Evaluation of Water Quality, Sanitation and Hygiene Conditions in Post- Emergency Situation. The Case of Asayita International Refugee Camp, in Afar Regional State of Ethiopia.

Nejat Salah Hassen

A Thesis Document Submitted to the Department of Water Resources Engineering,

School Of Civil Engineering and Architecture

Office of Graduate Studies

Adama Science and Technology University

October, 2024

Adama, Ethiopia

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Advisor(s): Keneni Alemu(Dr.)

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Declaration

I hereby declare that this Master Thesis entitled **"Evaluation of Water Quality, Sanitation and Hygiene Conditions in Post-Emergency Situation. The Case of Asayita International Refugee Camp, in Afar Regional State of Ethiopia"** is my original work. That is, it has not been submitted for the award of any academic degree, diploma or certificate in any other university. All sources of materials that are used for this thesis have been duly acknowledged through citation

Nejat Salah Hassen	___________________	______________
Name of student	Signature	Date

RECOMMENDATION OF ADVISORS

I, the advisor of this thesis, hereby certify that I read the revised version of the thesis entitled **“Evaluation of Water Quality, Sanitation and Hygiene Conditions in Post-Emergency Situation. The Case of Asayita International Refugee Camp, in Afar Regional State of Ethiopia” prepared** under my guidance by Nejat Salah submitted in partial fulfillment of the requirements for the degree of Mater’s of Science in Water Resources Engineering (specializes in Water Supply and Environmental Engineering). Therefore, I recommend the submission of the revised version of the thesis to the department following the applicable procedures.

Keneni Alemu (PhD)	___________________	___________
Major Advisor	Signature	Date

APPROVAL OF PAGE OF M.SC. THESIS

I/we the advisor of the thesis entitled — "**Evaluation of Water Quality, Sanitation and Hygiene Conditions in Post-Emergency Situation. The Case of Asayita International Refugee Camp, in Afar Regional State of Ethiopia"** developed by Nejat Salah Hassen hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis.

Keneni Alemu (PhD)	____________________	______________
Major Advisor	Signature	Date

We, the undersigned, members of the Board of Examiners of the thesis by Abebe Tamiru have read and evaluated the thesis entitled — "**Evaluation of Water Quality, Sanitation and Hygiene Conditions in Post-Emergency Situation. The Case of Asayita International Refugee Camp, in Afar Regional State of Ethiopia"** and examined the candidate during open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Water Resource (specializes in Water Supply and Environmental Engineering).

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LIST OF ABBREVIATIONS

ADL	Activities of Daily Living
ART	Antiretroviral therapy
BWT	Bulk Water Treatment
HWT	House hold Water Treatment
IDP’s	Internally displaced people
MHM	Menstrual Hygiene Management
NGO’S	Non-Governmental Organizations
NTU	Nephelometric Turbidity Unit
UNHCR	United Nations High Commission for Refugees
UNICEF	United Nations International Children’s Fund
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

ABSTRACT

Asayita emergency Camp is located in a lowland area facing harsh climate conditions, inadequate water supply and sanitation facilities, regional conflicts are the most critical challenges. a significant gap exists in understanding the comprehensive water quality and sanitation conditions within these post-emergency camps need to be adequately assessed. Hence the objective of this study was to assess the level of access to water, water quality, hygiene, and sanitation services within the refugee camp, and analyze the socio-economic challenges in meeting the WASH objectives. To achieve this objective, three hundred eighty-eight (388) households were surveyed within the camp through a questionnaires. This was accompanied with water sample analysis, field observation and secondary data. A total of five water samples were collected from different locations namely, from water borehole,water supply reservoir, public water tabs points and household water storage. descriptive statistics were used to describe data, while Pearson correlation and regression was used to determine the influences of the variables. The result shows that, the sanitation coverage of the a total of 63.8% as good, whereas the sanitation coverage in the household 36.2% was in poor condition. The survey data shows about 93.8% of respondents of refugees has access to drinking water supply.The analysis of water sample also shows that most of the parameters evaluated complies with WHO drinking water standards. . Results showed there were significant relationship in water collection and storage and drinking water where a significance level ($p < 0.01$) suggesting that better water collection and storage practices were associated with higher standards of drinking water hygiene.On the other hand between the stored water storage and Hygiene practice shows significant level ($p < 0.05$) indicates that improvements in water collection and storage are likely to enhance overall hygiene practices. This paper documents the gaps in provision in the key interrelated sectors of water supply quality and sanitation in Asayita camp. Where standards are not currently being met, or where there was insufficient information, the consequences were analyzed and documented so as to support planning of effective solutions that protect refugees' well-being. This study can be beneficial as insight for further assessing the situation to enhance the well-being of refugees in the world in general and particularly in Afar region.

Keywords: Refugee, WASH, Drinking Water Quality, Sanitation-Hygiene, Asayita.

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

When refugees run away as a result of civil wars or natural calamities, their future in refugee camps becomes uncertain. Their onset's state can vary intensely, contingent on their prior conditions when they left home and the distance travelled. Their primary exposure to the camp's life is confusing and incomprehensible and at the same time, they are exposed to many problems related to basic amenities and also frequently to the absence of sanitation facilities. This stems from the fact that many common diseases in the refugees are caused by inadequate sanitary facilities such as excrete disposal, solid waste management, domestic wastewater management, vectors and pest control and a poor understanding of hygiene practices (Baghri, 1998). The affected individual requires fundamental and immediate needs during context. Basic services such as shelter, education, health services, food, water and sanitation could be interrupted when a natural or man-made disaster disturbs people (ADF, 2005). All of these calamities, disasters or emergencies significantly distinct human beings, their families, their societies, and in which these events take place. They all request quick and operative response to physical necessities in which water and sanitation fall and longer-term recovery and reconstruction (Carter, 2015). It is well known that WASH is the core of human existence, and the conditions of its accessibility have direct effect on human progress, health, nutrition, livelihoods, wealth, the environment, culture, and peace(ACF-international, 2016) as such the provision of water services require direct consideration from the onset of a refugee emergency to ensure that enough water of good quality is supplied and as we all know access to water is inseparable from sanitation (presence of latrines, treatment and disposal of waste water). Water is vital to life, health, and dignity, making it a fundamental human right. it is usually not adequately available in quantity and quality, resulting in health hazard. Thus Water supply, sanitation and hygiene promotion are critical determinants for survival in humanitarian situations. refugees living in densely populated settlements and be susceptible to faecal-orally transmitted illness (such as cholera) and vector-borne illness, largely as a result of inadequate WASH services.

1.2 Statement of the problem

As Asayita emergency Camp is located in a lowland area facing harsh climate conditions, inadequate water supply, and sanitation facilities, and also it located far and isolated area from the city; thus the interplay between water supply quality, sanitation, and the socioeconomic conditions of post-emergency camp residents remains under explored. In the absence of adequate support from Regional Water Bureaus and Woreda offices, many water supply systems are being operated and maintained directly by humanitarian agencies. However, an important difference is that, unlike neighbouring countries, Ethiopia is also establishing rural utilities to operate and maintain emergency WASH services. The utility model has a particular focus on large piped water supply systems and is being led by UNICEF and UNHCR, with the backing and support of other agencies: the Regional Water Bureaus, Itang Woreda Water Office, ARRA, the International Rescue Committee and other development partners (UNHCR, 2017a). Despite the immediate implementation of such infrastructure, significant gap exists in understanding the comprehensive water quality and sanitation conditions within these post-emergency camps need to be adequately assessed. This study aims to address the following key issues.

There is water quality concern and as well as the sanitation infrastructure condition, practice and cultural inside the Asayita refugee camp is the worst condition. and there is a lack of comprehensive evaluations regarding the functionality, accessibility, and hygiene practices associated with sanitation facilities in these settings. Inadequate waste management and sanitation practices may contribute to the deterioration of overall camp health and well-being..

Thus, a poor water supply and sanitation conditions has a Socioeconomic impact on the refugees. it may hinder displaced populations recovery and rehabilitation efforts, affecting their ability to rebuild their lives and communities. There is a limited scientific study directed to evaluate the effective application of these standards in the refugee's camps of Asayita. the data shown are yearly UNHCR Asayita Refuge Camp report. and joint standardized expanded nutrition survey final report (aysaita and berhale) refugee camps afar region,2017) Consequently, it has an importance to assess the socio-economic challenges of WASH provision in the Asayita refugee camp according to WHO standards.

1.3 General Objective of the Study

The overall objective of the research is to assess the level of access to water, hygiene, and sanitation services within the refugee camp, and analyze the socio-economic challenges in meeting the WASH objectives.

Specific objectives of the study

- To evaluate the physicochemical and bacteriological parameters of the water supply in the Assayita refugee camp
- To examine the status of sanitation and hygiene in the Assayita refugee camp.
- To analyze the socioeconomic challenges of the refugee camp's water supply and sanitation facilities

1.4 Research Question

- What are the physical, chemical, and microbiological characteristics of the water supply in the Asayita refugee camp?
- What is the current sanitation and hygiene status in the Asayita refugee camp?
- How do the refugee camp's water supply and sanitation facilities impact socio-economic challenges?

1.5 Significant of the Study

This study has an impact and gives insight how to enhanced camp water supply and sanitation services and livability by effective assessment results contribute to the improvement of water supply and sanitation infrastructure within the camp. The findings from water quality and sanitation assessments inform to community, governmental bodies and scientific communities in further planning and implementation of humanitarian assistance programs in Asayita refugee camp. This includes the allocation of water resources for immediate relief efforts as well as the design of long-term strategies for sustainable water supply and sanitation infrastructure development in post-emergency settings, disease prevention and control mitigation of long-term health impacts can be identified waterborne diseases and sanitation-related illnesses early on can help to reduce before the spread within the camp. In summary, assessing water quality and sanitation in post-emergency camps is significant for the protection of public health, disease prevention, humanitarian assistance planning, water supply and sanitation infrastructure enhancement,and policy advocacy. These efforts collectively contribute to the well-being and resilience of displaced refugees in post emergency.

1.6 Scope of the Study

Inaccessibility adequate water supply and sanitation are the common problems in all over the world particularly in developing countries like Ethiopia. However, it is difficult to cover all the problems at once in all the areas. Hence, this study will mainly focus on water quality and , water supply storage, sanitation services and practices, personal hygiene practices at Asayita refugee camp, Afar Region, in Ethiopia. Moreover, sanitation is also a broad term. Including solid waste management and liquid waste management. However, this study has focused on more evaluating of water quality and sanitation condition in the study area.

The data for this study has been collected at household levels for the quantitative survey and water sample collected from the sources (borehole, reservoirs and public taps) for Chlorine test and at household water storage for bacteriological analysis, evaluating level of turbidity, PH value of water supply in the study area. The results from the study can not be generalized for the entire country or the regional state given the fact that the study will conduct in Asayita refugee camp Afar Regional state in Ethiopia. However, the result has been used as a reference for further water quality investigation in other refugee camp in the Afar region and beyond.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Water Supply and It's Implication

As stated by WHO & UNICEF (2013), the Joint Monitoring Programme for Water Supply and Sanitation defined safe drinking water as "water with microbial, chemical and physical characteristics that meets WHO guidelines or national standards on drinking water quality."The guidelines include an assessment of the health risks presented by the various microbial, chemical, radiological and physical constituents that may be present in drinking water. According to WHO/UNICEF (2012), Lack of drinking water is a vast problem and a major cause of death and disease in the world.Access to protected and feasible drinking water facilities, improved frameworks of sanitation adequate supply of water are key difficulties around the world (Gleeson et al. 2012; Ritchie and Roser 2021). Universally, 1.1 billion individuals need admittance to water offices, 2.2 billion individuals don't have fundamental sterilization offices and 4 billion peoples faces water shortage somewhere around one month of the year (Mekonnen and Hoekstra 2016; WWF 2020). The endlessly lower center less developed countries are the most exposed victims of inadequate supply of drinking water and developed disinfection and cleanliness offices (WHO and UNICEF 2017).

The absence of safe drinking water, sanitation and hygiene (WASH) facilities is considered as one of the main obstructions to work on the improving the quality and of peoples lives (WHO 2015). Internationally, over 1.2 million passing yearly are brought about by perilous water, 0.77 million passing result from risky disinfection and 0.7 million passing are brought about by luck of admittance to hand washing facilities (Ritchie and Roser 2021). Indeed, even WASH facilities are insufficient in regions with refugee peoples as a result of congestion and restricted water supply. Around the world, by far most of refugees and displaced populations live in developing countries. For instance, more than half of refugees live in seven nations (Turkey, Lebanon, Jordan, Pakistan, Iran, Ethiopia and Kenya) (World Bank 2016).

These WASH-related issues might set off the episode of constant illnesses among the Rohingya people group from here on out in the event that sufficient measures are not taken to work on the nature of water. As it has been accounted for in numerous past examinations that the Rohingya displaced people have been experiencing water-related issues (Mahmud et al. 2019; Jeffries et al. 2021; Mazhar et al. 2021), The water-related problems in the Rohingya camps have also been reported in a recent study (Mahmud et al. 2019; Jeffries et al. 2021). These studies reported that 74% (n = 4,644) and 34.7% (n = 2,179) of drinking water samples collected from stored household sources contained fecal coliform and Escherichia coli, respectively. Tubewells water was also found contaminated with these two pathogens. For example, 28% (n = 893) and 10.5% (n = 333) of drinking water samples collected from the tubewells in 21 Rohingya camps contained fecal coliform and E. coli, respectively (Mahmud et al. 2019). Mahmud et al. (2019) also reported that over 80% of point-of-use (household) water samples of nearly one-third of their studied camps (i.e., camps 3, 4, 6, 9, 31 and 34) contained fecal coliforms.

On another study of WASH Facility Assessment in Institutions: Refugee Camps in Gambella, Ethiopia - Final Report (August 2023); Gambella has the large number of refugees which has the a total of 383,795 South Sudanese refugees (74,390 households). It covers around 42% of the complete number of refugee in Ethiopia, at present living in 7 camps: Nguenyyiel, Tierkidi, Kule,Jewi, Pinyudo 1, Pinyudo 2 and Okugo, and 1 refugee settlement: Akula. The region has The refugee operation has transitioned from emergency to post emergency and protracted situation. UNHCR focuses on sustainable solutions through capacity building, infrastructure and refugee-led sanitation and hygiene promotion activities. In alignment with the Global Compact on Refugee (GCR) and Sustainable Development Goals (SDG), UNHCR promotes universal and equitable access to WASH services for refugees and host communities.

Therefore, improved WASH is a high-priority public health intervention in low-middle income countries from the standpoint of environmental health (Sahoo et al., 2022). Hence, Medlicott & Schmoll, (2022) conclude that access to WASH facilities for persons with reduced mobility is vital. Hutton & Chase, (2016) enumerated that the scope of WASH facilities includes water supply, treatment, safe handling, and storage of water.

Likewise, the sanitation facilities include management of toilets, onsite excreta, fecal sludge, Sewerage or combined sewer drainage systems, and Hygiene (Hand,washing practice). Likewise, Bartram et al., (2014) stated that the status of WASH has also been associated with morbidities and mortalities, particularly for children under five years of age. Moreover, Olanipekun, (2014) revealed that providing better access to improved water and sanitation confers cost offsets, and timed savings to convenience, and well-being and had a significant impact on people's health and livelihood (Sridhar et al., 2020). Thus, it is subsequently critical to comprehend the degree and greatness of WASH-related issues in these camps, which will give fundamental direction to the associations working in the camps and will add to the writing for additional academic research.

2.2 Sources of Drinking Water

As stated by UNICEF, (2006), sources of drinking water can be Improved and Unimproved. Population using improved sources of drinking water are those with any of the following types of water supply: piped water (into dwelling yard or plot), public tap or standpipe, tube well or borehole, protected well, protected spring and rainwater collection while unimproved sources are unprotected dug well, unprotected spring, surface water (river, dam, lake, pond, stream, canal, irrigation channel), vendor-provided water (cart with small tank or drum, tanker truck), bottled water, tanker truck-provided water.

2.3 Water Sources in Ethiopia

Ethiopia receives an average annual rainfall of around 1,200 mm. Its distribution is highly uneven, with 80 to 90 percent of surface water potential occurring in basins in the western and southwestern parts of the country. The central and eastern parts of the country have less than 20 percent of the total surface water. Some areas of the southeastern part of the country receive less than 200 mm of rainfall per year. The rainfall, when it does arrive, can often overwhelm local drainages, resulting in flooding that affects both livelihood and lives, limited infrastructure for water storage and watersheds protection further exacerbate these problems (Nuru, 2012).

2.4 Water Service Provision Options

According to UN-HABITAT (2006), Water service provision options are standpipes, yard, and house connections. In household connection, water service provision, the water pipe is connected within house plumbing to one or more taps (e.g. in the kitchen and bathroom) or tap placed in the yard or plot outside the house. Public tap or standpipe is a public water point from which people can collect water. Many low-income households that are unable to afford a household connection are relying on public water points.

2.5 Water Accessibility Indicators

According to UN-HABITAT, (2003), Access to safe water is the distribution of the population with reasonable access to a sufficient amount of safe water. Safe water includes treated surface water and untreated but uncontaminated water such as from springs sanitary wells and boreholes. In urban areas, the water source may be a public fountain or a standpipe not more than 200 meters away from households. A sufficient amount of water is that which is needed to satisfy metabolic, hygienic and domestic requirements usually about, 20 liters of safe water per person per day. This minimum quantity, however, varies depending on whether it's an urban location or rural and whether warm or hot climate. Accessibility must be seen within the situation of the ease with which people can get the services of a facility and function. Accessibility increases with decreasing constraint both physical and social. Water accessibility is balance between the demand for and the supply of consumer services over a geographic space and narrowing or bridging the gap between geographic spaces is all significance of transport.

As stated by WHO (2004), to measure water accessibility there are basic indicators. These indicators show four main levels of water accessibility that includes optimal access, intermediate access, basic access and no access. These are indicative of the level of water availability, which is a measure of the quantity available for use. Basically, they reflect the extent to which accessibility challenges such as time, distance and affordability are formidable or otherwise. WHO standards in relation to time stated that more than 30 minutes no access, 5 minutes - 30 minutes basic access and within 5 minutes intermediate access. According to Public Health Protection, (2000), affordability of water has a considerable pressure on the use of water and selection of water sources. Households with the lowest levels of access to safe water supply frequently pay more for their water than households connected to a piped water system. The high cost of water may force households to use small quantities of water and alternative sources of poorer quality that represent a greater risk too. According to a report by Alaci and Alehegn (2009), private access to tap water is the cheapest for the consumer. Dependence on a shared standpipe increases prices almost four times.

Private water delivery through tanker service (or sachet or bottled water) is the most expensive and tanker water delivery costs many times the tap water price. Thus, the consumers paying the most for water are the ones with the lowest income. According to WHO, (2004), time and distance traveled to fetch water are also key indicators of water accessibility. For most communities of Africa, long-distance travel to fetch water is common. Hence, they spend much time and money. If households travel more than 200 meters far away from the house in urban areas, there is no access for drinking water. Distance travel to fetch water is also one of the indicators of water accessibility.

2.6 Needs of Water Supply and Sanitation refugee Camps

According to ADF (2005), the need for quality water and sanitation is widely recognized as an important element of social and economic growth. The provision of water and sanitation services addresses some of the most critical needs of people. Safe water and good sanitation are essential to the protection of community health by preventing the transmission of infectious diseases and by supporting and preservation of a sanitary home environment. At the same time, they contribute greatly to the enhancement of human dignity and economic opportunity by relieving the burden of women and children, from the drudgery of water carrying and providing more time for them to engage in other activities. Report from ADF (2005), revealed that accessibility of improved and quality water supply and sanitation infrastructures is widely recognized as a vital part of human rights, social and economic progress.

Sanitation systems such as toilet facilities serve one of the most fundamental human functions. Despite this, inadequate facilities, access, and poor knowledge of urinary or bowel activities have wide implications for physical, emotional, and psychological health (Inah et al., 2020). Moreover, inadequate sanitation is associated with diarrheal diseases, which exacerbate malnutrition and continue to be a leading cause of child deaths worldwide, as well as parasitic infections like soil-transmitted helminthes and a variety of other neglected tropical diseases (UNICEF/WHO., 2018). Nyanza et al., (2018) mentioned that the affordability of latrines at the household level is the key determinant factor associated with having latrines. Consequently, the household with higher socio-economic status has greater odds of a latrine as compared with lower socio-economic status. Improved sanitation is defined as a system that promotes proper human and animal waste disposal to improve and protect public and environmental health (Owolabi, 2017).

Although, Inah et al., (2017) explained that poor environmental sanitation has been strongly linked to high rates of malaria transmission, morbidity, and mortality, particularly in low and middle-income countries. Muslim et al., (2021) itemized that individual household latrines, latrine cleaning, hand washing after defecation, latrine distance from the water source, and the number of latrines was found to be significantly associated with the availability of improved sanitation facilities. Since, according to UNICEF/WHO, (2018) report sharing sanitation facilities is also an important factor to consider, given the negative effects on dignity, privacy, and personal safety, particularly for women and girls.

According to Collick (2008), the high demand for water due to large family size leads to household water insecurity (less water available than is needed for drinking, cooking, and sanitation) in rural areas, especially for those households for which the demand is higher due to large family size and because of these conditions, it is difficult to think about personal hygiene and sanitation especially for the rural communities. Despite the scarcity of water, many give priority for drinking and cooking purposes. Rural communities use unprotected springs and hand-dug wells commonly for cooking and drinking purposes.

As reported by Sobsey, (2002), in addition to these rivers are also used for drinking purposes. This results in not only sickness and death but also economic crises. Therefore, safe drinking water is an essential component of primary health care and is vital for poverty alleviation. Introducing improved water supply sources at the household level enhance personal and community knowledge as well as awareness of the importance of other factors, such as hygiene and sanitation.

2.7 Hygiene Practices in Refugee Camps

Hygiene is the practice of breaking the chain of infection to maintain or promote good health through cleaning and disinfecting themselves and their surroundings other hygiene precautions include keeping a safe distance from infected people and wearing masks (IASDMP & IFH, 2021). Moreover, Odonkor et al., (2019) stated that hygiene is a longstanding concept in medicine, as well as in personal and professional care practices. The presence of soap and water with a hand washing facility on premises has been identified as a priority indicator for global hygiene monitoring under the SDGs (WHO & UNICEF, 2017). Hence, hygiene and sanitation have a direct impact on development and economic benefits (Odonkor et al., 2019).

Good hygiene practices include human excreta contained in the toilet, available hand washing, and bathing facilities with soap and other detergents used by the household members (WHO, 2017). Patel et al., (2019) mentioned that WASH includes water mainly covers the details of the water source to check the availability and whether the available water source is improved or unimproved and sanitation covers the details of the type of sanitation facility, facility of toilets, and whether available sanitation is improved. Moreover, hygiene covers the detailsof hand washing facilities and cleaning procedures.

2.8 Availability of Sanitation Facilities in Refugee Camps

Access to improved sanitation facilities is critical to the health and well-being of individuals and communities (Akpakli et al., 2018). However, according to WHO & UNICEF, (2013), a report revealed that globally over 2.5 billion people are living without access to safe sanitation facilities which lead to about 200 million tons of untreated human excreta annually. Likewise, About 2.6 billion people, more than 40% of the world population, do not use toilet facilities but defecate in open or unsanitary places (UNICEF, 2006). Correspondingly, 27% and 19% of the population proportion have access to improved sanitation facilities in urban and rural Ethiopia respectively (WHO & UNICEF, 2013). Peprah et al., (2015) explained that the accessibility to water and Sanitation involves both physical and economic dimensions Drangert, (2008) conclude that a sanitation system should consider the users of all parts of the system, along with the collection, transport, safe disposal and treatment of human excreta. Poor hygiene and sanitation cause economic losses associated with the direct costs of treating sanitation-related illnesses and lost income through reduced or lost productivity (Odonkor, 2019).

2.9 Environmental Sanitation and Communicable Diseases in Refugee Camps

Access to qualitatively good drinking water, adequate sanitation facilities and services and satisfactory hygiene practices significantly contribute to reducing the rate of morbidity and mortality among populations. Numerous studies indicate a direct link between environmental health risks and limited access to clean water, sanitation facilities and services on the one hand,

and poor hygiene practices on the other. This leads to negative health impacts, environmental degradation and related economic impacts on the affected population. There are a number of diseases related to excreta and wastewater which commonly affect people in the developing countries and which can be subdivided into communicable and no communicable diseases (Franceys, 1992).

All of the transmission routes of excreta-related diseases particularly the faeco-oral routes can be blocked by changes in domestic hygiene practice. Improved technologies, such as water and excreta disposal facilities, can also contribute to preventing transmission (Cairncross, 2000). Environmental health interventions for the prevention of diarrheal disease typically include steps to improve the proper disposal of human faeces (sanitation), improving water quality, water quantity and access, and promoting hand washing and other hygiene practices (Clasen et al, 2010). The primary water pollution problem in the world is lack of clean, disease-free drinking water. The occurrence of disease may quickly and surprisingly occur (Keller, 2009). Experience has shown that microbial hazards continue to be the primary concern in both developing and developed countries (WHO, 2004).

The great majority of evident water-related health problems are the result of microbial (bacteriological, viral, protozoan or other biological) contamination (WHO, 2008). Some improved water systems may start with water that is micro-biologically safe. However, once the water has flowed past cracked wellheads and casings, through poorly maintained pipes laid adjacent to sewer pipes, and has been subject to low and sometimes negative water pressure and other flaws, it is not surprising that the water is often contaminated by the time it reaches the point of collection. As the water is carried home and stored, it can be further compromised by hands and utensils that are dipped into the bucket and by other intrusions. The end result is that the water may be heavily contaminated at the moment it is consumed, even if it started out as potable (Choffnes and Rapporteurs, 2009).

The provision of potable drinking water for rural and urban areas is necessary to prevent the dangers of water diseases and public health prevention. Potable water has to comply with certain physical, chemical and microbiological standards which should not contain microorganisms and chemicals at harmful levels (Sartaj, A. 2013, Arunabh, M, Vasishta B, 2008).

2.10 Sanitation and Hygiene in Ethiopia: Status and Targets

Provision of an adequate supply of safe water and basic sanitation is a primary health activity an integral part of the national health systems, This reflects the key role of improved Sanitation &Hygiene practice in preventing tropical diseases and mortality from diarrhea (Mara, 2010). According to MoH (2010), 60 percent of the total population of Ethiopia has access to sanitation facilities (56 percent in rural areas), although only 20 percent of households actually utilize latrines Estimates published internationally are, however, much lower. In lowland areas of the country the situation is particularly challenging, as refugees and IDPs put increased pressures on limited human, material and financial resources. In March 2017, there were approximately 830,000 registered refugees and asylum seekers from more than five countries in Ethiopia (see Table 1). In addition, more than 680,000 IDPs have been recorded, driven from their homes by recurrent drought, food insecurity and conflict (DFID, 2017).The WASH response to refugees and IDPs falls outside the remit of the OWNP, which means that there is much less engagement from key line ministries, such as the Ministry of Health and the Ministry of Water, Irrigation and Electricity (MoWIE). Activities are coordinated mainly by the Administration for Returnee and Refugee Affairs (ARRA) and by UN agencies. According to information supplied by the Ethiopian Government, the 2012 report of the World Health Organization (WHO)/United Nations Children's Fund (UNICEF) Joint Monitoring Programme (JMP) estimated rural sanitation access, including basic and shared facilities, at 47 percent in 2010, up from 29 percent in 2008 (WHO/UNICEF, 2010; 2012).

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Description of the study area

The study was conducted in Asayita Refugee camp which is located in Assayita wereda. It is far from the regional town, Semera by 70km and from capital city of Ethiopia, Addis Ababa 640km. The temperature of the wereda ranges from 19ºC to 45ºC and this rainfall is pattern bimodal; the highest amount of rainfall is 560mm which occurs from June to September (karma) and the lowest amount of rainfall is 255.3mm which occurs between January and March (sugum).The soil of the wereda from loamy to clay (WPARDO, 2004). Although mean annual rainfall is less than 200mm, the alluvial floodplains of the Awash River and its distributaries as it enters the delta provide limited but very valuable grazing lands(WoPARD, 2004).

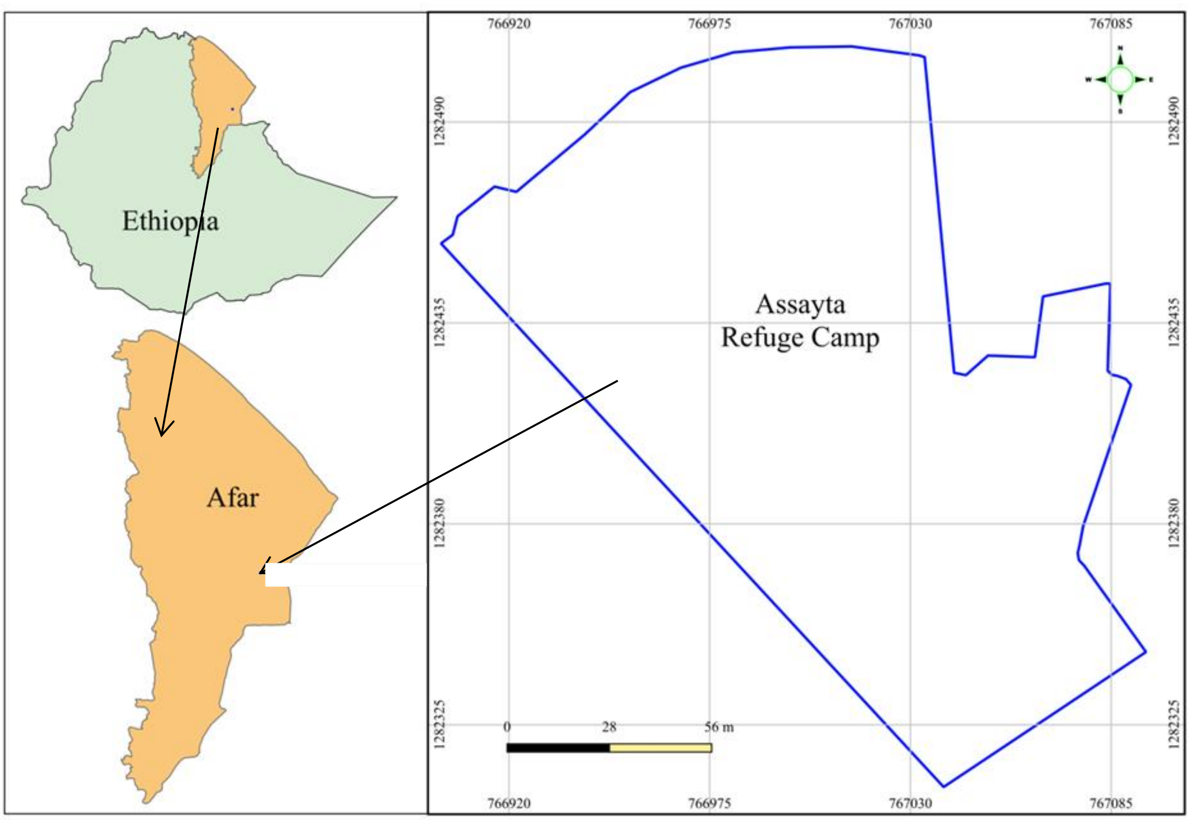

Figure 3. 1 Location map of the study area.

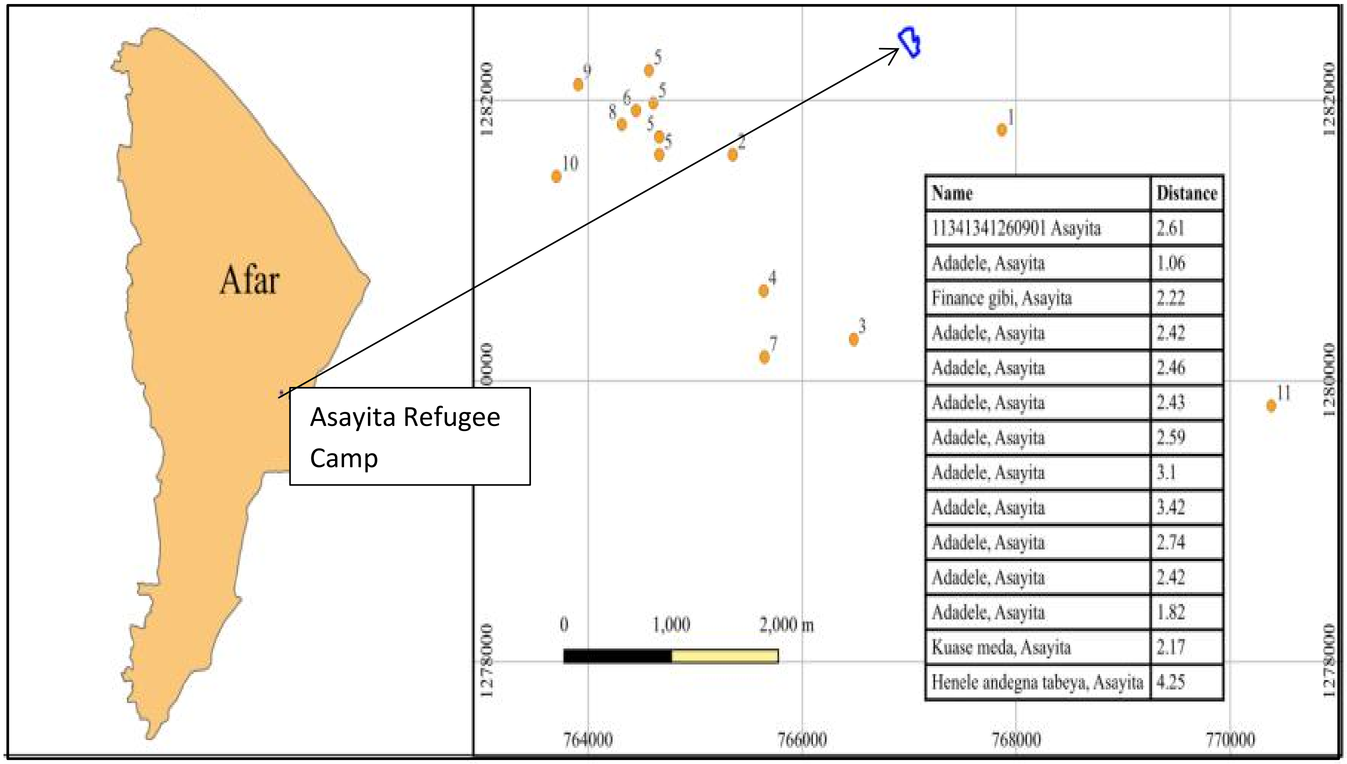

Figure 3. 2 Water resource boreholes of Asayita wereda

3.2 Feature of the Asayita Refugee Camp

The Asayita refugee camp is a temporary settlement built to accommodate refugees who are mainly ethnic Afar Eritrean refugees seeking international protection. The refugee camp was established in 2007 and officially opened in 2009 G.C (UNHCR Asayita camp profile,2020). The study population were cross over every age group and genders especially those in charge of supplying services and every adult person in various households in the refugee camp. The fact of taking into consideration every gender and age group given a better representation of the WASH situation of the site. As the report of UNHCR filed unit Camp-demographic 2023 shows the total number peoples is living in refugee are 29430 and the number includes all age groups and gender.

According to UNHCR Asayita Camp profile,March 2018 G.C, On behalf of the Government of Ethiopia, Administration for Refugee and Returnee Affairs (ARRA) ARRA implements: they responsible for Management and security; Primary health care, nutrition, food and CRIs distribution; Protection and Community services; Shelter management; logistics; environment protection; and Primary education.There are international organizations who are working with

ARRA. Such as Africa Humanitarian Action (AHA), Organization for Migration (IOM), Development Expert Center (DEC), Organization for Sustainable Development (OSD)– implements: Environmental protection and rehabilitation and energy, EECMY, DCA (OP) – Energy, Livelihoods, GOAL (OP).

3.3 Source of Water Supply for Refugee Camp

The Asayita refugee Camp has two boreholes for source of water supply. The first borehole was constructed in 2006 G.C. It's located at N 0764643 and E 1282157 and 3.2km far from the reservoirs .it gives 13.6m^3/s discharge of water and has 100m depth but the pressure pump is placed at 60m depth. As per MIC WASH expert's reports that only first borehole currently on service. Drilling and casting of the new borehole has been completed in 2023 G.C. it located at 400m far from the first borehole and it has 92m depth yet currently it has not merged to main line. but After Construction of connection to main line and distribution line of the water points, MIC experts reports that, it will give a discharge of 20m^3 volume of water per second .As per report of MIC, the MIC NGO has been applying WASH project intensively and managing throughout the day and night time for past 8 years. The researcher also observed that there are two water reservoirs with capacity of storage 50m^3 and 63m^3 respectively, those are connected to three main lines 150m, 300m,10m in length respectively. The distribution line covers around 11000m in length. Thus, main lines had connected to 28 water points of public tabs according to WHO guideline with in 200m walking distance . As MIC WASH experts explained to the researcher shown, they have been working in this refugee camp focusing on particularly in WASH project aims to deliver a standard requirement of water supply systems at least 20 litter per day, it is the minimum amount of water UNHCR, the UN Refugee Agency UNHCR WASH PROGRAMME GUIDANCE Manual.Additionally, the water supply has connected to refugee facilities centers such as health center, schools, communal food kitchen center, HCB block factory near to the area.

3.4 Research Method and Design

A mixed research paradigm comprises of quantitative and experimental research method was used in this study. This paradigm was chosen because it was intended to measure the extent of water quality, sanitation and hygiene problems and optimize actions to be prioritized in the prevention of environmental sanitation and hygiene related diseases. Quantitative research has been used to assess environmental sanitation and hygiene practices of refugees who live in the Camp An in-depth interview with key informants from Asayita refugee camp will conduct to make the finding more comprehensive. Experimental paradigm has been used to evaluate the salinity, microbial test and the Alkalinity P values, for turbidity in drinking water. To achieve the objective of this research the appropriate method was a research design. Basically, there are three types of research approaches qualitative, quantitative, and mixed approach (Cress well 2003). The choices of these methods were depended on several factors, including researchers' interest and experience, the nature of the study, etc. This study was requiring information on the water quality, sanitation and hygiene its associated effect on the cost emergency refugee camp. Thus the approach that suits to provide a comprehensive analysis of the research problem includes both quantitative and qualitative data. In this mixed design, both forms of the data collected and integrated in the interpretation of the overall results. This design has enabled to reduce biases inherent in each approach. Specifically, this study mainly focused on survey design based on self-report questionnaires as well as limited face-to-face interviews to generate additional data.

3.5 Sample Size Determination Procedure

For the quantitative part sample size was determined using single population proportion The **Yamane sample calculation** was formula with the level of confidence for sample size computation the estimation of a 95% confidence level, a margin of error of 5%, an estimated population proportion of 50%, and an adjustment of 10% for the non-response rate was considered.

$n=N/[1+N(e)^2]$ ……………………………………………………………..…… (3.1)

Where: n is minimum sample size, N is total population size, e is desired margin of error (expressed as a decimal, e.g. 0.05 for 5% margin of error).

Where n is the sample size; N is the number of peoples in the total households size; e is the level of precision thus. $n=29430/\ [1+29430(0.05\times0.05)] =395$ The proportion of sample size for each household will determine based on the amount of total population. The data shows from IMC international NGO statics the total population has divided in to five zones according to the distribution of household in refugee.

Table 3.1 Distribution of interview Questionnaires in Household of refugee peoples

	Name zone	Number of household	Number of refugee	Ratio zone/Total	Sample distribution(Ratio*n)
Asayita Refugee Camp	Zone 1	305	6735	0.2288	90
	Zone 2	324	7160	0.2433	96
	Zone 3	341	7536	0.2560	101
	Zone 4	194	4287	0.1456	58
	Zone 5	168	3712	0.1261	50
Total		**1332**	**=29430**		**395**

Due to absence of the 7 refugee peoples /expected participate for the interview, 388 refugees had been successfully managed get interviewed.

3.6 **Study Variables**

One of the variables which the study has used were dependent variables such as water quality measurement of selected parameters (salinity, pH-value, microbial test and turbidity test) and environmental sanitation- hygiene practices. And the other kind of variables were independent variables studying the specific demographic and economic data: income, educational status, sex, religion, distance of drinking water from the household; water handling practices: main source of water used for drinking purpose, type container used for water collection and storage, water utensils' handling condition, utilization of latrine, sanitation of the latrine, hand washing with soap, and latrine utilization.

3.7 In-Depth Interview

The qualitatively in-depth interview has been conducted with municipality officials, water, and sanitation technical persons and community representatives using interview guidelines. The key informants for this study were six peoples based on information richness of the study participants on water supply, quality, sanitation and hygiene-related problems of the Aysaita refugee camp. The study participants were include 4 technical personnel's from water supply and sanitation office one participant from administration and sanitation facility office and one elder from camp.

3.8 Data Collection

Primary and secondary data were used in this study, with the first collected through a structured questionnaire, key informant interviews and field observation and representative has been implemented, due to the large number of refugees. However, the sampling has been conducted in such a way that there even distributions of interviewees in refugee the Camp zones. The questionnaire was translated from English to local Afar language because refugees are all Afar ethnic group. The first section contains questions relevant to the demographically characteristics of the respondents; the second one covers questions related to water collection and storage; the third section has enclosed questions about hygiene of water, its quality and its treatment and the final section was made of questions related to hygiene and sanitation. A structured interviews was conducted with key stakeholders and also WASH experts mainly involved in the management of the refugee camp.

3.9 Water Sample Collection

As a cluster sampling method has chosen for studying this research collecting sample representing the boreholes which described currently only borehole is on currently giving service thus, one sample has taken from the old borehole ; the second water sample was representing two reservoirs which have connected to one mainline thus one sample has taken from the reservoir: the third water sample was from public tabs indicating existing 28 water points have the same water supply distribution pipe size which are connected to three sub mainline with similar water yield and they have similar method of construction, and the forth and fivth water sample were representing samples from number of 1332 households water storage will be categorized by two significant groups which is fresh fetched water with 24 hours and a water storage from 24 hours or more days. From those two random samples will take from each category. As the total number five water samples will to examine water quality. The Chlorine test and bacteriological water quality analyses has been conducted Oromia water and Energy laboratories. And also level of turbidity, pH value were evaluated.

The data for this study was analysis for quantitative studying water samples which has been collected from the sources (borehole, reservoirs and public taps) for Chlorine test, turbidity and pH value test and at household water storage for bacteriological analysis was conducted. Samples for analysis has been run in accordance with the standard method of American Public Health Association APHA (1998). Water samples were collected from each selected source of water from the towns. For the bacteriological analysis, water samples has been preserved in sterile glass bottles and transported to the laboratory in ice box containing ice freezer packs.

For the bacteriological analysis, water samples will collect in sterile glass bottles and transport to the laboratory in ice box containing ice freezer packs. The filtration apparatus were sterilized before use and re-sterilized between samples using methanol when analyzing water samples (OXFAM, 2004). With regard to the physicochemical analysis, 200ml glass water samples will collect, label and transport to the laboratory in the icebox, except Microbial and salinity test the other parameters has been analyzed at the site.

Temperature and pH were analyzed using portable digital pH meter. The pH meter has been calibrated before analysis using pH 4.0 and pH 7.0 and with distilled water from one sample to the other following the Jenway pH meter operation manual (Jenway,2003). Total dissolved solids (TDS) and electrical conductivity will analyze using portable digital conductivity meter (CC-401, Poland). Turbidity will analyze using portable microprocessor turbidity meter (H193703 ELE international, Hungary).

Thus one sample from each water source borehole B , a sample from water reservoir R and a sample from public taps P running a water test for Turbidity, Chlorine test and pH value; to assess the hygiene of drinking water, storage and condition of sanitation at household level, two sample were taken from different households HHS1 and HHS2 conducting for water storage for bacteriological analysis.

The water tests had examined at both field level and laboratory test. The instrument used mainly for laboratory test was Wagtech water testing Kit. the location of each sample has also record below.

Table 3.1 Water Quality Parameter and Location of Samples taken in Asayita refugee camp

NO.	Samples Taken	Type of Water Test Examined	Location of the Sample Taken	Elevation(m)
1	sample R(from the reservoir)	Salinity, Turbidity, pH TEST	N 07º67'39.5" E 12º83'40"	375.60
2	Sample P(from Public Tap water point)	Salinity, Turbidity, pH TEST	N 07º66'99.2" E 12º82'74.3"	376.30
3	Sample B(from Borehole water well)	Salinity, Turbidity, pH TEST	N 07º64.4'39" E 12º82'21.9"	365.70
4	Sample HHS1(from household 1)	Microbial Test	N 07º67'05.4" E 12º82'69.0"	371.90
5	Sample HHS2(from household 2)	Microbial Test	N 07º67'05.4" E 12º82'70.6"	372.30

3.10 Data analysis

Replies from the questionnaire has filled on Microsoft excel spread sheet then analyze using **SPSS 2000**. Both descriptive and inferential statistics will utilize to examine the data obtained from the questionnaire. The descriptive statistics used included percentage distribution, chart, tables, inferential statistics included chi square and paired sample t-test, hypothesis, charts, tables and figures will use to enhance explanation. The Cross tabulation technique will use to quantitatively display a breakdown of the data in order to analyses the relationship between multiple variables. It helped to understand the correlation between different variables. It will also show how correlations change from one variable grouping to another. This analysis were critical in finding underlying relationships within the survey results while the Chi square results showed whether or not the results of cross tabulation are statically significant or revealed the difference between expected frequencies and the observed frequencies in one or more categories.

3.11 Materials

The instruments that were used for examining the water quality test of selected parameters are describe below.

3.11.1 Wagtech Instrument Kit

It is he most advanced portable water quality Kit. with complete digital instrumentation, the delivers laboratory levels of accuracy and is inclusive of digital arsenic testing. The kit is ideally suited to longer-term surveillance and professional monitoring in rural locations. The multiple types of water quality tests can perform by this kit such as Microbiological tests for thermo tolerant or faecal coliforms and total coliforms, Chemical tests for ammonia, arsenic, free chlorine, total chlorine, fluoride, nitrate and nitrite,Physical tests for turbidity, pH, conductivity, TDS and temperature. There are a dual incubators with independent temperature control for simultaneous determination of up to 40 samples for thermotolerant or faecal coliforms and total coliforms. A combination of instruments and reagents allows users to analyse a wide range of physical and chemical parameters to ensure drinking water quality and assess risks against short-term and chronic health effects.

3.11.2 The Taylor K-1005 DPD

This water test kit test quickly and accurately measures for or Free & Total Chlorine, Bromine, pH, Acid & Base Demand, Total Alkalinity, Calcium Hardness, and Cyanuric Acid (CYA).it is simply collect your water sample using the comparator and add the appropriate testing reagents to determine the results. . It's used reagent tablets and shake the kit in order to mix an then indicate the reaction of a of amount chlorine by matching the level of color formed which ranging been b /n 0.1-1mg/l.

3.11.3 Turbidity Measuring Tube

Turbidity Measuring Tube which rise from 0 to 400 NTU. Measuring turbidity in Tube, it was only used 0 to 5 NTU Turbidity Tube. The yellow cross at the bottom sample can seen brightly with clear sight naked eye. Which show there no any cloudiness in the water or turbidity is near to zero. As per The WHO guidelines recommend that turbidity in drinking water should not exceed 5 NTU (Nephelometric Turbidity Units) to ensure aesthetic quality and minimize health risk. as they indicate better water clarity and lower levels of pathogens and contaminants.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1 Characteristics of the Respondents

The general information about the respondent's sex, age, educational level are presented for better understanding of their background. A total of 388 peoples from Asayita refugee camp who submitted the structured questionnaire were profiled. Despite there being the number of 395 sample questionnaire given, 4 male and 3 female individuals of household did not return the questionnaire for an unidentified cause. As a result, the study that follows is based on 388 respondents.

Table 4.1 Characteristics of respondents with regards to gender, age, educational level in the sample Asayita refugee camp

Characteristics	Category	Respondents Household	
		Number	%
Gender	Male	157	42.2
	Female	231	57.8
	Total	388	100
Age of respondents	15-24	145	34.4
	25-34	162	36.2
	35-44	81	20.8
	>44	48	12.5
	Total	388	100
Level of education	Grade 9	82	22
	Grade 10	103	27.7
	Grade 0-8	203	52.3
	Total	388	100
Family size	1 - 5 peoples	236	59.7
	6 - 10 peoples	132	33.4
	< 10 peoples	20	5.1
	Total	388	100

In the Table 4.1 shows sex, age and educational level of the respondents. Coming to the sex ratio of the respondents, collecting the background information about refugee's of the level of education which was highly contribute to the forming awareness about the importance and health benefits of proper sanitation. Thus, as the data shows there were 42.2% male refugee student and 57.8% female refugee students were attending classes inside the refugee camp. This indicate d that the difference between the two sexes was 15.6%. Age wise the respondents ranged the majority of the refugees who are also students were between the ages 25-34 years, forming 36.2 % of the total respondents . With regard to grade level, the distribution of refugees who are studying was at grade; The highest: 9-12_secondary school and Lowest: 0-8 primary school where by grade 47.6 %, and 52.3% people respectively the above survey data shows the most of young refugees are enrolled primary and secondary school following up their education inside the refugee Camp.

4.2 Water Collection in the Asayita Refugee Camp

Table 4.2 Water use for drinking, cooking, and personal hygiene

Water Use(Liters)	Number of Respondents	Percentage
10	167	42.3
15	209	52.9
25	12	3.0

Table 4.3 Table Time taken to collect water

Time Taken (Minutes)	Number of Respondents	Percentage
3-5	300	75.9
6-10	76	19.2
Don't know	12	3.0

Table 4.4 Household water collectors

Collector Persons	Number of Respondents	Percentage
Adult Female	198	50.1
Adult Male	190	48.1

Table 4.5 Sources of water

Source of Water	Number of Respondents	Percentage
Pipe Water	240	63.6
Water Seller/Kiosks	40	10.6
Protected Spring	23	6.1
Tanker	51	13.52
Hand Pumps/bore	23	6.1
Surface water	-	-

From the above the analysis of the survey data based on the questionnaires from the respondents about collection of water. Most of respondents has answered they used approximately 10 to 15 litters of water daily which approximately cover up 93.8% refugee has access to clean water supply, and it only take them average of 3-5 minutes of walking to collect water and this result indicated the water source not far more than 200m from their household. Based on gender role the responsible person who collects the water are 50.1% adult female the rest 48.9% are adult males. The data which was collected from survey which shown under Table 4.1.D contradict the finding of field assessment which the most of resource of water supply was pipe water from public tabs.

Table 4.6 Drinking Water Hygiene

Method	Number of Respondents	Percentage
Cupped dip	255	64.6
Hose/Tap	122	28.4
Poured	14	3.5
Other	7	1.8

From the survey data shown on table 4.1.2, it indicated that most of the respondent uses Cupped dip for removing water from the container. The it has a significant impact of the hygiene of drinking water if the cupped plastic was dirty or not properly cleaned.

4.3 Sanitation and Hygiene Practices

The majority 83.5% of the households had soap in their houses on the day of the interview which indicates the availability of higher percentage of soap in the households. Using for washing their hands (81%), washing of clothes (37.2 %), washing of body (72.5%), washing their children's body (24.9%) and washing their children's hand 108 (26.9%). Those households that mentioned they have washed their hands with soap, they were asked the occasions of hand washing performed. A large majority of the households (84.5 %) had reported they washed their hands before eating food.

Table 4.7 Sanitation and Hygiene Practices

Purposes for using Soap	**Number of Respondents**	**Percentage(%)**
Washing hands	314	81.0
Washing clothes	144	37.2
Washing body	281	72.5
Washing children's bodies	97	24.9
Washing children's hands	108	26.9

4.4 Sanitary and Hygiene Coverage in post-emergency Asayita refugee Camp

The data analysis from the respondents shows, the sanitation of the area near the household latrine was good in (63.8%) and poor in (36.2%) households. regarding the possibility of animals to reach water storage containers was in about (37.9 %) households. On the Other hand the field assessment result shows in refugee camp, household and communal latrines had been constructed to provide sanitation refugee living inside the camp area. There are 298 household latrines and 23 communal latrines. For each communal latrine addresses 4 pits multiply by 80 individuals and Assuming there are 5 individuals in one household; 80 individuals divided-by 5 household members resulted 16 household per one communal latrine. Thus, 16 households latrine multiplied by 23 communal latrines, it can give sanitation service for a number of 368 households. To calculating the total latrine coverage by communal latrine based on the field assessment.

- Total number of latrines addressed by both households and Communal latrines = 298 households+368 households=666 household latrine
- Te total coverage of latrine= (666/1332)*100=50%.

Despite having 50% coverage both household and communal latrine doesn't have piped water network line. And none of those latrines have a functioning hand container. As it is very crucial part for controlling hygiene and sanitation, the refugees are at high risk of contamination for fecal bacterial diseases.

Thus combining the above two result data, from the survey result which have collected from respondents indicates there is 63.8% total sanitary service coverage in good condition yet where the rest 36.2 % of respondents has not satisfied the condition of existing household sanitary services. Even if through the coverage of sanitation services has reached 50%, there were a problems that shows some of constructed household latrine and communal latrine has not functioning properly managed.

4.5 Correlation Result

Table 4.8 Correlations between Water Collection and Storage, and drinking water hygiene and Sanitation.

Correlations of Water Collection and Storage effects		
		Water Collection and Storage
Water Collection and Storage	Pearson Correlation	1
	N	388
Drinking water hygiene	Pearson Correlation	.970
	Sig. (2-tailed)	**.000**
	N	388
Hygiene	Pearson Correlation	.950
	Sig. (2-tailed)	**.029**
	N	388
Sanitation	Pearson Correlation	.986
	Sig. (2-tailed)	**.001**
	N	388

In the table 4.2 above listed the correlation values of the indicators of Water Collection and Storage for the three Drinking water hygiene , hygiene, and Sanitation are the shows significant difference in all variables p-value <0.05.

As the correlation table 4.2 clearly shown that result a positive value. it indicates a dependent variable and independent variable influence each other. The p value of Water Collection and Storage and Drinking water hygiene, hygiene, and Sanitation are is 0.000,.029, and 0.001respectively, p<0.05 this resulted indicates that there was statistically significant difference between Water Collection and Storage and Drinking water hygiene, hygiene, and Sanitation and Water Collection and Storage among 388 household of refugee camp. The above result of correlation has discussed below.

A. Water Collection and Storage vs. Drinking Water Hygiene

The significance level ($p < 0.01$) suggesting that better water collection and storage practices are associated with higher standards of drinking water hygiene.

B. Water Collection and Storage vs. Hygiene practice

The significant level ($p < 0.05$) indicates that this relationship is statistically significant, meaning improvements in water collection and storage are likely to enhance overall hygiene practices.

C. Water Collection and Storage vs. Sanitation

There is an extremely strong positive correlation between water collection and storage and sanitation practices. The significance level ($p < 0.01$), implying that effective water collection and storage are closely linked to better sanitation conditions.

The high correlation coefficients suggest that efforts to improve water management practices can lead to significant public health benefits.

4.6 Regression result

Table 4. 9 Regression analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
A) Drinking water hygiene	0.48150	0.080	14.26	0 .000
B) Hygiene	-0.007	0.261	11.010	0 .000
C) Sanitation	2.081	0.155	13.42	0 .000

R	R-squared	Adjusted R-squared	
A) Drinking water hygiene	**0**.677a	0.658	0.654
B) Hygiene	**0**.432a	**0**.587	**0**.581
C) Sanitation	0.327a	0 .607	0.600

During the study, checking the presence of water-borne diseases, the presence of latrines, the storage of waste and finally the menstrual hygiene and the sanitation of household .The study of the associations between these variables by regression analysis gave the following results. The independent variable of the water collection and storage with the drinking water, hygiene, and sanitation the observed results show there is the significant different between the variable. The regression analyses results showed that $p = 0.000<0.005$, it is statically significant differences between the independent and dependent variable see the table 4.3 above. which could be explained by the good management of excreta which makes it possible to avoid contamination of water sources and consequently the proliferation of water-borne diseases. moreover $p = 0.000<0.005$. the above regression results the relationship discussed below .

A. Drinking Water Hygiene:- the positive coefficient indicates that for every one-unit increase in the independent variable, drinking water hygiene increases by approximately 0.48150 units. The very low p-value ($p < 0.01$) shows this relationship is statistically significant.

B. Hygiene practice :-The negative coefficient suggests that there may be an insignificant relationship with the dependent variable in this context, as it is close to zero. However, the high t-statistic and low p-value indicate the result is statistically significant, even though the practical impact is

C. Sanitation:- A coefficient of 2.081 implies that for every one-unit increase in sanitation, drinking water hygiene increases by approximately 2.081 units. The p-value indicates a statistically significant and strong relationship.In the results from the regression analysis shows the models fit the data reasonably well, particularly for drinking water hygiene and sanitation.overall the regression analysis shows that both drinking water hygiene and sanitation have significant positive impacts on the dependent variable, with sanitation having the strongest effect. and Hygiene has statistically significant relationship but with a negligible practical impact.

Deducing that the practice of hygiene in the camp is to an extent effectively implemented. The regression analyses above show that there is indeed a link between these two variables, moreover these water sources are being well managed, so they could not be the major cause of diseases within the households. This implies that the level and quality of water response in the camp is attained and refugees are also conscious and aware of the different methods of improving the quality of water, even after they carry it from the water point.

4.7 Hygiene practices at the Asayita refugee camp

Looking at the hygiene practices in the camp, from the field observation it's concluded that most of households had access to soap for hand washing, and personal hygiene, which goes in line with the sphere standards of (250g). In the absence of soap respondents agreed to be using ash, and using hand washing devices to wash their hands. They also agreed to be washing their hands after defecation, before breastfeeding and cooking, this is a reflection of the effectiveness of the awareness implemented, and implies that having soap and hand hygiene education was vital intervention for disease prevention. This finding was consistent with observations from other studies conducted in similar settings (Mahamud et al, 2009). According to this results they were 77 persons(13households) per dump site in the camp, and this did not reflect sphere standards of 10 households per dump site.

4.8 Water Quality

According to the assessment, standpipes and boreholes are the two sources of drinkable water for refugees. According to MIC report data shows , a household's daily average water use may range from 10 to over 25 litters. Due to the small size of water container ,mostly they the water collection has been insufficient volume container which can impact their daily water usage. Yet as per the report of MIC WASH professionals, the water supply does meet the UNHCR standards 20 litter of water (UNHCR, 2006). A study done in another refugee camp revealed that daily water consumption varied between 20 to 23 liters (Mahamud et al., 2009). One reason for this insufficiency was attributed to the fact that water was pumped only during the day and from this observation it is evident that some extra efforts needs to be put forth. From the survey conducted with key informants and WASH experts, water supplied in the camp was good water quality. The water quality was certified during the construction of each structure by bacteriological and physic-chemical analysis tests and by laboratories approved by the Ministry of Water and Energy. and a water supply which was fed by a under ground water charge. Furthermore, a chlorine chemical was used as a treatment. This treatment was used daily in tanks where water is stored before distribution. Water from the boreholes which were equipped with hand pumps was monitored quarterly, and this was neither contaminated by sanitary installations put on lace nor by maintenance interventions which was carried out at the water point. In this same light, the refugees population were also sensitized on the different techniques which are simple and accessible to them, for instance by boiling, and refugees were also educated on how water was to be treated with chemicals like chlorine or granulate tablets, even though the usage of these methods often depended on the possibility to obtain or purchase these type of chemicals. Such methods have also been identified by similar studies done by Lantagne & Clasen (2012).

4.8.1 Turbidity

Determining the of the level of suspended particles such as sediment, plankton, or organic by-products, in a body of water. It’s necessary to measure the level of Turbidity. To examine the level of Turbidity water sample, in this research instrument Turbidity Measuring Tube, Turbidity Tube to examine the turbidity of all three Sample P public tab, B borehole , and R reservoir samples. The samples examine under this test were resulted value less than 5 NTU. The yellow cross at the bottom sample can seen brightly with clear sight naked eye. Which show there no any cloudiness in the water or turbidity is near to zero. As per The WHO guidelines recommend that turbidity in drinking water should not exceed 5 NTU (Nephelometric Turbidity Units) to ensuring aesthetic quality and minimize health risk. as they indicate better water clarity and lower levels of pathogens and contaminants. . Thus, all the samples were at normal or accepted state of Turbidity test.

4.8.2 Chlorine Content Test

The amount of chlorine the water supply can be determined by measuring the chlorine content by using Taylor Chlorine and pH testing Kit. It’s used reagent tablets and shake the kit in order to mix an then indicate the reaction of a of amount chlorine by matching the level of color formed which ranging been b /n 0.1-1mg/l. the field test resulted were, 0.3 mg/l for Sample B borehole, and 0.4mg/l for both P public tab and sample R reservoir . it has shown slightly increasing in chlorine content at the reservoir. WASH experts who responsible for water supply services add up chlorine for disinfection of water and Constant follow up the chlorine content As it’s highly recommended to any microorganism in the water. Furthermore, to know about the salinity of water as to examine the conductivity of three sample water using Wagtech water test instrument inside the lab. Which resulted the Sample B is 981µs/cm, sample R was 1006 µs/cm and Sample P was 956 µs/cm. WHO guideline states that ,the limit for the conductivity drinking water is 2500 µs/cm. thus three sample had acceptable value. Thus it’s safe to say the salinity of water is at acceptable rage.

4.8.3 pH Value

A pH value test is a test that can determine how acidic or Alkaline water exist . In this research Wagtech digital testing instrument was used for measuring pH value. The test result shown on those samples respectively Sample B borehole, Sample R reservoir and Sample P public tab were 7.75, 8.0 and 8.27. As per WHO drinking water guideline PH value as 6.5-8.5 can be acceptable. Thus the result Alkanity of water from the Borehole, Reservoir and Public tab water are at safe state.

4.8.4 Microbial Test

The microbial test means examining the micro coliform in the samples different methods those are membrane filtration test and confirmed test. For this research, two samples from different households has collected those are HHS1and HHS2. thus samples had passed through macro membrane filter with pressure pressing tool and the synthesis paper role to be a cultivated media for growth coliform. Based on pathogenic characterstic coliform divided by two kinds, which are Total coliform and Fecal coliform(Payment, P., & Franco, E. (1993). Pathogenic Bacteria in Drinking Water: Total Coliform and Fecal Coliform as Indicators. Water Science and Technology, 27(4), 211-218.). To find out the presence or the absence of pathogens in the water, both samples interred in to controlled temperature machine, at 37.7^{o}c for Total coliform and adding Briliante (green bile solution) as growth catalyst at 44.7^{o}c for Fecal coliform. The sample stayed in the machine for 24hrs long. The result shown household sample1 (HHS1)has negative for both Total coliform and Fecal coliform. yet household sample 2 had shown positive for pathogenic pollution. it had 3cfu/100ml of Total Coliform and 5cfu/100ml of Fecal Coliform. From the result, sample (HHS2) household sample 2 had been contaminated by pathogenic parasite.

Table 4. 10 Table Summary of Laboratory test results

<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Samples Taken</th><th rowspan="2">Turbidity (neiflometric Turbidity Unit)</th><th rowspan="2">Salinity (Conductivity)</th><th rowspan="2">pH vaule</th><th colspan="2">Microbial Test</th></tr>
<tr><th>Total Coliform</th><th>Fecal Coliform</th></tr>
<tr><td>1</td><td>Sample R(from the reservoir)</td><td><5 NTU</td><td>1006</td><td>8.00</td><td rowspan="3" colspan="2">Not applied (there is no underground contamination suspected)</td></tr>
<tr><td>2</td><td>Sample P(from Public Tap water point)</td><td><5 NTU</td><td>956</td><td>8.27</td></tr>
<tr><td>3</td><td>Sample B(from Borehole water well)</td><td><5 NTU</td><td>981</td><td>7.75</td></tr>
<tr><td>4</td><td>Sample HHS1 (from household 1)</td><td rowspan="2" colspan="3">Not applied (not have significant difference due to it collected from water points of public water tabs)</td><td>Negative</td><td>Negative</td></tr>
<tr><td>5</td><td>Sample HHS2(from household 2)</td><td>3cfu/100ml</td><td>5cfu/100ml</td></tr>
</table>

4.9 Socio- Economic Challenge

In the situation like post-emergency refugees,the socio-economic challenges include limited access to employment, education, health-care, and social services, as well as discrimination and the psychological toll of displacement.While Conducting this research, surveyed there are a number of a NGO's operating on many sectors which mainly supporting the living condition of refugees. In the Asayita refugee Camp the refugees have an access to education for their children's, health-care center , social services organized by Safety Net. There were an economic development initiatives such as construction of cement blocks production near inside the camp an financial support on funding a certain amount of money to start a vegetable shop for oldies and disabled refugees. still it was very low and can not met to solve refugees socio- economic challenges. Still the refugees can't afford to give a balanced food nutrition for their families. UNHCR has been applying nutrition and food support programme monthly for household as per WHO guide line. Currently there is no project which is working mainly on the social and economic development in the Asayita refugee Camp. These challenges has been increasing with increasing number of refugees each year.

4.10 Challenge

According to the results, there were so many challenges to the delivery of WASH services that go beyond the socioeconomic aspect. To begin with, an increase in the refugee population at the site had led to a decrease in resources, specifically financial resources to be rented to address the concerns of the refugees, and this depletion of resources also affected the water and sanitation sector. Insufficiency of these resources was diminishing and did not allow WASH experts to support the needs that will increase with time. In this study refugee's customs was also identified as a setback to the implementation of WASH services. was also insufficient surface water to be able to supply underground water sources on the environment where the site was located. Furthermore, currently there is no NGO or organization which drawn a priority on sanitation and hygiene sector. Thus, it shows less focus had given to the situation.The low purchasing power of refugees was another hindrance to the maintenance of WASH infrastructures. It is the task of communities, the users or the beneficiaries of this service should ensure their maintenance through management committees, but their financial situation, and continuous dependence of the refugees did not facilitate a mechanism that could be put in place in order to support the maintenance actions, due to the limited funds of such programs. (Li & Elliott, 2016) research also pointed out that individual's low social economic status also affected their access to safe water and sanitation. There is need for humanitarian actors to develop programs that will promote or reduce the dependence and reliance of refugee population. In terms of sanitation, one of the major difficulties was that Asayita is located in a village quite far from the regional capital of Afar. Sanitation services such as emptying services for excreta were not available. In a situation where humanitarian resources are decreasing, these replacements became difficult to achieve and there is therefore a risk that the humanitarian actors will be unable to bear the cost of the continual replacement of the latrines that may occur.

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATION

5.1 Conclusions

This study sought to look at the assessed and examine the level of water supply quality and sanitation in the post-emergency phase of the Asayita refugee camp and the condition of facilities and water supply resources .In regards to access to water and quality. It is found that parameters such as the average amount of water needed per person per day conforms to the international sphere standards. The survey data shows about 90% of respondents has access to drinking water supply. From similar finding reports that about 91.3% of the sampled household reported that they were satisfied with the drinking water supply. Only 8.7% of the sampled population were not satisfied with the drinking water supply, whereas among the 5 households who reported that they were not satisfied with water supply 80% or 4 of them reported that the drinking water supply was not enough(a report joint standardized expanded nutrition survey final report (asayita and berhale) refugee camps afar region, 2017). In addition to this, the distance between the households and water point, including queuing time also conforms to the standards. The majority of the refugees acknowledged that they cleaned their recipients simply with water every day. This indicates that, even though the water may be pure at the source, it can still get contaminated during transportation and storage. This has also been discovered by similar studies like (Aretouyap et al., 2017). Methods of washing recipients like using a cloth or washing it with a detergent has been proven to be effective against any re-contamination. The respondents also reported that carrying of water was often the duty of women and children(11-18years).(Cronin & Shrestha, 2008), study also revealed that 60% of respondents in both surveys were women and they along with their children, are charged with water collection in the vast majority of cases. In the field assessment result from the study camp there is some few latrines were to be rehabilitated and toilets on the Asayita site. 50% of respondents had access to latrines, toilets; however the average number of persons per this facility (44 people per facility) did not reflect the norms of sphere standards of 20 people per facility (Sphere handbook, 2011). They were traditional in nature, constructed in two types that are straws and tolls. From the field observation made, the toilets and latrines had doors, offered privacy and security, this actually matched with responses derived from the questionnaire. In similar studies Percentages of the beneficiaries who were using improved toilet is only 15.3% (11.1- 20.4, 95% CI) whereas about 43.5% were reported to use unimproved toilet facilities a report joint standardized expanded nutrition survey final report(aysaita and berhale) refugee camps afar region, 2017).These facilities were away from water sources in order to avoid potential contamination, in this same vein the 97% of respondents also admitted to be throwing children faeces in latrines, and not in bushes. (Atuyambe et al., 2011), conducted research also showed that 94.5 % of refugees threw children's faeces in pit latrines.

Therefore implies that refugees have access to water both in quantity and quality. On a general note, it appears that open air defecation is not yet a practice in the camp, because households have access to latrines, but less reflecting the management of hygiene which makes it possible to avoid contamination of water sources and consequently the proliferation of water-borne diseases, but there are still many facilities to rehabilitate and also high number of people sharing this facility, which might be a vital decisive element that push's people to defecate in the open air areas. Whatever the case, it is therefore essential to deliver additional water supply containers washing hands and build more latrines that conform to international standards.

Furthermore, With minimum standards of hygiene promotion addressed yet the number of households per hygiene promoter in the camp has not met confidently to the sphere standards, The study also discovered that the needs of vulnerable groups to a basic sanitation products is not provided. Only some women have access to and also dispose of their Menstrual hygiene products properly, there is a vigilance committee in the camp and the WASH facilities installed to provide security and privacy. On the other hand, the installed sanitation facilities do not take into account the needs of the physically challenged. This research revealed that the poor sanitation practice in refugee camp significantly contributes to drinking water pollution, creating a critical public health risk. Inadequate waste disposal, overcrowding, and lack of proper hygiene facilities often lead to the contamination of nearby water sources with pathogens and pollutants.

In-terms of Socio-economic challenges, the refugee has under difficult condition as the number of refugees increasing. Thus increase the support an effective initiatives which has a longer phase maintaining to continue the financial support. Furthermore by Increase support for refugee on socioeconomic outcomes and needs to inform policy reform and programming decisions . as the Create a formal process for directly engaging refugees and host communities in the decision-making process around policy changes and programs related to the IDA refugee sub-window the CRRF strategy. Refugee and host community voices must be included in a meaningful way, including through participation in the working groups and adding to thus collaborating with other existing NGOs should build on the leverage of the World Bank to elevate long-standing policy barriers for refugee self-reliance, such as on freedom of movement, rights to work, and other protection issues,(A case study of World Bank financing for refugee-hosting nations International Rescue Committee, November 2018).

5.2 Recommendations

As this study paper shows there is household water contamination in refugee camps. it is a critical issue, leading to a variety of health risks, such as waterborne diseases (e.g., cholera, dysentery, typhoid). thus addressing water contamination problems is essential for safeguarding the health and well-being of displaced populations in the camp.

From the findings of this study the following recommendations are categorized by two parts based on the time frame of application

5.2.1 Immediate Application and Recommendation.

- Water Source Protection & Management:- Protection of Water Sources from Contamination should be valued seriously. while conducting this study the reservoirs and boreholes were under protection with fencing and security guards. it very crucial control and protect water sources from external contamination by ensuring proper fencing, waste management practices, and keeping animals away from water collection points.

- Regular Water Testing and Monitoring: Implement routine water quality testing at various points including source, treatment, and distribution points . This can be done by camp health teams or with the help of NGOs to monitor for Micro and Macro bacterial contamination (e.g., E. coli, coliforms) and

- Promotion of water Treatment at Household Level :- Promote Household Water Treatment Solutions: Encourage the use of affordable, easy-to-use household water treatment options such as Boiling: Boiling water for at least one minute can kill most pathogens.

- Improved Sanitation and Hygiene:- Improving the existed household latrine which has been out of service and constructing adequate and well-maintained sanitation facilities inside refugee camp in sufficient numbers to prevent open defecation. Ensure that waste disposal systems are not located near water sources to prevent contamination of groundwater. A proper and regular Cleaning and waste management which providing a waste collection services to prevent garbage and human waste from contaminating the water supply. Educate the camp population on how to properly dispose of solid waste and the importance of keeping latrines clean. Separation of Water and Waste Systems, ensuring that waste water from latrines and other facilities (e.g., showers, kitchens) is safely channeled into septic tanks or appropriate treatment systems to avoid cross-contamination with drinking water.

- Skills Training and Education:-Provide refugees with access to vocational training, language courses, and formal education to equip them with skills that are in demand in the host country's labor market.

- Inclusive Social Safety Nets- Extend social welfare programs to include refugees, ensuring they have access to unemployment benefits, health-care, and social services, similar to nationals. And Designing programs specifically targeting the unique needs of refugee women, children, and other vulnerable groups, offering them protection, economic opportunities, and educational support.

5.2.2 Long-term Application Solution and Recommendation.

- Community Education and Training Water, Sanitation, and Hygiene (WASH) Education: Conduct regular educational campaigns to raise awareness about the importance of clean water, safe storage, and personal hygiene. Installing proper hand-washing tools, the importance of treating water before drinking, and the role of sanitation in preventing disease. Further more, Engaging local Leaders by empowering the community leaders and health workers to disseminate information and encourage best practices. This could include local demonstrations on water purification, safe water storage, and hygiene.

Giving awareness using posters, radio broadcasts, and community meetings to inform families about how to prevent water contamination, including how to disinfect water and identify signs of waterborne diseases.

- Installing water Quality Monitoring Points: Set up decentralized water quality monitoring points in the camp which easily allow for more localized response to contamination issues and ensure early detection of water quality problems.

- Distributing a larger Water storage Container : Improving the availability of safe water storage of large storage containers, to store treated water and reduce the need for frequent refills, especially in areas of high water demand.

- Partnerships with NGOs and Government Collaborate with International Organizations: Engage NGOs, UN agencies (e.g., UNHCR, UNICEF), with a local governments to secure funding and technical expertise in household water treatment and sanitation systems. These partnerships can help scale up solutions and ensure sustainability.

- Continuous assessment, adaptation of strategies, and community involvement are key to improving hygiene and sanitation standards in post-emergency refugee camps. long-term monitoring and evaluation by WASH experts to establish a system for ongoing monitoring of water quality, sanitation facilities, and community health indicators to track the success of the interventions and make necessary adjustments. And building the capacity on social and economic aspect of the refugees by giving training camp residents, local health workers, and sanitation staff to maintain and operate water treatment systems, latrines, and hygiene programs, ensuring sustainability and local ownership of the programs.
- Financial Support and Micro-finance Initiatives by providing financial support allows refugees to meet immediate needs while fostering long-term economic independence. Micro-finance initiatives can help refugees use their entrepreneurial skills to create businesses and generate income.

- Collaboration with the Private business sectors to integrate in economic integration by creating job opportunities for refugees. Engaging businesses in refugee integration initiatives can also lead to mutual benefits, as companies tap into a diverse labor pool by employing the skilled refugees.

- This research also revealed that the disposition of waste inside the camp is not properly managed and other donor organization need to reduce expenses and prioritize and focus on certain key activities and sustainable projects.

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7. APPENDICES

Figure 7.1 Water Storage Reservoir Tank, Pubic Tabs water points, water storage plastic

Figure 7.1 Figure Sanitation Situation at the ASayita Camp

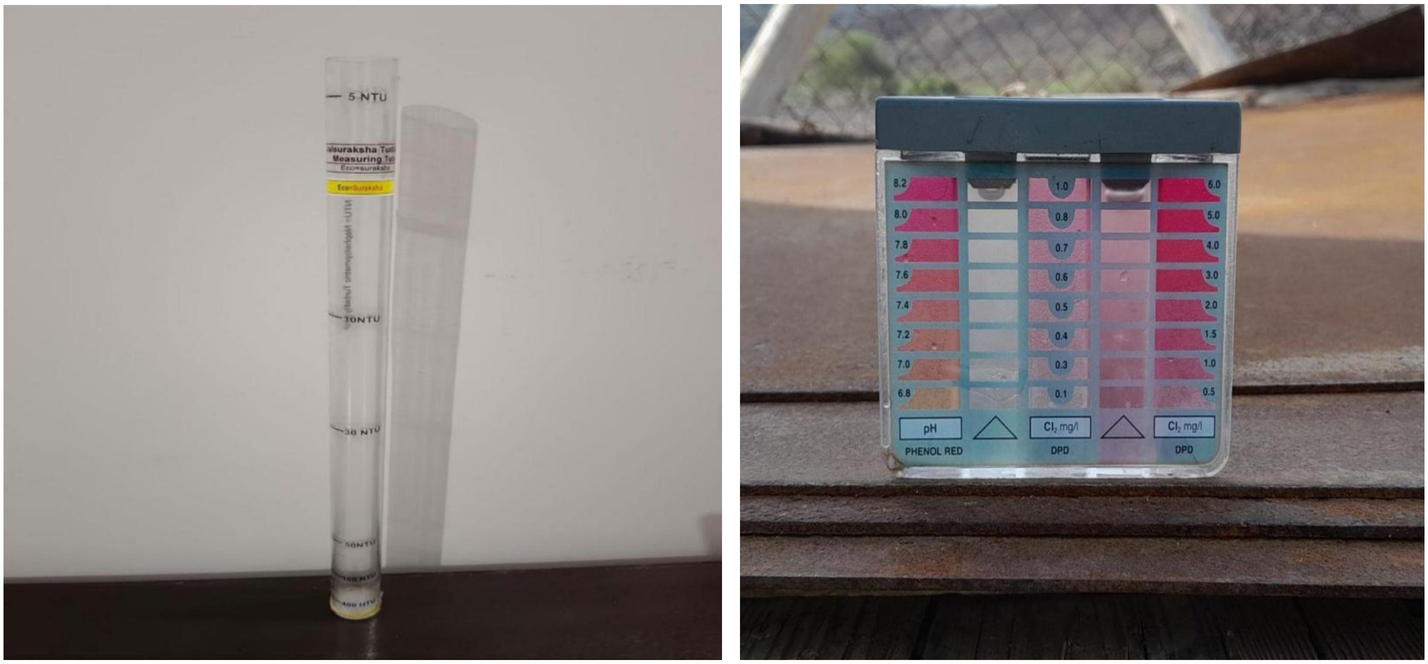

Figure 7.3 Turbidity Tube 0 to 5NTU and Taylor Chlorine and pH testing Kit

Figure 7.4 Wagtech Instrument Kit box with digital Conductivity test kit

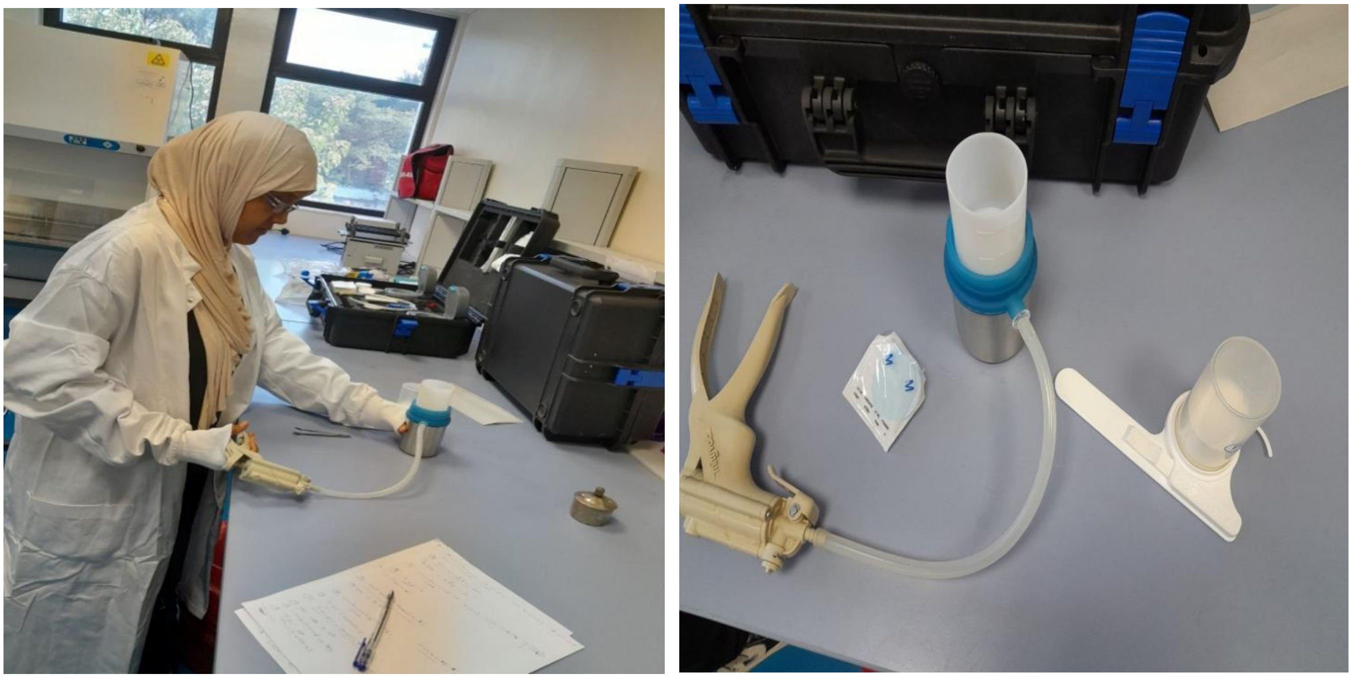

Figure 7.5 Laboratory activities picture conducting a membrane filtration tool for Microbial test

List of Questionnaire's for Household Survey

APPENDIX A: Core question on socio - demographic characteristics of household owner

Questions

A1) Did the household give its consent to be interviewed?

☐YES

☐NO

A2) please kindly state your sex

☐ Female

☐Male

A3a) How many people live in this house? _____ People

A3b) How many children less than 5 years old live in this house? ____________

A4) Are there any persons with disabilities and / or elders in this household?

☐YES → How many? Kindly state number of disabled and elders

☐NO

A5) Please tell me what your country of origin is: ____________

A6a) Have your family members received prior education before arriving at the camp?

☐ yes

☐ no

A6b) What is the level of education in your family

☐ Lowest: _____________________

☐ The highest: _____________________

B - Water Collection and Storage

B1) What is the principal source of domestic drinking water for members of your household?

(Consider water for drinking, cooking, bathing, personal hygiene, laundry and cleaning only – NOT

for non-domestic use.)

☐ Public tap/standpipe

☐ Handpumps/boreholes

☐ Water seller/kiosks

☐ Surface water (lake, pond, dam, river)

☐ Protected spring

☐ Rain water collection

☐ Bottled water, water sachets

☐ Other (please specify): ______________________

☐Don't know

B1/A) apart from the main source what other type of second source for your domestic drinking water?

☐ Public tap/standpipe

☐ Handpumps/boreholes

☐ Water seller/kiosks

☐ Surface water (lake, pond, dam, river)

☐ Protected spring

☐ Rain water collection

☐ Bottled water, water sachets

☐ Other (please specify): ______________________

☐Don't know

B2/a) Are there situations where water is rationed or pumped at given times?

o Yes ☐ During the day

☐ During the night

o No

B2/b) From your point of view which source of water is safe or secure?

☐ Public tap/standpipe

☐ Handpumps/boreholes

☐ Water seller/kiosks

☐ Surface water (lake, pond, dam, river)

☐ Protected spring

☐ Rain water collection

☐ Bottled water, water sachets

☐ Other (please specify): ______________________

☐Don't know

B3) What is the average water use for drinking, cooking and personal hygiene in your household

per day?

☐10 liters

☐ 15 liters

☐ 20 liters

☐ 25 liters

☐ more than 25 liters

☐ don't know

B4) How long does it take to go one direction to get water? (On the way to the source, not the way back. Not including time spent socializing)
☐ Number of minutes
☐ Water is available on premises
☐ Don't know
B5) What is the queuing time at the water source, considering that water is not available on

Premises?

☐ 3 - 5 minutes

☐ 6 -10 minutes

☐ 11 – 20minutes

☐ More than 20 minutes

☐ Don't know

B6) Do you collect enough water to meet all your households' needs – not for animal use, agriculture, gardening, etc.?

☐ Yes

☐ NO → Why not?(select the main reasons only)

☐ There are water shortages

☐Water source is too far

☐ It is too dangerous to get water

☐Can't afford to buy enough

☐ Waiting time at the water point is too long

☐ Don't have enough storage containers

☐ Don't know

B7) Who usually collects water for your household?
☐ Adult female
☐ Adult male
☐ Child (11-18 years)
☐ 10 years or younger
☐ Don't know

B8a) Where do members of your household collect and store water?

Plastic containers

Buckets

B8b) How often do you clean drinking water containers? (Check one)

☐Every time we use them

☐At least once a week

☐At least once a month

☐At least once a year

☐Don't know

☐ Never or less than once a year

C- Drinking water hygiene

Questions

C1) How do you remove water from the container?

☐ Cupped dipped

☐ Hose/Tap

☐ poured

☐ Other

C2) Do you or someone else in the household do anything to your water to make it ready for drinking?

☐Yes, sometimes treat it before drinking

☐ Yes, sometimes treat it before drinking

☐No, do not treat it before drinking

☐Don't know

C3) how do you or someone else in the household treat the water before drinking?

☐ Boil it

☐ expose it to sunlight

☐ Use disinfectant products (water purification tablets, liquid chlorine, granular chlorine)

☐Filter it(Bio-sand filter, ceramic pot filter, bucket filter)

C4) When was the last time someone or you treat the drinking water? (Choose one. Treating means of boiling, filtering, disinfecting, and/or other actions taken to clean water.)

☐ Today

☐Yesterday

☐Before yesterday

☐Don’t know

D-hygiene

Questions

D1) Do you have a soap?

☐ Yes

☐ No

D2) Where did you get the soap from?

☐ Purchased

☐ Traded

☐ Distributed by an NGO

☐ Other

D3) In the absence of soaps what do you use for hand washing?

☐water only

☐ ash

☐ Don’t use anything

☐ Other

D4) Can you state at least three important times when one should clean his hands?

☐ After breast-feeding

☐ before eating

☐ After defecation

☐ Before cooking

☐ Don’t know

D5) Is there any hand washing device in your household or camp?

☐ Yes

☐ No

D6) What kind of installed hand device is found?

☐ Pouring device (Tap)

☐ Bucket

☐ Other

D7) where do your household members dispose of their domestic waste?

☐ Street bin

☐ Designated open area

☐undesignated open area

☐ Bury it

☐ House-hold/ communal pit

☐ Burn it

☐ Other (please specify): ____________________

D8) Have you or any member of your household ever contracted cholera disease (diarrhea, vomit) once? When is the last time?

☐ less than one week

☐ less than a month

☐ approximately a year

☐ Other: ___________________________.

☐ Don’t know

D9) select the different ways to prevent members of your household from getting diarrhoea?

☐ Receive a vaccine

☐Store water safely

☐ Cook food well

☐ Wash fruits and vegetables

☐ Cover food

☐ Boil or treat your water/drink clean water

☐ Wash hands with soap and water

☐ Use toilet/latrine facility to defecate

☐ Dispose of children's faeces in toilet/latrine

☐ Bury faeces

D10) How do the women in this household dispose of their menstrual hygiene management products?

☐ Wash and reuse

☐ Burn them

☐ Dispose in open areas

☐ Trash bin

☐ Latrine

D11) Where do the women of the household change their menstrual hygiene management products?

☐ Home

☐ Latrine

☐ Other: ____________________

<u>E- Sanitation</u>

Questions

E1) Please state where you and the household members usually go to defecate?

☐plastic bag

☐ Open defecation

☐ Bucket Toilet

☐ Household latrine

☐ Other

☐ Communal latrine

E2) What is the facility where your household members usually defecate?

☐ A single facility used by your household only

☐ A shared facility used by a number of households→ Please the number of Household that use

this facility

☐ Communal latrine ____________________

☐ Other please specify____________________

E3) Does the latrine provide enough privacy for members of your household, especially women?

☐ Yes

☐ No→ please state the reason

☐ too close to the house

☐ Doors nor curtains are not available

☐ lock not working

☐ Other

☐ No latrine

E4) Do adult in your house hold usually defecate outside, especially in the night?

☐ Yes→ Why ☐ Latrine is too far

☐ Too dark at night

☐ Too tired

☐ Don't know/not sure

☐ Other (please specify):__________

☐ No

E5) what is done with faeces of children under five years?

☐ Bury it

☐ Nothing is done

☐ disposed in the latrine

☐ Disposed elsewhere