics of housemaids working in communal living residences in Jimma City, Southwest Ethiopia, 2022 (n=223).

Variables	Category	Frequency (N)	Percent (%)
Wash hands frequently	No	21	9.40
	Yes	202	90.6
How to wash hands?	Cold water	11	4.9
	Water with soap	191	85.7
	Hot water	-	-
Wash hands frequently with soap or other detergents	No	6	2.7
	Yes	185	83.0
Wash hands including picking under fingers dirt at any time	No	23	10.3
	Yes	200	89.7
Follow five steps to wash hands the right way at any time	No	152	68.2
	Yes	71	31.8
Remove watch, ring, and bracelet during HW at any time	No	159	71.3
	Yes	64	28.7
Wash hands for 20 seconds every time	No	117	52.5
	Yes	106	47.5
Need to dry hands after washing any time	No	90	40.4
	Yes	133	59.6
Use of clothes to dry hands after washing	No	13	5.80
	Yes	120	53.8

Handwashing prevents diseases	No	8	3.60
	Yes	215	96.4
Hand washing can prevent CDs especially diarrheal diseases and related diseases	No	6	2.70
	Yes	209	93.7
Handwashing facility-related factors			
Availability of HW sink	No	2	0.90
	Yes	221	99.1
Availability of a wall mount/ individual ABHR	No	90	40.4
	Yes	133	59.6
Availability of soap and water all the time	No	2	0.90
	Yes	221	99.1

ABHR: alcohol-based hand rubber; **CDs:** communicable diseases; **HW:** Hand washing

Accordingly, 222(99.6%), 214(96%), 218(97.8%), and 186(83.4%) of the study participants responded that they wash their hands always while performing different activities at home including before and after a meal, before preparing meals, after cleaning home and washing dishes, after touching garbage and doing laundry respectively. The majority 218(97.8%) of the study participants responded that they wash their hands after visiting the toilet, and more than half (61.4%) of study participants replied that they wash their hands after touching their own or others' body parts (Figure6).

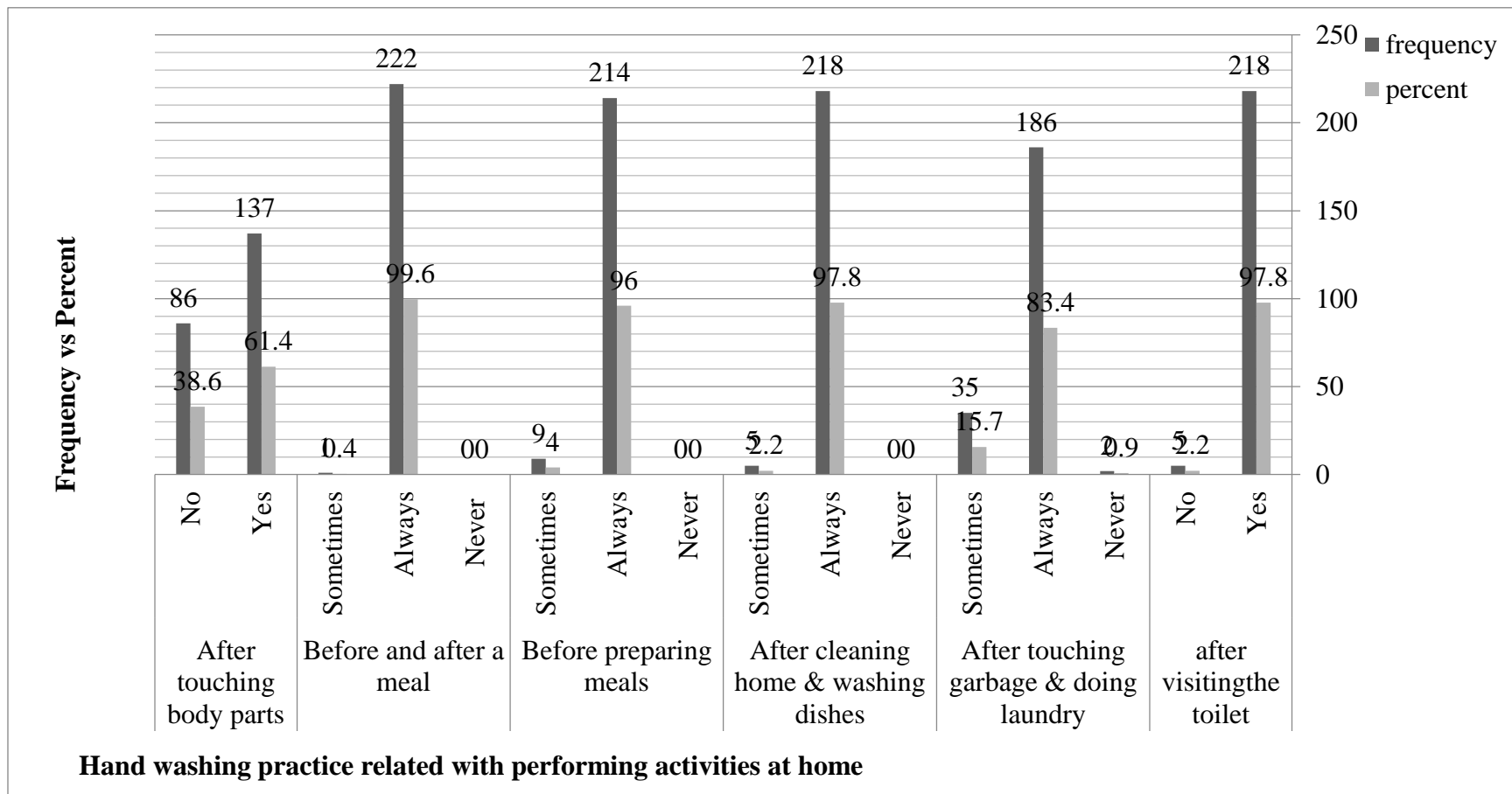


Figure 6: Bar graph showing hand washing practice related to critical times at home among housemaids working in communal residences in Jimma City, Southwest Ethiopia, 2022 (n=223).

5.4. Bacterial isolates

The majority, 162(72.6%) of study participants tested positive for one or more than one bacterial hand contaminants. A total of 224 bacterial isolates were identified. *S.aureus* 71(31.8%) was the predominant bacterial species isolated from hand swabs of housemaids followed by *Klebsiella spp.* 52(23.3%) and *E.coli* 48(21.5%) whereas the least bacteria isolated was *CNS*. However, bacteria weren't isolated from the hand swabs of 61(27.4%) of the study participants (Table4).

Table 4: Bacterial isolates of hand swabs samples from the hand of housemaids working in communal living residences in Jimma City, Southwest Ethiopia, 2022 (n=223).

Variables	Frequency (N)	Percent (%)
<i>S. aureus</i>	71	31.8
<i>CNS</i>	2	0.90
<i>E.coli</i>	48	21.5
<i>Salmonella</i>	3	1.30
<i>Shigella</i>	15	6.70
<i>Klebsiella spp.</i>	52	23.3
<i>Proteus spp.</i>	33	14.8
Total bacteria isolated	224	

CNS: Coagulase-Negative Staphylococci

5.4.1. Bacterial isolate(s) and associated factors

The frequencies of the isolation rates of bacteria from hand swabs were relatively higher among 122(76.7%) of the study participants who didn't remove their watch, ring, and bracelet during HW than among 40(62.5%) of the study participants who removed the watch, ring, and bracelet during HW ($\chi^2_{(DF=1)} = 4.650, P=.031$). Similarly, isolation rates of bacteria from hand swabs were relatively higher among 94(80.3%) of the study participants who didn't wash their hands for 20sec every time than among 68(64.2%) of their counterpart ($\chi^2_{(DF=1)} = 7.337, P=.007$) (Table5).

In addition, the isolation rates of bacteria(s) from hand swabs were relatively higher among 47(85.5%) of the study participants working in the ineffective head of household attach to the fact to perform optimal HH than 115(68.5%) of the study participants working in the very effective head of household ($\chi^2_{(DF=1)} = 6.028, P=.014$) (Table5).

Moreover, the isolation rates of bacteria(s) from hand swabs were relatively higher among 51(86.4%) of the study participants engaged within households being merchants than their counterparts ($\chi^2_{(DF=2)} = 7.689, P= .021$) (Table5).

There were statistically significant associations between the bacterial isolation rate with the frequent HW, removal of a watch, ring, and bracelet during HW, washing hands for at least 20sec every time, presence of wall mount/ individual ABHR, and effectiveness of head of household attach the fact to perform optimal HH at P-value <0.05 (Table5).

Table 5: Cross-tabs between bacterial isolates with associated factors among housemaids working in communal living residences in Jimma City, Southwest Ethiopia, 2022 (n=223).

Variables	Category	Bacterial Isolate(s)		Pearson χ^2 & Asymptotic Sign (2-sided)
		Negative [N ^o (%)]	Positive [N ^o (%)]	
Occupational status of households of housemaids	Gov't employees	49(32.2%)	103(67.8%)	$\chi^2_{(df=2)}=7.689$ P= .021*
	Merchant	8(13.6%)	51(86.4%)	
	Others	4(33.3%)	8(66.7%)	
Washing hands frequently	No	10(47.6%)	11(52.4%)	$\chi^2_{(df=1)}=4.791$ P= .029*
	Yes	51(25.2%)	151(74.8%)	
Removal of watch, ring, and bracelet during handwashing	No	37(23.3%)	122(76.7%)	$\chi^2_{(df=1)}=4.650$ P=.031*
	Yes	24(37.5%)	40(62.5%)	
Washing hands for at least 20sec every time	No	23(19.7%)	94(80.3%)	$\chi^2_{(df=1)}=7.337$ P=.007*
	Yes	38(35.8%)	68(64.2%)	
Availability of a wall mount/ individual ABHR	No	16(17.8%)	74(82.2%)	$\chi^2_{(df=1)}=6.964$ P=.008*
	Yes	45(33.8%)	88(66.2%)	
Head of the household to attach the fact to perform optimal HH	Not effective	8(14.5%)	47(85.5%)	$\chi^2_{(df=1)}= 6.028$ P=.014*
	Very effective	53(31.5%)	115(68.5%)	

ABHR: Alcohol Based-Hand Rubber; **HH:** Hand hygiene; **DF:** Degree of freedom; **Others:** Other professional workers;

*: statistically significant at P-value \leq 0.05; N^o: number

The frequencies of the isolation rates of bacteria(s) reported as positive from hand swabs were relatively higher among 34(89.5%) of the study participants who didn't keep their HH than those 128(69.2%) of their counterparts. However, the frequencies of the isolation rates of bacteria(s) reported as negative were relatively higher among 57(30.8%) of the study participants who kept their HH than 4(10.5%) of those who didn't keep their HH (Table6). There was a significant association between hand hygiene status with the presence of bacterial isolate ($\chi^2_{(DF=1)} = 6.527$, $P = .011$) at a cut-off p-value ≤ 0.05 .

Table 6: Cross tabs between hand hygiene status with bacterial isolates among housemaids working in communal living residences in Jimma City, Southwest Ethiopia, 2022 (n=223).

Variables	Category	Keep hand hygiene (HHS)		Pearson χ^2 & Asymptotic Sign (2-sided)
		No [N ^o (%)]	Yes [N ^o (%)]	
Presence of bacterial Isolate	Negative	4(10.5)	57(30.8%)	$\chi^2_{(DF=1)} = 6.527$ $P = .011^*$
	Positive	34(89.5%)	128(69.2%)	

*: statistically significant at p-value < 0.05 ; N^o: Number

From laboratory investigation, this finding revealed there weren't microbes isolated from hand swabs among 57(25.6%) of the study participants' hands sampled. In other words, more than 74% of the study participants sampled for hand swabs had microbial isolates on their hands.

5.5. Antimicrobial susceptibility pattern of bacterial isolates

The majority, 70(98.6%) of *Staphylococcus aureus* were sensitive to Chloramphenicol followed by 51(71.8%) and 46(64.8%) sensitive to Vancomycin and Gentamycin respectively, but around 22(31.0%) were resistant to Ceftriaxone. *CNS* was sensitive to all drugs except a single isolate of *CNS* resistant to Ceftriaxone.

More than 2/3, 36(75%), 38(79.2%), 42(87.5%), and 37(77.1%) of *E.coli* were sensitive to Tetracycline, Vancomycin, Ceftriaxone, Chloramphenicol, and Ceftazidime respectively, while no resistance was recorded on Gentamycin with only 18(37.5%) of *E.coli*, were intermediates. Thirty-three (100%) and 46(88.5%) of *Proteus spp.* and *Klebsiella spp.* were sensitive to Chloramphenicol whereas 16(48.5%) and 24(46.2%) of *Proteus spp.* and *Klebsiella spp.* were resistant to Ceftriaxone and Vancomycin respectively.

Despite three *Salmonella* and 12(80.0%) of *Shigella* being sensitive to Chloramphenicol, two *Salmonella* and 15(100%) of *Shigella* were resistant to Vancomycin respectively. Antimicrobial susceptibility patterns of different bacteria isolated from swab samples of housemaids working in communal living residences in Jimma City are presented in (Table7).

Table 7: An antimicrobial susceptibility pattern of bacteria isolated from hand swabs of housemaids working in communal living residences in Jimma City, Southwest Ethiopia, 2022.

Bacterial isolates	Total	SP [N^o(%)]	TE	CRO	C	GEN	VA	CAZ
<i>Staphylococcus aureus</i>	71	S	42[59.2]	45[63.4]	70[98.6]	46[64.8]	51[71.8]	30[42.3]
		I	9[12.7]	4[5.6]	1[1.4]	25[35.2]	1[1.4]	25[35.2]
		R	20[28.2]	22[31.0]	0[0.00]	0[0.00]	19[26.8]	16[22.5]
CNS	2	S	2	-	2	2	2	2
		I	0	1	0	0	0	0
		R	0	1	0	0	0	0
<i>Escherichia coli</i>	48	S	36[75.0]	38[79.2]	42[87.5]	30[62.5]	36[75.0]	37[77.1]
		I	0[0.00]	4[8.30]	0[0.00]	18[37.5]	0[0.00]	5[10.4]
		R	12[25.0]	6[12.5]	6[12.5]	0[0.00]	12[25.0]	6[12.5]
<i>Salmonella</i>	3	S	1	2	3	1	1	2
		I	1	0	0	1	0	1
		R	1	1	0	1	2	0
<i>Shigella</i>	15	S	3[20.0]	8[53.3]	12[80.0]	12[80.0]	0[0.00]	8[53.3]
		I	5[33.3]	3[20.0]	3[20.0]	0[0.00]	0[0.00]	3[20.0]
		R	7[46.7]	4[26.7]	0[0.00]	3[20.0]	15[100.0]	4[26.7]
<i>Klebsiella species</i>	52	S	25[48.1]	28[53.8]	46[88.5]	31[59.6]	5[9.6]	28[53.8]
		I	15[28.8]	14[26.9]	6[11.5]	21[40.4]	23[44.2]	7[13.5]
		R	12[23.1]	10[19.2]	0[0.00]	0[0.00]	24[46.2]	17[32.7]
<i>Proteus species</i>	33	S	23[69.7]	9[27.3]	33[100.0]	27[81.8]	16[48.5]	5[15.2]

		I	1[3.0]	8[24.2]	0[0.00]	5[15.2]	7[21.2]	20[60.6]
		R	9[27.3]	16[48.5]	0[0.00]	1[3.0]	10[30.3]	8[24.2]

CNS: *Coagulase-Negative Staphylococci*; **S:** Sensitivity; **I:** Intermediate; **R:** Resistant; **SP:** Sensitivity pattern; **TE:** Tetracycline; **CRO:** Ceftriaxone; **C:** Chloramphenicol; **GEN:** Gentamycin; **VA:** Vancomycin; **CAZ:** Ceftazidime; **N^o:** Number

5.6. Observation survey result

5.6.1. Water storage practice-related characteristics at the household level

In this study, almost 223(100%) of the households of the study participants living in the residences use piped water to tap into the yard as the primary source of water for domestic purposes including HW. The majority, 217(97.3%) of the condition of containers used to store water were covered barrels within households. Accordingly, 201(90.1%) of the condition of the stored water was visibly clean. Furthermore, 175(78.5%) of the households used water and soap to wash the storage container while 37(16.6%) used water only as recorded during the observation (Table8).

5.6.2. Handwashing facility-related characteristics at the household level

The result indicated that all households in the communal living residences had a specific HW station/area. Among these, 94(42.2%), 40(17.9%), and 89(39.9%) were located near the latrine, cooking place, and elsewhere inside the house, respectively. In addition, 212(95.1%) of those specific HW stations/areas were supplied with water and soap. About 118(52.9%) liquid and 92(41.3%) powdered types of soap were predominantly available in the HW areas (Table8).

Table 8: Hand hygiene status observation and infrastructure survey at households in communal living residences in Jimma City, Southwest Ethiopia, 2022 (n=223).

I. Water storage practice		Observation recorded	Frequency (N)	Percent (%)
The main source of water for domestic purposes including HW		Piped water to tap in the yard	223	100.0
Cover condition of container used to store within the household		Covered barrel	217	97.3
		Open barrel	3	1.30
		Others (Jar)	3	1.30
Condition of the stored water		Visibly clean	201	90.1
		Visibly dirty	22	9.90
How to wash the storage container		Water only	37	16.6
		Water and soap	175	78.5
		Others	11	4.90
Others represent: sand, ash, clothes, and stitch				
II. Handwashing				
Specific HW station/area	Yes		223	100.0
	No		-	-
The location of the HW facility	Near the latrine		94	42.2
	Near the cooking place		40	17.9
	Elsewhere inside the house		89	39.9
	Elsewhere in the compound		-	-
Available soap and water in the HW station/area	Only water		10	4.50
	Soap & Water available		212	95.1
	Soap & Water unavailable		1	0.40
Type of soap available	Liquid soap		118	52.9
	Powdered soap		92	41.3
	Others		12	5.40
Others represent: top detergent (ajax in the local name), laundry soap like sky and sunlight				

5.7. Factors associated with HHS

The variables such as occupational status of households of housemaids, fingernail status, effort required to perform good HH, the effectiveness of the head of household to attach the fact to perform optimal HH, and isolation of *S. aureus* from hand swabs were found to be significantly associated variables with HHS of housemaids with p-value ≤ 0.05 .

About 97% of housemaids working within households having an occupation of merchant were less likely to keep their HH. Housemaids engaged within the households being merchants were .030 times less likely to keep their HH than households being government employees (AOR=.030, 95% CI: .020, .402) (Table9).

The odds ratio of 1.764 indicates a unit increase in trimming fingernails, odds of housemaids keeping their HH changed by a factor of 1.764. This means that the unit increase on trimming fingernails changed by 76.4% keeping HH by housemaids rather than not trimming their fingernails. Housemaids who trimmed their fingernails were 1.764 times more likely to keep their HH than housemaids not trimmed their fingernails (AOR=1.764, 95% CI: 2.190, 3.424) (Table9).

The odds ratio of 3.790 indicates a unit increase in requiring a big effort to perform good HH, the odds of housemaids keeping their HH changed by a factor of 3.790. This means that unit increase on requiring a big effort to perform good HH changed by 79.0% keeping HH by housemaids rather than their counterpart. Housemaids requiring a big effort to perform good HH were 3.790 times more likely to keep their HH than housemaids not requiring effort (AOR=3.790, 95% CI: 1.732, 2.694) (Table9).

About 86.5% of housemaids engaged in very effective head of household were more likely to keep their HH than their counterpart. The odds of housemaids engaged in the very effective head of household to attach to the fact to perform optimal HH were 1.865 times more likely to keep their HH compared to ineffective (AOR=1.865, 95% CI: 1.242, 1.963) (Table9).

About 89.6% of housemaids were less likely to keep their HH. The odds of housemaids with isolation of *S.aureus* from their hand swab reported as positive were .104 less likely to keep their HH than compared to those reported as negative (AOR=.104, 95% CI: .015, .776) (Table9).

Table 9: Logistic regression showing associated factors with HHS of housemaids working in communal living residences in Jimma City, Southwest Ethiopia, 2022 (n=223)

Independent variables	Category	HHS		COR(95%CI)	Sig.	AOR(95% CI)
		No	Yes			
Occupational status of households of housemaids	GE	19	133	1	1	1
	Merchant	17	42	.352(.268,.760)*	.005	.030(.020,.402)*
	Others	2	10	.712(.146 ,3.412)	.561	.414(.030,8.201)
Fingernail status	Not trimmed	31	20	1	1	1
	Trimmed	7	165	1.546(1.238, 3.672)**	.008	1.764(2.190,3.424)*
efforts required to perform good HH	No effort	35	34	1	1	1
	A big effort	3	151	1.481(1.804,2.403)**	.000	3.790(1.732,2.694)**
Head of the household to attach the fact to perform optimal HH	Ineffective	35	20	1	1	1
	Very effective	3	165	3.520(2.801,3.477)**	.032	1.865 (1.242,1.963)*
Washing hands frequently with soap/other detergents	No	16	20	1	1	1
	Yes	22	165	2.001(2.614,3.470)**		
Washing hands including picking under fingers dirt	No	10	13	1	1	1
	Yes	28	172	1.527(0.982,1.108)		
Follow five steps to wash hands the right way	No	36	116	1	1	1
	Yes	2	69	0.717(.502, 0.806)*		
Removing watch, ring, & bracelet during HW	No	31	128	1	1	1
	Yes	7	57	2.862(.720, 2.372)		

Washing hands for 20 seconds	No	28	89	1	1	1
	Yes	10	96	2.120(1.488, 2.522)*		
Washing hands after a touch of own/others' body parts	No	25	61	1	1	1
	Yes	13	124	3.607(1.861, 2.179)**		
Washing hands after visiting the toilet	No	2	3	1	1	1
	Yes	36	182	4.370(.544, 3.897)		
Use of clothes after washing	No	4	9	1	1	1
	Yes	15	105	1.301(.789, 2.401)		
Presence of wall mount/ individual ABHR	No	19	71	1	1	1
	Yes	19	114	1.606(.796, 3.238)	.051	2.432(.659,2.6172)
<i>S.aureus</i>	Negative	13	78	1	1	1
	Positive	21	50	.397(.128, .923)*	.027	.104(.015, .776)*

ABHR: Alcohol Based-Hand Rubber; **HHS:** Hand hygiene status; **HW:** Handwashing; **CI:** Confidence Interval; **1:** For reference category; **COR:** Crude Odd Ratio; **AOR:** Adjusted Odd Ratio; *: P-value<0.05; **: P-value<0.001; **GE:** government employees; **Others:** Other professional workers

Table10: Multicollinearity showing tolerance and variance inflation factors (VIF) of predictor variables.

Predictors variables	Collinearity Statistics	
	Tolerance	VIF
Occupational status of household of housemaids	.698	1.433
Fingernail status	.382	2.619
Effort required to perform good HH	.507	1.974
Head to attach the fact to perform optimal HH	.297	3.367
Washing hands frequently with soap or other detergents	.705	1.418
Washing hand including picking under your fingers dirt	.817	1.224
Follow 5 steps to wash your hands the right way	.526	1.902
Remove watch, ring, and bracelet during handwashing	.536	1.864
Washing hand for 20 seconds every time	.656	1.525
Washing hand after touching own or others' body parts	.702	1.424
Washing hand before preparing meals	.646	1.549
Washing hand after cleaning home & washing dishes	.783	1.278
Washing hand after touching garbage & doing laundry	.736	1.359
Washing hand after using the toilet	.845	1.184
Use of clothes to dry after washing	.645	1.551
Presence a wall mount/ individual ABHR	.720	1.389
Handwashing prevent disease	.819	1.221
<i>S.aureus</i>	.813	1.229

VIF: Variance Inflation Factors

Chapter Six

6. Discussion

Hand hygiene is the mechanism or process of removing debris, soil, and microbes (1). Despite this, little is known about hand hygiene status of housemaids working in dwellings. The findings from this study would provide basic information for decision-makers and baseline data for further studies. The current study aimed to assess hand hygiene status and its associated factors among housemaids working in communal living residences in Jimma city, Southwest Ethiopia.

In this study, the proportion of hand hygiene status among housemaids was 83.0% (95%CI: 77.6%, 87.9%). This result is higher than the results reported in Saudi Arabia (65.4%) (88) and Ethiopia (43,89) and lower than the result reported in China (96.1%) (90). The disparity could be because of differences in the study participants, socio-demographic characteristics, and study settings (43,88,89). As regards, housemaids perform different activities at home that involve the use of water and soap to wash their hands which enhances hand hygiene practices.

Therefore, improvement in HH is a multimodal strategy (2,18). It can be achieved through placing reminders/posters elsewhere in the working environment, being role models by the head of household/manager, and providing required facilities and others (91,92). Recent studies showed that there was an improvement in HHP through multidimensional intervention like availing HW facilities. For instance, an interventional study disclosed that there was a reduction in the frequency of inadequate HH (92). Another study revealed an increased availability of HH facilities from a baseline of 22% to 95.6% there was a change in HH practice from a baseline of 37% to >80% (93).

Regarding fingernail status, 172(77.1%) of the study participants trimmed their fingernails. This result is higher than the results reported in Alexandria, Egypt (10) and Debre Tabor, Northwest Ethiopia (40). This difference could be because differences in study participants who were food handlers in government institution and different status of occupation that means government employed in Egypt and Ethiopia respectively (10,40). Another reason for the difference could be residency and referent pressure in which study participants were engaged (94).

Proper HH involves trimming and cleaning fingernails because pathogens and dirt can accumulate under them (95). Artificial nails or long natural nails can hinder the effectiveness of HH (96). A study indicated that there was a high probability of poor HH when keeping long fingernails and nail polish (97). Evidence showed the growth of pathogenic MOs as well as the impacts of a fingernail on the effect of cleansing hands (98). Handwashing with soap and making fingernails short, and clean can enhance HH (95,96,99).

Accordingly, 168(75.3%) of the study participants were engaged in the very effective head of household to attach to the fact to perform optimal HH, and more than two-third, 154(69.1%) of study participants required a big effort to perform good HH. This result is supported by the result reported in Denmark (100).

The effective head of household attaches the fact to perform optimal HH by the way how and when employees keep their HH, fulfilling facilities needed for HH such as water and soap, and demonstrating that HH prevents different diseases. Being a picture and giving feedback on HH performance, accessing reminder posters (signboards) in the working environment, support from the concerned body especially the administrative body, and their encouragement needed to perform good HH (62,100).

In this study, the proportion of washing hands frequently among study participants was 90.6% (95%CI: 87%, 94.2%). This result is in line with results reported across the world: Arab Residents of Qatar (95.8%) (101); England (>85%) (102), and Ethiopia (77.3% & 98.6%) (103,104). However, the result is higher than the result reported in Saudi Arabia (68.7%) (88).

Furthermore, about 185(83%) of study participants responded as they wash their hands frequently with soap/other detergents. This result is lower than the results reported in (16,103). The discrepancy could be because of differences in the study participants (students and mothers/caregivers) and a lack of a good attitude toward the use of soaps (16,103). Frequent HW and the use of soap could be because of the working environment, settings of living, the status of the head of household, and accessibility to media about the importance of HW with soap and water and the impact of the Covid-19 pandemic on an individual take challenge of handwashing to keep their HH.

In this study, the proportion of HWP after critical time was 222(99.6%), 214(96%), 218(97.8%), 186(83.4%), and 218(97.8%) of the study participants responded that they wash their hands always while performing different activities including before and after meals, before preparing meals, after cleaning home and washing dishes, after touching garbage and doing laundry and after visiting toilet respectively. This result is nearly coherent with the result reported in Aman Sub-City, Southwest Ethiopia (103). However, the result is higher than the result reported in the Sagnarigu Municipality of Ghana (22). The difference could be because of differences in living settings and other sociodemographic factors. Hand hygiene at critical times is meant to cross-cut the transmission of pathogens (14,22,50).

In this study, the prevalence of one or more bacterial isolates that tested positive was 72.6% (95%CI: 66.4%, 78.5%). This result is nearly coherent with the results reported in different countries: Sari City, north of Iran (62.2%) (27), Tripoli, Libya (71.41%) (105), Alexandria, Egypt (60%) (10), Mauritius (91.0%) (106) and Ethiopia (49.6%,70.1%,55.7% & 83.9%) (36,39,107,108). On other hand, the result is higher than the results reported in Eastern India (37.9%) (28), Sudan (23.2%) (71), and Ethiopia (29.5%) (40).

Staphylococcus aureus 71(31.8%) was the predominant bacterial species isolated from hand swabs of housemaids followed by *Klebsiella spp.* 52(23.3%) and *E.coli* 48(21.5%) respectively. This result coincided with the results reported in previous studies (27,36,39,40,71,105,108,109).

Isolation of bacterial from hand swabs could be because of improper HHP such as not removing watch, ring, and bracelets during HW, not washing hands with soap and water, not vigorous rubbing of lathered hands for at least for 20sec during HW and lack of effective referent to attach to the fact to perform optimal HH and not washing hands frequently with soap. Another reason would be likely because of HW water quality. Similarly, the isolation of *S.aureus* could be because it is pathogenic bacteria that are normal flora of the skin and other body parts whereas the isolation of *Klebsiella spp.*, *E. coli*, *Proteus spp.*, and other isolate illustrates the concept of fecal contamination due to poor HHP.

Majority of *S.aureus*, 70(98.6%) were sensitive to Chloramphenicol followed by 51(71.8%) and 46(64.8%) to Vancomycin and Gentamycin respectively. This result is

lower than the result reported in the UoGRH, Northwest Ethiopia which was 76.9%, 100%, and 82.1% of *S.aureus* was sensitive to Chloramphenicol, Vancomycin, and Gentamycin (36). More than $\frac{2}{3}$, 36(75%), 38(79.2%), 42(87.5%), and 37(77.1%) of *E.coli* were sensitive to Tetracycline, Vancomycin, Ceftriaxone, Chloramphenicol, and Ceftazidime. Nearly, 33(100%) and 46(88.5%) of *Proteus spp.* and *Klebsiella spp.* were sensitive to Chloramphenicol. This result is higher than the results reported in UoG Cafeteria, UoGRH, and Debre Markos, Northwest Ethiopia (36,40,107). Despite three *Salmonella* and 12(80.0%) of *Shigella* being sensitive to Chloramphenicol, two *Salmonella* and 15(100%) of *Shigella* were resistant to Vancomycin respectively.

Even though a high rate of bacteria's isolate sensitivity to Chloramphenicol in the present study, a high frequency of drugs resistance to Tetracycline, Vancomycin, Gentamycin, and Ceftriaxone was observed for *S.aureus*, *E.coli*, *Salmonella*, *Shigella*, *Klebsiella spp.* and *Proteus spp.*

Nowadays, antimicrobial resistance is an emerging global challenge that results in the spread of infectious diseases that affect human populations (110,111). Those drug-resistant microbes can multiply, carry on and produce harm because of a complex set of causes: biological processes, human behaviors, and other social factors (112). The resistance to drugs could be because they developed mechanisms (evolutionary processes) or be natural phenomena that microbe tends to adapt it (112,113). Another reason could be the inappropriate use of drugs by the community, the use of antibiotics in animals, and the external environment (110,111,114). In addition, global connection of a large human population allows microbes into the environment to which all of humanity has access to it (110).

Classic communicable disease control methods especially HH remain the cornerstone (115). As regards, in order to control and prevent those antimicrobial drug-resistant microbes, washing hands regularly and improvement in HH are up to date (116). Moreover, proper HW minimizes the expansion of fecal-oral pathogenic microbes from hands and other sources of the environment (117). Therefore, practicing good HH can reduce outbreaks of pathogen transmission and food-borne illness and minimize the spread of antibiotic resistance MOs (22).

Occupational status of households, fingernail status, effort required to perform good HH, head of the household attach to the fact to perform optimal HH, and *S.aureus* were significantly associated factors of hand hygiene status.

About 97% of housemaids working within households having an occupation of merchant were less likely to keep their HH (AOR=.030, 95%CI: .020, .402). This result is supported by the studies conducted in Arba Minch Town (AOR=1.65, 95%CI: 1.03-7.98) and Kolladiba town (AOR=.09, 95%CI: 0.02-0.37) (94,118).

Compared to housemaids who didn't trim their fingernails, housemaids who trimmed their fingernails had 1.764 times higher odds of keeping HH (AOR=1.764, 95% CI: 2.190, 3.424). This result is supported by another study conducted in Małopolska, Poland (119). This would be likely due to those sharp fingernails or long may limit performance in HHP and enhance the microbial growth. Fingernails should be short while artificial fingernails should be rinsed thoroughly (60).

This study also suggested that housemaids engaged in very effective head of household to attach the fact to perform optimal HH had 1.865 times higher odds of keeping HH compared to their counterparts (AOR=1.865, 95% CI: 1.242, 1.963). This result coincided with the study conducted in Arba Minch Town, Ethiopia (94). In addition, the result is supported by a study conducted in India (26). This could be because the effective head involves the way how and when housemaids keep their HH, fulfilling facilities needed for HH such as water and soap, alcohol, and demonstrating that HH prevents different diseases. Effective HH needs support and encouragement from the concerned bodies especially the administrative (62).

Housemaids requiring a big effort to perform good HH were 3.790 times more likely to keep their HH than their counterparts (AOR=3.790, 95% CI: 1.732, 2.694). This result is in line with the result reported in Denmark (100). About 89.6% of housemaids who tested positive for isolation of *S.aureus* from their hand swabs were less likely to keep their HH than their counterparts (AOR=.104, 95%CI: .015, .776). This result is supported by the results reported in previous studies (23,106,109,120). This would be likely due to using stored water for HW, not washing hands with soap and water, not following proper steps of HW, not drying hands after HW, absence of protocol and poster for HH, lack of training/education for HH, and contamination of HW water.

Strength and limitations of the study

This study had lots of strengths. Hand hygiene status and its associated factors were adjusted and showed significance. Probability sampling techniques were applied for sampling to make the study more representative. In addition, the study revealed the hand hygiene status of housemaids by applying appropriate statistical analysis such as binary logistic regression. As result, the study contributed the real and general results that direct the focus of the responsible bodies to address the issues that need immediate intervention/measures before affecting the public or provide the basic information for decision-makers and baseline data for further studies.

Despite these strengths, there are some limitations. Only the relationship between the outcome variable and the predictor variables was provided by using a cross-sectional study. Along with this, the presence of fungi and parasites was not isolated as well as coliform, and total plate count has not been carried out due to constraints of time and resources. In addition to this, the study doesn't show the comparison between coliform bacteria before and after hand washing. Moreover, there is a scarcity of studies conducted directly on HHS and its associated factors among housemaids engaged in communal dwellings across the globe as well as in developing countries including Ethiopia which makes challenging to compare with the result of the present study.

Chapter Seven

7. Conclusions and Recommendations

7.1. Conclusions

Based on the study results obtained from data collected among 223 housemaids working in communal living residences in Jimma city, Southwest Ethiopia the following conclusions were made. Information from this study provides clues and insight into the HHS of housemaids. The result of the study showed that the majority of housemaids keep their HH and wash their hands frequently. However, the finding of the study revealed that there weren't microbes isolated from hand swabs sampled among 57(25.6%) of the study participants. In other words more than 74% of the study participants engaged in communal living residences in Jimma city, Southwest Ethiopia sampled for hand swabs were tested positive for bacterial contaminants that emphasized poor hand hygiene status.

The following bacterial isolates were identified *S.aureus*, *CNS*, *E.coli*, *Salmonella*, *Shigella*, *Klebsiella spp.*, and *Proteus spp.* Of those, the majority of bacterial isolates were sensitive to Chloramphenicol. The occupational status of the household of a housemaid, fingernail status, the effort required to perform good HH, the effectiveness of the head of household attach to the fact to perform optimal HH, and *S.aureus* were significantly associated factors of hand hygiene status. As regards, housemaids could be very important potential sources of disease-causing pathogens, especially bacteria which would result in potential risk to FBDs.

7.2. Recommendations

Based on the finding of the study the following recommendations were forwarded

For a household of housemaids as the responsible body; they should:

- Avail posters and protocol regarding good HH as well as HW at home
- Orient and address the fact that attaches housemaids how to keep good HH and follow their employees' hygiene practices and give feedback
- Follow up fingernail status of housemaids and the steps or procedures of HW that employees follow as well for themselves to be an advocator of hand hygiene
- Avail all necessary HW facilities such as soap, water, and alcohol to keep HH
- Be sure that housemaids was aware of hand hygiene practices before employment unless they should give orientation, education, and training before preceding any activities for newly employed employees at home
- Follow up hand hygiene status of their employees through continuous checkups of commensal microbes on the hands of their employees in the nearest health facility
- Concerned about their employee's hand hygiene

For housemaids as the responsible body to be effective housemaids; they should:

- Well-educated/trained about hand hygiene on pointing out its importance in disease prevention through different means like television, radio, etc
- Cut their fingernail short since it limits performance in hand hygiene
- Remove any watch, ring, or bracelet during hand washing
- Wash their hands with water and soap at all critical times and follow the correct steps of HW i.e. wet hands with clean running water, lathering the hands with soap, rinse or scrubbing the hands, and dry hands using clothes or a towel
- Follow all necessary steps to keep their hand hygiene wisely

Other Researchers in the future; should:

- Focus on fungal and parasitic contaminants in hands of housemaids and enumeration of bacterial isolates well as their association with HHS
- Reveal an association of fungal and parasitic contaminants of hands with HW water quality
- Economic (income) and other factors associated with HHS of housemaids at Jimma city level or country level as large.

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Annexes

Annex I: Participant's Consent form

Part I: Participants' Consent Information Sheet

Good morning/good afternoon Ms./madam! My name is _____. I am studying MSc in Environmental Health Science at Jimma University. I am working on data collection for the study entitled the hand hygiene status of housemaids working in communal living residences in Jimma city which were carried out by postgraduate or Masters in Science in Environmental Health student Tadele Shiwito Ango at Jimma University.

Title of Study: hand hygiene status of housemaids working in communal living residences in Jimma city, Southwest Ethiopia.

The aim and benefits of the study: this study aims to assess the hand hygiene status of housemaids working in communal living residences in Jimma city, Southwest Ethiopia. The finding from this study helps to find solutions to various contagious diseases, especially fecal-oral infections and provide the basic information for decision-makers, and also will provide baseline data for further studies.

Procedures, risks, and durations: You are one of the eligible participants for this interview. So you are kindly requested to answer every question and provide hand swabs samples. The data collection procedures might cause minor discomfort and will take 20-30 minutes.

Rights and Privacy: You do not have to take part in this research if you do not wish to do so or with a draw at any time after starting the interview, and refusing to participate will not affect you in any way. If you feel uncomfortable about sharing any of the information, you have the right to decide not to answer any questions. This will not result in you being treated differently during the study or at any other time. The information provided in this study is strictly confidential. This research has been reviewed and approved by Jimma University Ethical Review Committee. If you have any questions about your rights or any as a research participant, you may contact the principal investigator, Tadele Shiwito via Telephone at +251923337992. Therefore, do you agree to participate in this discussion? Yes_____No_____ If yes, continues interviewing but if no, say thank you and go to next.

Annex II: English Version of semi-structured Questionnaires

Date _____, Participant's code _____, address _____

Direction: Mark “√” in the box for the given answers to the questions

S/No	Questions	Responses
1.	Part I. Socio-demographic characteristics of the respondents (housemaids)	
1.1	Sex	Male <input type="checkbox"/>
		Female <input type="checkbox"/>
1.2	Age	_____ Year
1.3	Religion	Orthodox <input type="checkbox"/>
		Muslim <input type="checkbox"/>
		Protestant <input type="checkbox"/>
		Others <input type="checkbox"/>
1.4	Marital status	Single <input type="checkbox"/>
		Married <input type="checkbox"/>
		Widowed <input type="checkbox"/>
		Divorced <input type="checkbox"/>
1.5	Educational status	Can't read and write <input type="checkbox"/>
		Primary school <input type="checkbox"/>
		Secondary school & above <input type="checkbox"/>
1.6	Occupational status of household	Gov't employee <input type="checkbox"/>
		Merchant <input type="checkbox"/>
		Others professional workers <input type="checkbox"/>
1.7	What is the monthly housemaid income	_____ ETBs
Part II. Hand hygiene practice of housemaids		
2.1	Do you frequently keep your hand hygiene?	Yes <input type="checkbox"/>
		No <input type="checkbox"/>
2.2	Fingernail status	Trimmed <input type="checkbox"/>
		Not trimmed <input type="checkbox"/>
2.3	Is there a poster for hand hygiene?	Yes <input type="checkbox"/>
		No <input type="checkbox"/>

2.4	Is there a protocol level for hand hygiene?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
2.5	Did you receive education or training for HH in the last year?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
2.6	What effort is required for you to perform good HH?	A big effort	<input type="checkbox"/>
		Not effort	<input type="checkbox"/>
2.7	What importance does the head of your household attach to the fact that you perform optimal HH?	Very effective	<input type="checkbox"/>
		Not effective	<input type="checkbox"/>
2.8	Is HH automatic or do you need to remember or be reminded to do it?	Very importance	<input type="checkbox"/>
		Not importance	<input type="checkbox"/>
Part III. Handwashing practices			
3.1	Do you frequently wash your hand?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.2	If yes in Q3.1, how do you wash your hand?	Water with soap	<input type="checkbox"/>
		Cold water	<input type="checkbox"/>
		Hot water	<input type="checkbox"/>
3.3	If yes in Q3.2, do you wash your hands frequently with soap or other detergents at the appropriate time?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.4	Do you wash your hand including picking under your fingers dirt at any time?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.5	Do you follow five steps to wash your hands the right way at any time?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.6	Watch, ring, and bracelet should be removed at any time during handwashing	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.7	Do you wash your hand for 20 seconds every time?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.8	Do you wash your hand after touching your own or others' body parts?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.9	Do you wash your hand before and after a meal?	Always	<input type="checkbox"/>

		Sometimes	<input type="checkbox"/>
		Never	<input type="checkbox"/>
3.10	Do you wash your hand before preparing meals?	Always	<input type="checkbox"/>
		Sometimes	<input type="checkbox"/>
		Never	<input type="checkbox"/>
3.11	Do you wash your hand after cleaning home and washing dishes	Always	<input type="checkbox"/>
		Sometimes	<input type="checkbox"/>
		Never	<input type="checkbox"/>
3.12	Do you wash your hand after touching garbage and doing laundry	Always	<input type="checkbox"/>
		Sometimes	<input type="checkbox"/>
		Never	<input type="checkbox"/>
3.13	Do you wash your hand after using the toilet?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.14	Does the hand need to be dried after washing at any time?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.15	If yes in Q3.14, did you dry your hands using clothes after washing?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.16	Is there a handwashing sink?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.17	Is there a wall mount/ individual alcohol-based hand rubber?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.18	Is there available soap and water all the time?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.19	Does handwashing prevent disease?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
3.20	Handwashing can prevent CD especially diarrheal diseases and related diseases	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>

Annex III. English Version of semi-structured observation checklist

Water storage and treatment practice			
S/N	Questions	Response	
1.	What is the main source of water for domestic purposes (e.g. washing utensils) used by the household?	Piped water to tap in the yard	<input type="checkbox"/>
		Well	<input type="checkbox"/>
		Others (specify)	<input type="checkbox"/>
2.	How is water for washing utensils stored within the household?	Covered barrel	<input type="checkbox"/>
		Open barrel	<input type="checkbox"/>
		Others (specify)	<input type="checkbox"/>
3.	What is the condition of the stored water?	Visibly clean	<input type="checkbox"/>
		Visibly dirty	<input type="checkbox"/>
4.	What is used to wash the storage container?	Water only	<input type="checkbox"/>
		Water and soap	<input type="checkbox"/>
		Others specify	<input type="checkbox"/>
Handwashing			
5.	Is there a specific hand washing station/area?	Yes	<input type="checkbox"/>
		No	<input type="checkbox"/>
6.	If yes Q5; what is the location of the handwashing facility	Near the latrine	<input type="checkbox"/>
		Near the cooking place	<input type="checkbox"/>
		Elsewhere inside the house	<input type="checkbox"/>
		Elsewhere in the compound	<input type="checkbox"/>
7.	Are soap and water available in the handwashing station/area?	Only water	<input type="checkbox"/>
		Only soap	<input type="checkbox"/>
		Soap & Water available	<input type="checkbox"/>
		Soap & Water unavailable	<input type="checkbox"/>
8.	If the answer in Q7 is 3, then what type of soap is it?	Liquid soap	<input type="checkbox"/>
		Powdered soap	<input type="checkbox"/>
		Other specify	<input type="checkbox"/>

Thank you for your participation!!!

አባሪ IV: የተሳታፊዎች ስምምነት ቅጽ

ክፍል አንድ: የተሳታፊዎች ስምምነት መረጃ ሉህ

እንደምን አደሩ/ ደህና ከሰአት ወ/ሮ/እመቤት! ስሜ_____ይባላል። በጅማ ዩኒቨርሲቲ ኤም.ኤስ.ሲ በአካባቢ ጤና ሳይንስ እየተማርኩ ነው። በጅማ ከተማ በድህረ ምረቃ ወይም በአካባቢ ጤና ሳይንስ ማስተርስ ተማሪለሆነዉ የታደለ ሺዊቶ አንጎ በጅማ ዩኒቨርስቲ ያካሄዴ ያለዉን የእጅ ንፅህና አጠባበቅ በሚል ርዕስ የተዘጋጀውን ጥናት መረጃ የመሰባሰብ ስራ እየሰራሁ ነው።

የጥናት ርዕስ: በጅማ ከተማ፣ በደቡብ ምዕራብ ኢትዮጵያ ውስጥ በጋራ መኖሪያ ቤቶች ውስጥ የሚሰሩ የቤት ሰራተኞች የእጅ ንፅህና ሁኔታ።

የጥናቱ አላማ እና ጥቅማ ጥቅሞች: የዚህ ጥናት አላማ በደቡብ ምዕራብ ኢትዮጵያ በጅማ ከተማ በጋራ መኖሪያ ቤቶች ውስጥ የሚሰሩ የቤት ሰራተኞችን የእጅ ንፅህና ሁኔታ ለመገምገም ነው። የዚህ ጥናት ግኝት ለተለያዩ ተላላፊ በሽታዎች መፍትሄ ለማግኘት ይረዳል በተለይም የሰገራ የአፍ ውስጥ ኢንፌክሽን እና ለውሳኔ ሰጪዎች መሰረታዊ መረጃዎችን ያቀርባል እና ለቀጣይ ጥናቶች መሰረታዊ መረጃዎችን ያቀርባል።

ሂደቶች፣ ስጋቶች እና የቆይታ ጊዜ: እርስዎ ለዚህ ቃለ መጠይቅ ብቁ ከሆኑ ተሳታፊዎች አንዱ ነዎት። ስለዚህ እያንዳንዱን ጥያቄ እንዲመልሱ እና የእጅ መታጠቢያ ናሙናዎችን እንዲያቀርቡ በአክብሮት ይጠየቃሉ። የመረጃ አሰባሰብ ሂደቶች ትንሽ ምቹት ሊያስከትሉ ይችላሉ እና ከ20-30 ደቂቃዎችን ይወስዳል።

መብቶች እና ግላዊነት: ቃለ መጠይቁን ከጀመሩ በኋላ በማንኛውም ጊዜ ወይም በስእል መሰል ካልፈለጉ በዚህ ጥናት ውስጥ መሳተፍ የለብዎትም እና ለመሳተፍ ፈቃደኛ አለመሆን በምንም መልኩ አይነካዎትም። ማንኛውንም መረጃ ማጋራት ካልተመቻቸው ማንኛውንም ጥያቄ ላለመመለስ የመወሰን መብት አልዎት። ይህ በጥናቱ ወቅት ወይም በማንኛውም ጊዜ በተለየ መንገድ እንዲስተናገዱ አያደርግም። በዚህ ጥናት ውስጥ የቀረበው መረጃ በጥብቅ ሚስጥራዊ ነው። ይህ ጥናት በጅማ ዩኒቨርሲቲ የሥነ ምግባር ገምጋሚ ኮሚቴ ታይቶ ጸድቋል። ስለመብቶችዎ ወይም እንደ ጥናትና ምርምር ተሳታፊ የሆነ ማንኛውም አይነት ጥያቄ ካሎት ዋናውን መርማሪ ታደለ ሸዊቶን በስልክ በ +2519233337992 ማግኘት ይችላሉ። ስለዚህ በዚህ ውይይት ለመሳተፍ

ተስማምተሃል? አዎ _____ አይ _____ አዎ ከሆነ፣ ቃለ መጠይቁን ይቀጥሉ ግን አይደለም ከሆነ፣ አመሰግናለሁ ይበሉ እና ወደሚቀጥለው ይሂዱ።

አባሪ V: የአማረኛ ቃለ መጠይቆች

የቃለመጠይቅ ቀን _____ የተሰታፊ ከድ _____ የተሰታፊ አድራሻ _____

መመሪያ፣ ለጥያቄዎቹ መልሶች ለማግኘት በሰጥኑ ዉስጥ “√” ምልክት ያድርጉ

ተ.ቁ	ጥያቄዎች	ምላሾች	
ክፍል አንድ፤ ምላሽ ሰጪዎች (የቤት ሰራተኞች) ሰሲዮዲሞግራፊ ባህሪያት			
1.1	የተጠያቂዎ/ዉ ያታ	ወንድ	<input type="checkbox"/>
		ሴት	<input type="checkbox"/>
1.2	የተጠያቂዎ/ዉ ዕድሜ	_____ ዓመት	
1.3	የተጠያቂዎ/ዉ ሀይማኖት	አርቶዶክስ	<input type="checkbox"/>
		ሙስሊም	<input type="checkbox"/>
		ፕሮተስታንት	<input type="checkbox"/>
		ሌላ	<input type="checkbox"/>
1.4	የተጠያቂዎ/ዉ የጋብቻ ሁኔታ	ነጠላ (ያላገባ)	<input type="checkbox"/>
		ባለትዳር	<input type="checkbox"/>
		ባል የሞተባት	<input type="checkbox"/>
		የተፈታ	<input type="checkbox"/>
1.5	የተጠያቂዎ/ዉ የትምህርት ደረጃ	ማንበብና መጻፍ የማይችል	<input type="checkbox"/>
		1ኛ ደረጃ	<input type="checkbox"/>
		2ኛ ደረጃ (ሀይስኩል) እና ከዚያ በላይ	<input type="checkbox"/>
1.6	የቤተሰብ የሥራ ሁኔታ	መንግስት ሠራተኛ	<input type="checkbox"/>
		ነጋዴ	<input type="checkbox"/>
		ሌላ ባለሙያ	<input type="checkbox"/>
1.7	የተጠያቂዎ/ዉ ወርሃዊ ገቢ?	_____ ብር	

ክፍል ሁለት፤ ምላሽ ሰጪዎች (የቤት ሰራተኞች) የእጅ ንጽህና ልምዶች			
2.1	የእጅ ንጽህናን በተደጋጋሚ ትጠብቁዎታላች/ትጠብቃለህ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
2.2	የጥፍር ሁኔታ	የተከረከመ	<input type="checkbox"/>
		አልተከረከመም	<input type="checkbox"/>
2.3	የእጅ ንጽህና ፖስተሮች አሉ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
2.4	የእጅ ንጽህና የፕሮቶኮል ደረጃ አለ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
2.5	ባለፈው ዓመት የእጅ ንጽህናን በተመለከተ ትምህርት ወስደዋል?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
2.6	ጥሩ የእጅ ንጽህናን ለማከናወን ምን ጥረት ያስፈልግዎታል?	ትልቅ ጥረት	<input type="checkbox"/>
		ምንም ጥረት የለም	<input type="checkbox"/>
2.7	ጥሩ የእጅ ንጽህናን ስለማድረግ የቤተሰብዎ አስተዳዳሪ ምን አስፈላጊነት ያያይዙታል?	በጣም ዉጤታማ	<input type="checkbox"/>
		ዉጤታማ አይደለም	<input type="checkbox"/>
ክፍል ሶስት፤ ምላሽ ሰጪዎች (የቤት ሰራተኞች) የእጅ መታጠብ ልምዶች			
3.1	እጅዎን በተደጋጋሚ ይታጠባሉ	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.2	በጥያቄ ቁጥር 3.1 አዎ ከሆነ፤ እጅዎን እንዴት ይታጠቡ?	በዉሃ እና ሳሙና	<input type="checkbox"/>
		በቀዝቃዛ ዉሃ	<input type="checkbox"/>
		በሙቅ ዉሃ	<input type="checkbox"/>
3.3	በጥያቄ ቁጥር 3.2 አዎ ከሆነ፤ በተገቢው ጊዜ እጅዎን በሳሙና ወይም በሌሎች ሳሙናዎች በተደጋጋሚ ይታጠባሉ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.4	በማንኛውም ጊዜ ከጣት በታች ያለውን ቆሻሻ መምረጥ ጨምሮ እጅዎን ይታጠባሉ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>

3.5	በማንኛውም ጊዜ እጅዎን በትክክለኛው መንገድ ለመታጠብ አምስት ደረጃዎችን ይከተላሉ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.6	በማንኛውም ጊዜ የእጅ ሰዓት፡ቀለበት እና አምባር የእጅ መታጠቢያ ጊዜ መወገድ አለባቸው?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.7	ሁል ጊዜ እጅዎን ለ 20 ሰከንድ ያህል ይታጠቡታል?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.8	የራስዎን ወይም የሌላውን የሰውነት ክፍል ከነካ በኋላ እጅዎን ይታጠባሉ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.9	ከምግብ በፊትና በኋላ እጅዎን ይታጠባሉ?	ሁልጊዜ	<input type="checkbox"/>
		አንዳንዴ	<input type="checkbox"/>
		በፍጹም	<input type="checkbox"/>
3.10	ምግብ ከማዘጋጀትዎ በፊት እጅዎን ይታጠባሉ?	ሁልጊዜ	<input type="checkbox"/>
		አንዳንዴ	<input type="checkbox"/>
		በፍጹም	<input type="checkbox"/>
3.11	የቤት ባንድ ማጠቢያ ዕቃዎችን ካጸዱ በኋላ እጅዎን ይታጠቡታል ?	ሁልጊዜ	<input type="checkbox"/>
		አንዳንዴ	<input type="checkbox"/>
		በፍጹም	<input type="checkbox"/>
3.12	ቆሻሻ ከነኩና ልብስ ካጠቡ በኋላ እጅዎን ይታጠቡታል?	ሁልጊዜ	<input type="checkbox"/>
		አንዳንዴ	<input type="checkbox"/>
		በፍጹም	<input type="checkbox"/>
3.13	ሽንት ቤት ከተጠቀሙ በኋላ እጅዎን ይታጠባሉ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.14	በማንኛውም ጊዜ ከታጠብ በኋላ እጆች መድረቅ አለባቸው?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.15	በጥያቄ ቁጥር 3.14 አዎ ከሆነ፤ ከታጠቡ በኋላ እጅዎን በልብስ ወይም በጨርቅ አደርቀው ነበር?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>

3.16	የእጅ መታጠቢያ ስርዓት አለ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.17	ግድግዳ ላይ ወይም በግለሰብ አልኮሆል ላይ የተመሠረተ የእጅ ለስቲክ አለ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.18	ሁልጊዜ ሳሙና እና ዉሃ አለ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.19	እጅ መታጠብ በሽታን ይከላከላል?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
3.20	በጥያቄ ቁጥር 3.19 አዎ ከሆነ፤ እጅ መታጠብ ተላላፊ በሽታዎችን በተለይ ተቅማጥ እና ተያያዥ በሽታዎችን ይከላከላል?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>

አባሪ VI: የተዋቀረ የምልክታ ማረጋገጫ ዝርዝር

የውሃ ማጠራቀሚያ እና ህክምና ልምምድ			
ተ.ቁ	ጥያቄዎች	ምላሾች	
1.	ለቤተሰቡ ጥቅም ላይ የሚውለው ዋናው የውሃ ምንጭ ለቤት ውስጥ አገልግሎት (ለምሳሌ ለማጠባበቅ ዕቃዎች) ምንድን ነው?	በግቢው ውስጥ የቧንቧ ውሃ	<input type="checkbox"/>
		ቢሪ (ጉድጓድ ውሃ)	<input type="checkbox"/>
		ሌሎች (ይጥቀሱ)	<input type="checkbox"/>
2.	የውሃ ማጠባበቅ ዕቃዎች በቤት ውስጥ እንዴት ይከማቻሉ?	የተሸፈነ በርሜል	<input type="checkbox"/>
		ክፍት በርሜል	<input type="checkbox"/>
		ሌሎች (ይጥቀሱ)	<input type="checkbox"/>
3.	የተከማቸው ውሃ ሁኔታ ምን ይመስላል?	የሚታይ ንጹህ	<input type="checkbox"/>
		የሚታይ ቆሻሻ	<input type="checkbox"/>
4.	የማከማቻ ማጠራቀሚያውን ለማጠብ ምን ጥቅም ላይ ይውላል?	ውሃ ብቻ	<input type="checkbox"/>
		ውሃ እና ሳሙና	<input type="checkbox"/>
		ሌሎች ይግለጹ	<input type="checkbox"/>

እጅ መታጠብ			
5.	የተለየ የእጅ መታጠብ አለ? ጣቢያ/አካባቢ?	አዎ	<input type="checkbox"/>
		አይ	<input type="checkbox"/>
6.	አዎ ከሆነ በጥያቄ ቁጥር 5; በታው ምንድን ነው	ከመጻፍ ሴት አጠገብ	<input type="checkbox"/>
		በማብሰያው ቦታ አጠገብ	<input type="checkbox"/>
		ቤት ውስጥ ሌላ ቦታ	<input type="checkbox"/>
		በግቢው ውስጥ ሌላ ቦታ	<input type="checkbox"/>
7.	ሳሙና እና ውሃ በእጅ ማጠቢያ ጣቢያ/አካባቢ አለ?	ውሃ ብቻ	<input type="checkbox"/>
		ሳሙና ብቻ	<input type="checkbox"/>
		ሳሙና እና ውሃ ይገኛሉ	<input type="checkbox"/>
		ሳሙና እና ውሃ አይገኙም	<input type="checkbox"/>
8.	በጥያቄ ቁጥር 7 መልሱ 3ከሆነ፤ ምን ዓይነት ሳሙና ነው?	ፈሳሽ ሳሙና	<input type="checkbox"/>
		የዱቄት ሳሙና	<input type="checkbox"/>
		ሌላ ይግለጹ	<input type="checkbox"/>

አመሰግናለሁ!

Annex VII: Guca Fedhii/Eeyyama Hirmaannaa Kan Gaafatamaa Irraa Fudhatamu

Obboo/Addee! Akkam bultan/akkam ooltan? Maqaan koo_____. Ani barataa digirii lamaffaa kanan tahee; yuunivarsiitii Jimmaa irraa Eegumsa Fayyaa Naannoo barachaa jira. Ani yeroo ammaa qorannoo haala qabatamaa qulqullina harkaa namoota tajaajila manaa mana waliin jireenyaa magaalaa Jimmaa keessa hojjetan irratti gaggeessaan jira.

Mata duree Qo'annoo: haala qulqullina harkaa hojjetoota manaa mana waliin jireenyaa hawaasaa keessatti hojjetan magaalaa Jimmaatti

Kaayyoo fi Faayidaa qorannichaa: Faayidaan qorannoo kanaa sakatta'insa qulqullina harkaa hojjetoota tajaajila mana keessaa; mana waliin jireenyaa magaalaa Jimmaa keessatti kennan madaaluu ta'a. Argannoon qorannoo kana irraa argame dhukkuboota daddarboo adda addaa, keessattuu kan akka garaa kaasaaf furmaata barbaaduu fi murteessitootni odeeffannoo bu'uuraa kennuuf akka faayadamanii fi akkasumas qorannoo dabalataaf ragaa bu'uuraa ni kenna. Kanaafuu, ani akka qorataa dirreetti manneen dhimma kanaaf filataman irraa namoota tajaajila mana keessaa; mana waliin jireenyaa keessatti kennan magaalaa Jimmaa irraa odeeffannoo guurrachuun barbaada.

Hojimaata, Bala fi Yeroo itti fudhatu: Isin namoota ani af-gaaffii/qorannoo koof barbaadu keessaa isaan tokko. Kanaafuu gaaffii hunda deebisuun saamuda harkaa akka dhiheessitan kabajaan isin gaafanna. Hojimaanni odeeffannoo walitti qabuu kun daqiiqaa 20-30 fudhata dabalataanis miira dhukkubii xiqqoo fiduu danda'a.

Mirgaa fi Waan dhuunfaa: Yoo itti hirmaachuuf fedhii hin qabdan ta'es dhiisuu dandeessu yookaan jalqabdaniis yoo isinitti toluu didee addaan kutuu dandeessu. Hirmaachuu dhiisuun keessan miidhaa isinirraan gahu tokkoyyuu hin qabu. Odeeffannoo utuu kennaa jirtanii bakka isinitti hin tolle yoo geessan gaafficha irratti yaada kennuu dhiisuun mirga keessan. Kana gochuu keessaniif namoota biraarra adda baafamtanii akka isin ilaalamtan kan godhu tokkoollee hin jiru. Odeeffannoo isin qorannoo kanarratti laattan iccitiidhaan kan qabamu ta'uusaa isin hubachiisa. Qorannoon kun Koree Naamusaa Univarsiitii Jimmaatiin ilaalamee kan mirkanaa'e ta'uusaan isiniif ibsa. Mirga keessan ilaalchisee gaaffii kamillee qorannoo kanarratti hirmaachuu keessaniif yoo qabaattan gaggeessaa qorannoo kanaa, Taaddelee Shiwitoo karaa bilbila kanaa +251923337992

quunnamuu dandeessu. Knaaf, qorannoo kanarratti hirmaachuuf hayyamamoodhaa? Eyyee__Lakkii__Eyyee, yoo ta'e gaafannoo kee itti fufi, Lakkii yoo ta'e galateeffadhuu dhiisi gara itti aanutti darbi

Annex VIII: Guca Gaafannoo

Guyyaa gaafannoo _____, koodii hirmaataa _____, Teessoo _____

Qajeelfama: Mallattoo “√” saanduqa deebii itti kennamu keessatti.

T/L	Gaafannoo	Deebii	
	Haalota jijjiiramaa hawaasa deebii laattotaa		
1.1	Saala	Dhiira	<input type="checkbox"/>
		Dhalaa	<input type="checkbox"/>
1.2	Umurii	_____ waggaa	
1.3	Amantaa	Ortodoksii	<input type="checkbox"/>
		Musiliima	<input type="checkbox"/>
		Piroteestantii	<input type="checkbox"/>
		Kanbiro	<input type="checkbox"/>
1.4	Haala fuudhaa fi heerumaa	Qeenxee	<input type="checkbox"/>
		Kan fuudhe/heerumte	<input type="checkbox"/>
		Kan irraa du'e/duute	<input type="checkbox"/>
		Kan wal hiikan	<input type="checkbox"/>
1.5	Sadarkaa barnootaa	Dubbisuu fi barreessuu hin danda,u	<input type="checkbox"/>
		Sadarkaa jalqabaa	<input type="checkbox"/>
		Sadarkaa lammaffaa	<input type="checkbox"/>
1.6	Haala hojii maatii	Hojjetaa mootummaa	<input type="checkbox"/>
		Daldaalaa	<input type="checkbox"/>
		Hojjetaa kan biraa	<input type="checkbox"/>
1.7	Galiin ji'aa maatii ammam?	_____ETBs	
	Shaakala dhiqannaa harkaa hojjetoota mana keessaaf		
2.1	Yeroo maara qulqullummaa harka keessanii ni eeggattuu?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
2.2	Haala qulqullina qeensaa	Ni qoratu	<input type="checkbox"/>

		Hin qoratan	<input type="checkbox"/>
2.3	Poosteriin dhiqannaa harkaa jiraa?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
2.4	Sadarkaan pirootokoolii dhiqannaa harkaa jiraa?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
2.5	Waggaa darbe barumsa/leenjii dhiqannaa harkaa isiniif kennamee?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
2.6	Qulqullina harkaa eeggachuuf carraqqii maaltu barbaachisa?	Carraqqii guddaa	<input type="checkbox"/>
		Carraqqii homaa	<input type="checkbox"/>
2.7	Warri manaa sadrkaa qulqullinaa raawwii hojii kee bu'a qabeessaa?	Baayyee bu'a qabeessaa	<input type="checkbox"/>
		Bu'a qabeessa mit	<input type="checkbox"/>
2.8	Haala dhiqannaa harkaa ni yaadatta immoo si yaadachiisu?	Raawwii baayyee gaarii	<input type="checkbox"/>
		Barbaachisaa miti	<input type="checkbox"/>
Shaakala dhiqannaa harkaa hojjetoota mana keessaa			
3.1	Harka kee guyya guyyaan ni dhiqataa? Yoo deebiin keessan Lakkii ta'e gar gaaffii 3.4 tti darbaa	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.2	Harka keessan attamitti dhiqattu? Deebiin keessan bishaan qofa yoo ta'e gara gaaffii 3.4 itti darbaa	Bishaanii fi saamunaan	<input type="checkbox"/>
		Bishaan qorra	<input type="checkbox"/>
		Bishaan ho'aatiin	<input type="checkbox"/>
3.3	Harka keessan yeroo yeroon saamunaa fi kanneen biroon sirriitti ni dhiqattuu?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.4	Harka keessanii fi xurii qeensa keessan jalaa ni dhiqattuu?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.5	Sadarkaa harka dhiqannaa shanan sirriitti ni hordoftuu?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.6	Yeroo dhiqannaa harkaa sa'atii,qubeelaa fi bitawoo ni baaftuu?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.7	20' keessatti harka keessan ni dhiqattuu?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.8	Nafa keessan ykn kan nama biraa erga harkaan tuqxanii booda harka ni dhiqattuu?	Eyyee	<input type="checkbox"/>

		Lakkii	<input type="checkbox"/>
3.9	Nyaata duraa fi booda harka keessan ni dhiqattuu?	Yeroo hunda	<input type="checkbox"/>
		Yeroo tokko tokko	<input type="checkbox"/>
		Gonkumaa	<input type="checkbox"/>
3.10	Nyaata utuu hin qopheessin dura harka ni dhiqattuu?	Yeroo hunda	<input type="checkbox"/>
		Yeroo tokko tokko	<input type="checkbox"/>
		Gonkumaa	<input type="checkbox"/>
3.11	Erga manaa fi meshaalee qulqulleessitanii booda harka ni dhiqattuu?	Yeroo hunda	<input type="checkbox"/>
		Yeroo tokko tokko	<input type="checkbox"/>
		Gonkumaa	<input type="checkbox"/>
3.12	Erga kosii harkaan qabdani fi michaa michitanii booda harka ni dhiqattuu?	Yeroo hunda	<input type="checkbox"/>
		Yeroo tokko tokko	<input type="checkbox"/>
		Gonkumaa	<input type="checkbox"/>
3.13	Mana fincaanii booda harka ni dhiqattuu?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.14	Harka erga dhiqattanii qoorsuun ni barbaachisaa? Deebiin keessaan Lakkii yoo ta'e gara gaaffii 3.16 itti darbaa	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.15	Erga dhiqattanii booda harka keessan huccuun ni qoorsituu?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.16	Dhimimsituun bakka dhiqanna harkaa jiraa?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.17	Alkooliin axawwannaa harkaa ni jiraa?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.18	Yeroo hunda saamunaa fi bishaan ni jiraa?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.19	Dhiqannaan harkaa dhukkuboota ni ittisaa? Deebiin keessan lakki yoo jettaan gaaffii itti aanu hin gaafatiinaa.	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>
3.20	Dhiqannaan harkaa dh/d keessumaa garaa kaasaa fi kan isa fakkaatan ittisaa?	Eyyee	<input type="checkbox"/>
		Lakkii	<input type="checkbox"/>

Annex IX: Cheekliistii daawwannaa caasawaa

Haala kuufachuu fi yaala bishaanii			
T/L	Gaafannoo	Deebii	
1 .	Mddi bishaanii keessan ittiin meeshalee qulqulleessitanii fi fayyadamtan eessarraati?	Boonbaa	<input type="checkbox"/>
		Bishaan boollaa	<input type="checkbox"/>
		Kan biroo (ibsaa)	<input type="checkbox"/>
2 .	Bishaan meeshalee mana keessaa ittiin qulqulleessitanii haala attamiin kuufattu?	Qodaa qadaaddii qabutti	<input type="checkbox"/>
		Kan qadaaa hin qabnetti	<input type="checkbox"/>
		Kan biroo (ibsaa)	<input type="checkbox"/>
3 .	Haalli bishaan kuufattanii maal fakkaata?	Yeroo ilaalamu qulqulluu fakkaata	<input type="checkbox"/>
		Yeroo ilaalamubooruu fakkaata	<input type="checkbox"/>
4 .	Kuustuu bishaanii maaliin qulqulleessitu?	Bishaan qofaan	<input type="checkbox"/>
		Bishaanii fi saamunaan	<input type="checkbox"/>
		Kan biroo (ibsaa)	<input type="checkbox"/>
Dhiqannaa harkaa			
5 .	Bakki dhiqannaa hrkaa adda bahee jiraa?	E y y e e	<input type="checkbox"/>
		L a k k i i	<input type="checkbox"/>
6 .	Eyyee Q5; bakki dhiqannaa hrkaa kun Eessatti argama?	Mana fincaanii biratti	<input type="checkbox"/>
		Bakka nyaannibilchaatu biratti	<input type="checkbox"/>
		Mana keessaa bakkaa tokkotti	<input type="checkbox"/>
		Mooraa mana jireenyaa keessaa bakka tokkotti	<input type="checkbox"/>
7 .	Bakka dhiqannaa harkaa kanatti saamunaa fi bishaan wal faana ni argamaa?	Bishaan qofa	<input type="checkbox"/>
		Saamunaa qofa	<input type="checkbox"/>
		Lamaanuu wal faana	<input type="checkbox"/>
		Lamaanuu hin argaman	<input type="checkbox"/>
8 .	Saamunaa gosa attamiituu argama?	Saamunaa dhangala'aa	<input type="checkbox"/>
		Saamunaa daakuu	<input type="checkbox"/>
		Kan biroo (ibsaa)	<input type="checkbox"/>

Hirmaannaa keessaniif galatoomaa!