

An Assessment of Solid Waste Management Practices at Household Level in Fitch Town, North Shoa Zone, Oromia National Regional State, Ethiopia.

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Abstract

Poor solid waste management practice is a major environmental issue in developing countries like Ethiopia. This study aimed at assessing solid waste management practices in Fitch Town. Due to rapidly increasing urbanization and population, the rate of generation of solid waste in Fitch Town is also increased. Probability and non-probability sampling techniques, questionnaire, interview, observations and descriptive research design were used. Primary and secondary data were collected, processed, analysed and interpreted in qualitative and quantitative methods. The study discovered that there was low performance of solid waste management in the town mainly due to poor households' solid waste management practices resulting from the use of unreliable solid waste storage materials, there was low level of solid waste separation (41%) and recovery activities (there was no reuse solid waste, for instance), only 7.8% undertake composting; unauthorized solid waste dumping (64.5%); negative perception against solid waste management workers, and externalizing their responsibilities. It was also found out that there were poor institutional capacity and coordination to fulfil equipment and manpower; lack of properly designed collection system and time schedule, less awareness creation among the society, absence of formulating and enforcing the implication of rules and regulations in the town. It was recommended that there have to an execution of sustainable solid waste management (reuse, composting and recycling) through awareness creation and training the local community, improvement of institutional capacity and structure, and implementation of integrated solid waste management approach, which comprises all stakeholders.

Key words: Fitch Town, Solid Waste, Waste, Waste Management

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1. Introduction

1.1. Background of the study

Solid waste management which has a long and convoluted history has been intrinsically linked to human advancement due to its effect on both public and environmental health (Nathanson, 2015). Solid waste management (SWM) is a multidisciplinary activity that includes administrative activities and solid waste management practices such as the control of waste generation, storage, collection, transfer and transport, processing, and disposal of solid waste (Radaet *al.*, 2013). The effective SWM plays a significant role in improving the quality of the environment, human health, and socio-economic activities of local communities. However, according to the United Nations Environment Programme (UNEP, 2018), SWM is a major environmental problem and a public health concern. The negative environmental, social, and economic impacts of solid waste are more severe in developing countries than in the developed ones (World Bank, 2018).

Solid waste problem is worse in urban areas where enormous industrial and other activities widely occur. Various SWM activities in developing countries are performed by public sectors, and these sectors alone are unable to deliver solid waste management services effectively, with the limited enforcement of SWM policies (Sandra and Weghmann, 2019). Thus, the illegal open burning and dumping of solid waste are common practices in many developing countries (Weldeyohaniset *al.*, 2020). In many cities of developing countries involvement of communities, private sector and NGOs is still very limited. The wastes collected typically end up in open dumps, where they may be burnt, and in some cases are deposited in illegal dumping sites (Yohanis & Genemo, 2015).

In Africa, SWM constitutes one of the most crucial health and environmental problems facing governments of African cities including Ethiopia (Biruk, 2017). In Sub-Saharan African (SSA) cities, like in other developing regions, rapid population growth and the expansion of service and manufacturing sectors have led to an increase in the amount of solid waste (Abdalahet *al.*, 2016).

Wastecontrol is a growing public challenge in Ethiopia. Studies such as in different areas of Ethiopia have shown poor waste control practices (Abegazet *al.*, 2021) and many factors are associated with residential waste control practices (Noufalet *al.*, 2020). The main contributing factors are conventional modes of transport, dumping of waste in roadsides, waste disposal in water bodies, irregular waste picking programs, infrastructure constraints, financial constraints, a lack of skilled human resources, and unregulated landfills (Mulat et al., 2019).

1.2. Objectives

1.2.1. Main Objective

The main objective of the study was to review solid waste management practices at household level in Fiche Town, North Shewa zone, Oromia National Regional State, Ethiopia.

1.2.2. Specific objectives

- i. To assess the solid waste management practices at household level in Fiche town
- ii. To examine the challenges that solid waste collectors encounter in the study area

Waste control is a growing public challenge in Ethiopia. Studies conducted in different areas of Ethiopia have shown poor waste control practices (Abegaz et al., 2021) and many factors are associated with residential waste control practices (Noufal et al., 2020). The main contributing factors are conventional modes of transport, dumping of waste in roadsides, waste disposal in water bodies, irregular waste picking programs, infrastructure constraints, financial constraints, a lack of skilled human resources, and unregulated landfills (Mulat et al., 2019). In Ethiopia, authorities found it difficult to deal with strict waste control without the involvement of local communities (Mulat et al., 2019).

There are many initiatives taking place in Ethiopia to improve the environmental health, especially in the capital city, Addis Ababa. Population growth, urbanization and expansions of industries in urban center have led to a rapid increase in the quantity and complexity of solid wastes in Ethiopia (Lema et al., 2019). Unluckily, this has not been accompanied by an equivalent increase in the capacity of municipality to deal with the problems. Fiche Town is one of the towns of Ethiopia in which proper provision of solid waste management was unsatisfactory and incomplete. Illegal dumping of waste on open areas, street, ditches and stream courses was considered as repetitive task of residents. The efforts made by the municipalities to change the situation in the town were also not only insufficient but also extremely minimal as compared to the extent of the problem. Therefore, in order to reduce this situation and achieve efficient solid waste management system of the town, the study of solid waste management system was required.

Fiche Town is one of the towns in Ethiopia characterized by rapid population growth caused by natural increase and migration, basically from rural to urban. It is a rapidly growing city in Ethiopia and 71.8% of food and drink establishments in the town involved undesirable practices of disposing of solid waste in open fields. Solid waste management is a challenge to the municipality in terms of preventing the town from environmental pollution and health problems and there is also a limited study on solid waste management practices and its challenges in the town. Hence, this cross-sectional study was proposed to assess the status of household solid waste management and its associated factors in Fiche Town.

The results of this study can be used as a reference to conduct a similar study at regional level. Moreover, the finding of this study could help stakeholders and policy makers to devise solutions for solid waste management related problems (Chane et al., 2022).

The investigators preferred Fiche Town as it has been highly suffering from problem of solid waste management practices. Moreover, it was a work place of the investigators. Rapid increase in population together with rapid development of the town has been producing large volumes of solid

waste of which men and women households generate the largest amount of solid waste (residential waste) estimated at 85% of the total solid waste generated in the town (Fiche Town Municipal Office, FTMO, 2022).

There was neither any public communal waste collection/storage container nor any roadside dustbins in the town except the container provided by Salale University. Generally, the town has been highly suffering from shortage of solid waste management, infrastructures, and lack of appropriate and sustainable work on awareness of residents, institutions and commercial private owners (FTMO, 2022). The environmental and sanitary conditions of the town have become a more serious problem from time to time, and people were suffering from living in such conditions. Urgent need of efficient municipal SWM practice system, on one hand, and the steady growth of solid waste problem on the other side are still the main features of the town. These limitations were leading not only to deterioration of the town's environment, but also reinforcing incorrect disposal habits to the people.

2. Literature review

2.1. Conceptual Literature

2.1.1. Concept of Solid Waste Management

Solid Waste (SW) is the collection of various wastes generated by households, commercial and industrial organization, institutions such as schools, hospitals, care homes and prisons, and from public spaces such as streets, markets, slaughter houses, public toilets, bus stops, parks, and garden (Biruk, 2017) and also during the processing and disposal of solid waste in one city properly without influencing community's health of city and environments around city and re-use and recycling. Solid waste management contains all governmental, economical, lawful, planning, development and solved all waste problems by engineering principle. The solution of solid waste may be very difficult which requires interdisciplinary field-practices such as political measures including regional and topographical arrangements. It also requires financial, public health, communications of people, demography, conservation, sociology, fine engineering and materials science (Ali and Eyasu, 2017).

2.1.2. Major Functional Elements of Solid Waste Management

2.1.2.1. Waste Generation

Many human activities generate solid waste and these are major causes of the pollutions of the environmental in general and of houses, streets, public places, shops, offices and hospital in particular. Solid wastes can be emanated from different areas such as household - solid waste from single and multiple-family homes, hotels and recreation areas, commercial-solid waste from markets, stores, offices, restaurants and other non-manufacturing activities and institutional areas, solid waste from schools and colleges, hospitals, prisons, etc (U.S. EPA, 2014).

In modern cities and towns, huge volumes of solid wastes need regular collection, transportation, and disposal. As the scope and complexity of solid waste management grows and consumes an ever-increasing proportion of city budgets, the solid waste management sector must carefully be monitored and adjusted to balance service quality and cost effectiveness. Efficient solid waste management systems must have precise data about the quantity and type of waste materials. Unfortunately, in many developing countries, systems for managing waste are primitive and cannot process the volume of generated waste (USAID, 2015).

As in all developing countries, increased solid waste generation and related problems in Ethiopia are due to rapid urbanization and population increase. The severity of the problem is indicated by indiscriminate dumping of wastes along streets, drains, ditches, canals, and open spaces of the city. Such careless handling, collection, transportation, and disposal of waste are hazardous to public health and the environment. Because Ethiopia has no comprehensive data on solid waste generation and composition, it has not been able to develop a strategy to mitigate the problem (USAID, 2015).

Women play a key role in this context from waste generation (such as grey water and food waste in kitchens, and grey water from washing laundry and bathing children) and waste management which is often the responsibility of women and makes them an important target for efforts supporting waste reduction, segregation, composting and recycling (UNEP-IETC, 2019).

2.1.2.2. Sorting, Storage and Transport

Unlike high-income countries where there is public awareness of waste sorting, sorting activities at the household level in low- and middle-income countries are still limited. Therefore, the MSW generally consists of mixed waste containing food and other types of waste. Waste sorting is usually conducted by poor families to earn extra income from selling recyclable materials (WB, 2012). Despite the high amount of municipal budget spent for waste collection, about 80–90% of the total MSW budget, the efficiency of MSW collection is still very low in many countries, particularly in SSA, which has collection rates ranging from 17.7% to 55% (WB, 2012). Waste transfer stations are intermediate places where solid waste is deposited and stored until they are transported to the processing and final disposal sites (Mohammed, 2016). Similarly, in many Ethiopian towns and cities, the collected waste is stored on the roadside, in open spaces, and exposed to rain and sun, which creates a bad odour and attracts pests (Hayalet *et al.*, 2014). This directly affects the quality of the environment and public health of those residing around the solid waste transfer stations.

A study in Nepal indicates that waste management practices are labour-intensive and require hard manual work, though at present, only rudimentary technical equipment is used. Socio-economic status, gender and basic working conditions determine access to jobs in the waste sector, both the formal and informal sectors. Poverty, education and gender, among other factors, prevent individuals from participating in a wide range of jobs. Men are exclusively the drivers of vehicles,

including light waste collection transport, such as mini-trucks or tractors, as well as heavy vehicles, in both the public and private sectors. This is due to two primary reasons: the traditional nature of the role (e.g. the work is too hard for women) and the level of education (e.g. women's limited access to driving licenses and their participation in vocational education). Men are also employed more than women are in other related positions, such as mechanical maintenance and waste loading (UNEP-IETC, 2019).

2.1.2.3. Collection

Solid waste collection is structurally similar in developing, transition, and industrialized countries, but there are important technical and institutional differences in implementation. In most cases, industrialized countries have more efficiency and effectiveness than developing ones in terms of their approach of collection, role of municipal governments, private-sector participation, and demographic and social factors relevant to collection. In developing countries, collection often involves a face-to-face transaction between generator and collector. The level of service is low, and generators often have to bring their wastes long distances and place it in containers. As a result, many collection activities in developing countries are carried out by informal sectors (UNEP, 2018).

In most major cities of the developing countries, there are three basic types of collection systems: human powered, animal powered and engine powered (Yohanis & Genemo, 2015).

- i. *Human powered collection system:* This includes pushcarts, pedal tricycles, wheel barrows, and two-wheel donkeys with baskets. In general, these require some sort of smooth surface on the cones to be effective.
- ii. *Animal-powered collection system:* animal-powered collection equipment either takes the form of drawn carts or animal may be directly backed with containers such as basket. This type of collection is applicable in the cities where there is no much traffic problem.
- iii. *Engine-powered collection system:* This includes all motorized collection equipment.

Solid waste collection is one of the main components of municipal solid waste management (Tassieet *al.*, 2019). In urban areas of Ethiopia, formal solid waste collection is mostly conducted by micro and small enterprises that collect waste door-to-door and transport the waste to facilities and disposal points (Ferede, 2018). Additionally, informal groups, called street boys and scavengers, collect solid waste in many urban areas of Ethiopia (Cheru, 2016).

Women typically manage household waste. According to the in-person interviews conducted with collectors who interact directly with households, it is women who manage the waste in the households but men may participate in the actual handing-over to a formal waste collector or the disposal process (UN, 2019).

The study in four Asian countries (India, Indonesia, Philippines and Vietnam) indicates that participation by women is high in the informal sector. In these countries, women's participation in the picking of recyclables from municipal waste, dumpsites or landfills was notable. They also work along side the men in their family who collect recyclable sand manage junkshops and scrap-dealing businesses. Later in the value chain, there are few waste businesses that are women-owned or operated. Women are employed by processing companies to sort, clean, separate and sift through recyclable material through the various stages of processing. While men are tasked with the more labor-intensive activities like loading and unloading, women perform the more repetitive and time-consuming tasks of sorting and separating (UN, 2019).

2.1.2.4. Disposal

Waste disposal is the final step in municipal solid waste management to protect the environment and people from solid waste impacts (Birhanu, 2015). The quality of the waste disposal facility may depend on the availability of technology, skilled workers, and the financial resources of each country. Open dumping (unplanned dumping of waste without consideration for environmental protection and public health) is the most common method of waste disposal in Africa, with open burning coming close as another regularly used mechanism to eliminate waste (Sandra and Wegmann, 2019). Thus, the unplanned and unmanaged solid waste disposal practices severely harm the environment and public health around disposal areas and also affect the lives of future generations by increasing green house gases that contribute to climate change (UNEP, 2018).

According to the Open Wash report (2016), the two main waste disposal methods in Ethiopia are land fills (including waste burial pits and communal open dumping) and thermal processing, which includes the burning and incineration of solid waste. However, there are no standardized waste disposal sites for most towns and cities in Ethiopia.

Nzeadibe and Adama (2015) found that in Nigeria waste picking is male- dominated occupation with 95.5 per cent of the activity is performed by men. The investigator indicates that even if it is not further elaborated, 'the tedious and unhealthy nature of the work for women was provided as the reason. However, it is the women performing the solid waste management activities in the domestic setting. Because in most of the developing countries including Ethiopia it is the women who have the responsibility to handle the waste produced on the household.

2.1.3. Solid Waste Management Options

2.1.3.1. Open burning

In developing countries, less attention has been paid to waste minimization strategies that result in the sending of wastes to dumpsites for final disposal (De Medina *et al.*, 2020). Openly burning solid waste is another common practice, while incineration is mostly used to treat health care waste in Ethiopia. According to the African Development Bank Report in 2019, the final disposal systems of solid waste in Ethiopian cities are not environmentally friendly because over 50% of the urban

population practices open burning (Teshome, 2020). This indicates that solid waste management systems in Ethiopia have several constraints that affect their implementation.

2.1.3.2. Composting

Composting is biological process which converts heterogeneous organic wastes into humus like substances by mixed microbial population under controlled optimum conditions of moisture, temperature and aeration. Composting is seen as key processes in the waste management options and has an important role in reducing the volume of biodegradable municipal solid waste going to disposal areas. The compost made out of urban heterogeneous waste is found to be of higher nutrient value as compared to the compost made out of cow dung and agro-waste. Composting of MSW is, therefore, the simplest and cost-effective technology for treating the organic fraction of MSW (Annepu, 2012).

2.1.3.3. Open Dump

Open dumping and landfilling are the most common methods of MSW disposal in developing countries, mainly because they are cheap when social and environmental impacts are not considered (Ali *et al.*, 2014). Open dump sites pose a significant risk to public health and the environment. Transitioning from open dumpsites to sanitary landfills should be the ultimate goal for most cities and urban centers. However, that transition is typically complex and expensive, and requires extensive long-term planning. A phased transition that focuses on improving operations at open dumpsites using low-cost techniques while developing sanitary landfills, and then eventually closing them and transitioning over to sanitary landfills, is a best practice in most situations (U.S.EPA, 2020). Mohammed (2016) stated that most urban areas in Ethiopia use open dumping for waste disposal, which pollutes the surface and groundwater, soil, and natural environment as a whole.

2.1.3.4. Reuse

Solid waste generation prevention and reduction, as well as reuse, recycling, and waste-to-energy conversion strategies, are not well implemented in developing countries such as Ethiopia. According to the UNEP (2015), approximately 70–80% of municipal solid waste generated in Africa is recyclable, but only 4% of it is currently recycled by the private sector. Moreover, the African Union Commission mainly aimed at recycling at least 50% of urban waste in African cities by 2023 (AUC, 2015). Thus, recycling initiatives by private companies are already underway for wastes such as plastics, paper, glass, metals, and organic waste in some Ethiopian cities, such as Addis Ababa; however, it is important to scale up such implementations by introducing new recycling companies and strengthening end-product markets. Concurrently, the urban solid waste recycling activities in Ethiopia were not adequate; for example, only about 5% of the solid waste generated in Addis Ababa is recycled (Mohammed, 2016).

This shows that Ethiopia requires several years to achieve the goal of the African Union Commission to recycle its urban waste. Additionally, the first stage of the solid waste recycling process includes separating the waste into different categories (Open wash, 2016). Solid waste separation at the source has a crucial advantage in encouraging reuse and recycling strategies in urban areas. The informal private sector has promoted the reuse and recycling of solid waste; for example, individuals are known as “*korales*” who buy reusable bottles, jars, and recyclable materials from households and sell them to shopkeepers and merchants in Addis Ababa (Bjerkli, 2013). They also sometimes collect reusable and recyclable solid waste from dumpsites and sell it to private companies.

2.1.4. Solid Waste Management in Developing Countries

Solid waste (SW) has emerged as one of the most pressing challenges for urban areas across the world. Global SW is increasing; currently, the world’s cities produce 1.3 billion tons of waste annually, which is expected to reach 2.2 billion tons by 2025 (Kaza *et al.*, 2018). Historically, the causes and effects of SW were considered local or regional. But with increasing volumes and changing waste compositions, SW has become a global challenge with public health, environmental, social, and economic costs. Developing countries face complex issues in SW management (SWM) ranging from policy and governance to capacity and cost recovery, attracting private sector expertise and investment, and integrating informal actors in the sector. The rapid increase in population coupled with the expansion of the industry is producing large volumes of waste whose management demands greater infrastructure, institutional setup, and community participation (Umeret *et al.*, 2019). This massive generation of waste coupled with unbalanced waste management is a major challenge faced by developing countries, particularly the sub-Saharan African countries. The SSA countries are characterized by the least gross domestic product, and a large portion of their populations live below the poverty line.

However, according to the recent World Bank study (WB, 2018), the economic development of the majority of SSA countries is growing at a fast rate, as well as the population growth and urbanization in SSA countries is increasing from time to time. Moreover, Ethiopia is one of the fastest economically growing countries in SSA countries and the second country in terms of population size in Africa. As a result, the municipal solid waste management problems, such as an increasing generation rate of solid waste and open burning and dumping in SSA countries, are found at an alarming rate (Sandra and Weghmann, 2019).

2.1.5. Solid Waste Management in Ethiopia

2.1.5.1. Solid Waste Management Problems in Ethiopia

Rapid urbanization coupled with increased urban population in the last decade brought immense pressure on municipal services, mainly in the management of the ever-increasing amount of solid waste. Since the year 2001, most municipalities and city councils have become aware of the

consequences of poor SWM. Municipalities in the country have put a system in place with traditional practices to collect, dispose and reuse waste which is not aimed at promoting public health, environmental protection and energy gains (Mengistu and Assegid, 2014). Following this, the Ethiopian government has passed a SWM proclamation in 2007 (FDRE, 2007). Despite this, there are many challenges in the implementation of the proclamation and hence, an extremely low level of returns has been obtained from efforts put into dealing with solid waste.

2.1.5.2. Solid Waste Management Laws in Ethiopia

Solid waste, if not collected and well-managed, has an impact on environment by polluting rivers, lakes, underground water and the society by affecting their health because it creates favorable condition for vector of diseases, creates psychological dissatisfaction, and cause flooding by blocking ditches and water canals that in turn damages infrastructure. Similarly, if the waste management practice of the municipality is not properly designed and implemented, it will result in high environmental and social impact throughout the value chain including composting/recycling practices (UNDP, 2021). According to FDRE (2007), solid waste management activities had been designed under proclamation No.513/2007 as follows:

Source reduction/segregation–households: Households shall ensure that recyclable solid wastes are segregated.

Collection and storage: Urban administration shall ensure that adequate households' solid waste collection facilities are in place to ensure the installation of marked waste bins by streets and in other public places guaranteeing the collections of solid waste from bins with sufficient frequency.

Transportation: Urban administration shall set the standards to determine the skills of drivers and equipment operators and prevent overloads of solid waste drivers and equipment operators and prevent overloads of solid waste.

Treatment: All urban administrations shall ensure the collections, transportation, and, as appropriate, the recycling, treatments or safe disposal of municipal waste through the institution of an integrated municipal waste management system.

Disposal: Construction of solid waste disposal sites and auditing existing solid waste disposal waste.

Recycling and Reuse: Manufacturer or importer of glass container or tin cans shall collect and recycle glass or tins.

2.1.6. Contributions of Waste Collectors in Urban Solid Waste Management

Despite the stereotyped view of waste collectors as being marginalized and the poorest of the poor, a growing number of evidences have demonstrated that is often the case. Waste collectors provide benefit to cities in a number of ways; as service providers of urban waste collection, as

environmental agents who enable recycling, and as key economic actors who feed the market with secondary raw materials (Dias, 2016). Waste collectors reduce the cost of municipalities in solid waste management by accessing labour at the lowest wage, provides positive externalities towards the community through their important contributions to environmental sustainability by reducing the amount of waste that goes to landfills which in turn reduces air and water pollutions (Maldonado *et al.*, 2014). For example, the study conducted in Pune (India) shows that each waste picker on the area has contributed US\$5 worth of free labour to the municipality every month, and their combined labour saves the municipality US\$316.455 in municipal waste transport cost (Chikarmane, 2012).

It is also indicated that the activity of waste collectors can save foreign currency by reducing import of raw materials; alternatively, if industrial demand is stronger in neighbouring countries, waste collection can become a source of foreign currency by exporting the materials recovered by waste collectors. In addition to the above provided roles, waste pickers can also play a significant contribution in creating employment for themselves and for other vulnerable section of the society. For example, a study shows that in Belo Horizonte, waste picker's cooperative open doors for workers and creates opportunities for marginalized groups such as, sometimes "taking them of the streets" by incorporating street dwellers as workers in their cooperatives (Muller and Scheinberg, 2013). Both men and women participate in solid waste management activities outside home as paid workers. Studies indicated that due to the paucity of income opportunities for uneducated women and their interest to get an income to meet the survivalist need of the family, women solid waste collectors are found more reliable on their work compared to men (Muller and Schimberg, 2013).

Similarly, it is suggested that including women in waste collection can bring effective and efficient waste management. This is because women are responsible for the maintenance of the living space and the health of children as they have strong sense of civic responsibility and a desire to improve their living conditions and health situations (Ganiet *al.*, 2012). For example, it is discovered that up to 81%, 96% and 91% of solid waste generation, storage and collection respectively in Nigeria, is carried out by women as their traditional responsibility in the house (Ganiet *al.*, 2012). The study also shows that women in Bauchi metropolis indicated high degree of willingness (89.5%) to segregate their solid wastes in order to improve the environmental quality and increase their income-base by selling the sorted materials (Ganiet *al.*, 2012).

In addition to the arguments provided on the above paragraph, given that solid waste collection is part of their domestic work, women have the experience which enables them to be effective and efficient workers on the solid waste management system (Madsen, 2006). However, for their gendered abilities to make change in some communities, women are respected and officially celebrated for the voluntary community work. The other side of this coin is that women are often not regarded for paid community work, while people refer to the notion that "paid work is men's work".

A best example for this will be the case of waste collection MSEs in Ouagadougou, Burkina Faso provided by Gani et al. (2012). The same Investigator indicates that, at first the community leaders insist that men be hired for the waste collection work, as women had to stay home and look after children. The men provided to be unreliable and careless workers who quit the job as soon as they had other work. Women were then hired “as an experiment”. The women performed the waste removal work to everybody’s satisfaction, motivated by their desire to make full use of their rare opportunity to earn regular money, albeit under very difficult conditions. The Investigator notes that this project has received the Grand prize award of the president of Republic of Senegal and it has since been replaced in other part of the country (Gani et al, 2012).

2.1.7. Challenges the Waste Collectors Face

Despite the potential benefits of waste picking to the urban poor and overburdened waste management services, waste pickers have faced with various challenges ranging from social exclusion, health risks and well-being to unfair market prices. For example, there are some negative connotations attached to waste pickers as waste picking is often conceived to be a symbol of poverty. They are generally either ignored or looked down on because of the work they do, which is perceived as dirty (Marta, 2013). It is also indicated that the little concern and neglect of waste workers role and activities in urban development and planning policies by the concerned bodies on the government is also the other significant challenge (Simatele and Longandjo, 2015). The study in Egypt showed that waste picker communities had an infant mortality rate of 1/3 in Port Said which is several times higher than for the region as a whole (ILO, 2017). In Cairo, a quarter of babies born in the waste picker’s community die before reaching their first year (ILO, 2017).

Privatization of waste management is also identified as one of the challenges for waste picker’s economic benefit. For example, ILO (2017) indicates that many waste pickers are negatively affected by the privatization of waste collection through contractors and companies, thus reducing their livelihood opportunities and income. Even when waste management is open for bidding, waste picker cooperatives are not able to compete with larger and well-established waste companies in the absence of governmental support. Besides this, policy-related challenges such as the lack of enforcement of law and agreement regarding waste management plan is also identified (ILO, 2017).

Both as a resident living within one’s specific country and from being a waste collector, men and women have differently of being exposed and affected by the challenges happening in their work due to their gender and related roles. Scholars identify that women are highly disadvantaged in the work of waste collection (Vineeshia and Mahees, 2016). Given that waste management is conducted in domestic and public space, household waste management which is taken as the waste management system undertaken in domestic sphere is often the unpaid work of women, but when

it is mechanized (in the delivery cycle), it is paid in many cases men take over this work (Vineeshia and Mahees, 2016). This is an aspect of participation of solid waste management where men and women act differently.

In addition to the above provided gender issue as solid waste collection workers, women have faced different economic, social, and cultural challenges. It is identified that the domestic responsibilities that women have at home limited their time to spend on their job which in turn negatively affective their productivity at work. For example, the survey report of the study conducted in Durban (South Africa) shows that in terms of working hours, women waste pickers are found working 34 hours compared to men who work 44 hours per week (Mkhizeet *al.*, 2014). For that reason, male waste pickers are actually found earning three times more thantheir female counter parts' earning potential (Mkhizeeta.*l*, 2014). Thus, the limited time and limited geographic mobility of women is identified as one of the basic challenges for women's profitability on the sector.

Denial of access to recyclable waste materials with the highest value and exclusion of women from any position and decision-making authorities is also the other gender issue faced by women waste collectors which impacted their earning compared to men (Nzeadibe and Adama, 2015). Scholars identified that women tend not to be permitted access to higher valuable materials like metal or papers but focus on the textile, plastics, and the like (Gani *et al.*, 2012). Similarly, in Nigeria, women are excluded from participating in the more profitable sectors of the recycling economy namely the scarab dealers and middle men (Nzeadibe and Adama, 2015).

Evacuation of women waste collectors from their work while opportunities are getting improved on the waste management system is the other challenge identified by different literatures. For example, women are forced out from the work while the activities on waste becomes legitimized and formalized and as production gets mechanized and industrialized, the demand for men skilled labor increases, by forcing out women to take up jobs not usually preferred by men (Sida, 2016).

As waste collection is considered as a strenuous and difficult work which needs a physical strength, women are not recruited by the formal waste management enterprises and the private sector. And if they get recruited most of the time, women are forced to work on the most time-consuming activities of the work due to the gender division of labour and their activities are not valued. For example, men work in collection, transportation, and processing activities. These activities need physical strength in comparison to the activities women are involving in that require greater dexterity, such as sorting of recyclables. Women work manually through their hands due to the lack of skills to operate the available technology which makes them more likely to expose to different health-related risks. Thus, it is suggested that, the gendered approach to waste picking needs to address the multiple dimensions of subordinations that women are subjected to, at home, in the work place and within their organization (Dias and Fernandez, 2013).

2.2. Theoretical Literature

The theoretical framework is the structure that can hold or support a theory of a study. The theoretical framework introduces and describes the theory that explains why the research problem under study exists (Mugenda and Mugenda, 1999).

2.2.1. Structural Functional Theory

Based on structural functionalism theory by Emile Durkheim, the study attempts to explain how institutions and social structures can be strengthened to offer sound SWM services to the society. According to this theory, the human society is organized through institutions which perform various functions for continuity of the society. Durkheim viewed the human society as an organism made up of interrelated structures and social institutions. The theory states that one organ can affect the others ultimately the whole due to this interdependence (Ngugi, 2017).

The study attempts to find out how women and men households can play a role in SWM in the residential areas of Fiche town to affect the overall SWM situations in the town. This is based on the understanding that women represent a certain institutions in the society whose role has a bearing to the SWM practices in this town. The municipal authority represents the whole while women individually or communally represent a social structure whose activity could affect service delivery in the community and vice versa. Through this theory, the study is expected to provide remedies on SWM by suggesting possible measures aimed at strengthening the existing social structures and institutions featuring women and men household waste collectors.

2.2.2. Theory of Habitus

The study is also being based on Habitus, a theory advanced by Pierre Bourdieu. Habitus describes one's physical and psychological appearance and behaviour as a result of habits developed over a period of time. It develops a person's attitude towards society and influences the way they react to the world around them. Bourdieu believes that an individual is as a result of internalized influences throughout their life and as such, the study tries to link this influences to SWM habits and practices. Therefore, it tries to propose ways on how women and men households can instil good habits and values concerning solid waste management.

2.3. Empirical Literature

The investigator had tried to compare the findings of the following five related studies with the present study and tried to fill the gaps:

The poor solid waste management in Fiche town is seriously suggested by researchers who conducted their studies on the town. For instance, the finding of the study shows that 78.4% of residents used improper solid waste management practices. Respondents in this study improperly disposed of solid waste (dumped in the yard (23.7%), burned in their compound (81%), dumped in ditches (22%), and on the road (35.6%) as most are unaware of proper solid waste management. Therefore, there is a need to raise awareness about solid waste management at the community level

using different pieces of training. In addition, the city municipality needs to strengthen door to door waste collection services (Samuel, 2022).

The other study by Ketsela (2020) shows that people in Fiche town used different methods in collection of solid waste, transport it and later dispose at recognized site. It was found that solid waste management is the work of small group under the authority of the municipality. The study concludes that there was a big problem of solid waste management in the town. The study also calls different groups and organizations to apply modern techniques for the collection, transportation, and disposal of solid waste in Fiche Town.

The study by Angesom (2019) shows that people in Akaki-kality sub-city used different methods in the collection of solid waste transport it and later dispose at recognized site. It was found that solid waste management is the work of unions and the solid waste administration offices under the authority of the municipality. The study concludes that there was poor solid waste management in Akaki-kality sub-city. Therefore, there was a need for all people to work for the clean environment and a better life waste in the study area.

The study by Nigatu (2020) indicates that though most households have temporary storage in their home, they did not store wastes separately based on its nature. Disposal of solid wastes in unauthorized sites by the households is highly practiced in Bishoftu Town. As shown by the empirical analyses on household heads' age, sex, educational level, monthly income, family size, willingness to pay for solid waste collection service, awareness on solid waste management and households' location, that is distance from the main road, and households' access to the private waste collectors' service are the major challenges of effective household solid waste management in the study area. In addition, the qualitative analyses, which was done by using interview and fuscous group discussion shows that the major problems of effective solid waste management practice in the household level are budget problems, limited man power, resources and facilities like adequate containers, vehicles, gown, and gloves.

However, the current study on SWM in Fiche Town is different from the above-mentioned studies. This is because, it focused on the benefits that household waste collectors provide to this sector and the challenges that they faced in the work place and in the communities. The study emphasized on individual actors rather than the community as well as managerial and technical issues.

2.4. Conceptual Framework

The scope of SWM encompasses planning and management systems throughout the whole stages of collection, storage, transportation and disposal. It is a complex task which requires appropriate organizational capacity and cooperation between numerous stakeholders in the private and public sectors like residential waste generators, informal sector workers, public health and sanitation department and municipal government.

The conceptual framework provides brief explanation that there are different options of solid waste management. Based on economic status of the countries, open burning, composting, open dump and reuse are the most commonly used for developing countries and they are known to be relevant to the study area. The framework further insight that SWM is essential to public health and environmental protection, however, solid waste management in most cities of developing countries is highly unsatisfactory because of different technical, financial, institutional, social, public awareness and attitude constraints and problems.

Generally, the conceptual framework in Figure 1 has been shown in terms of different elements: its main elements of SWM, main options of SWM, contributions of household waste collectors and challenges that can affect the effectiveness of the management. These elements are important issues to attain the intended objectives (Fig.1).

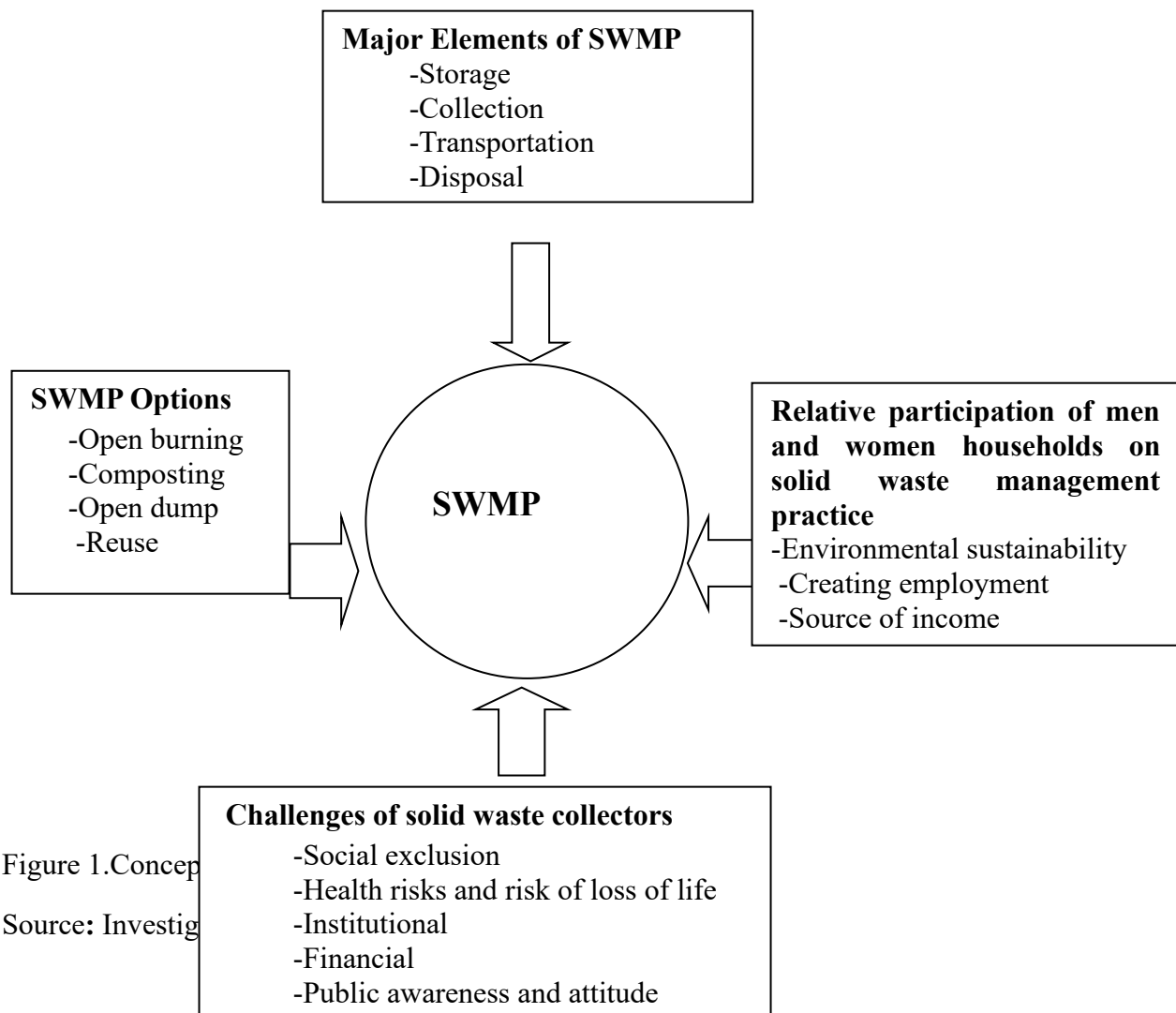


Figure 1. Conceptual framework

Source: Investigator

3. Methods

3.1. Description of Study Area

Fiche Town is the administrative centre of North Shoa Zone of Oromia Region. The town has four kebeles (the smallest administrative units). It is located at 114km from Addis Ababa, the capital city of Ethiopia. It is bounded by Girar Jarso woreda in all directions (South, East, North and west). Astronomically, the town is located at 9°45'30"N-9°48'30"N latitude and 38°43'00"E-38°45'30"E longitude and an elevation range between 2,738 & 2,782 meters above mean sea level (Fiche Town Administration, 2022).

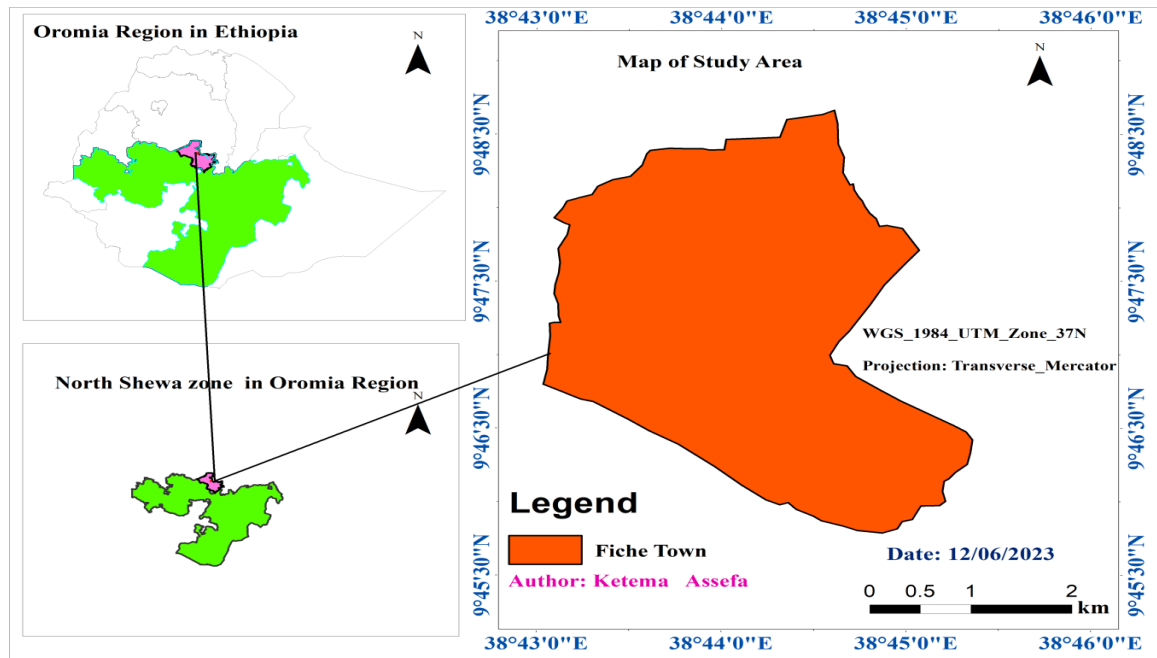


Figure 2. Map of the study area

Source: Author (2023)

According to 2007 population and housing census, the total population of Fiche town was 27,487, of which 12,925 (47.02%) were males, whereas the remaining 14,562 (52.98%) were females (CSA, 2008). The current total population of Fiche town is estimated to be 140,705, male accounts for 54,685 and females are estimated to be 86,020. And there were 57,470 households in the town. This may have its own significance on the study results because the study was conducted on Fiche town administration households (FTKA, 2022).

3.2. Study Design and Study Population

Descriptive study design was employed to analyse the current status of solid waste management practices in Fiche town.

3.3. Sample Size and Sampling Techniques

Multi-stage cluster sampling was employed. First, getting the list of Fiche Town kebeles and selecting all of them purposively was carried out. Second, list of 'Gots' of each kebele and randomly selecting 'Gots' was undertaken. Third, list of households living in each selected 'Gots' was identified. Finally, selection of sample households using simple random sampling was undertaken.

In this study, key informants (KI) from municipality of Fiche Town were purposively selected. Yalew (2011) stated that purposive sampling is used when the researcher believes to include those who have more information about the issue. They were directly selected and considered to generate more information than others because they were responsible for and familiar with SWM than other local authorities whereas, respondent for questionnaires were selected based on simple random sampling (lottery method). The rationale for using this sampling technique, as compared to other sampling techniques, is that it requires the minimum knowledge of population, free from subjectivity and free from personal error and provides appropriate data for one's purpose (Pandey and Pandey, 2015). The same source also describes that simple random sampling was more preferable than systematic sampling as systematic sampling is not free from error, since there is subjectivity due to different ways of systematic list by different individuals, knowledge of population was required and information of each individual was needed.

Fiche Town had 57,470 total households. Therefore, the sample size was determined by using Israel (2012).

$$n = \frac{N}{1 + N(e)^2}$$
 Where, n = total sample size, N = Total number of households of the selected kebeles.

e = the level of statistical significance (Allowable error) (0.05) that represent 95% confidence level. Hence, $n = \frac{N}{1 + N(e)^2}$, $n = \frac{57,470}{1 + 57,470(0.05)^2} = \frac{57,470}{1 + 57,470(0.0025)} = \frac{57,470}{144.675} = 397$

Therefore, 397 was the minimum sample size of household units for reliable results.

Sample size from each kebele and got was taken proportionally, with the assumption that the higher the total population, the greater number of sample sizes (Table 1).

Table 1. Population and Sample size

Kebeles	Total N ^o HHs	Total N ^o of Sample HHs	% Of Sample HHs to Total Sample HHs
Dida Heto	47,000	324	81.6
Ganda Caffé	6,790	47	11.9

Burka Gora	2,568	18	4.5
GandaGara	1,112	8	2.0
Total	57, 470	397	100

Source: Fiche Town Kebele Administration and Investigator's own calculation (2023).

3.4. Data Collection Tools

Questionnaire, interview, and field observation were used for this study. To collect data on the existing solid waste management, questionnaires were distributed to select households in the town. The scheduled questionnaires were distributed and collected with the help of field assistants and for those who were unable to read and write the assistants were assigned. Four data collectors, one for each kebele, were trained on how to collect the data. In addition to this, relevant information was collected from interview of Fiche town municipal office and Fiche town kebele administrators. Checklist for interview and questionnaire were prepared in English language and translated to Afan Oromo, which is the mother tongue for the majority of people in the area in order to forward their understandings of the situation understudy. The translation was conducted by using professional translation services and pre-tested the translated tools with small sample households. The researchers also carefully and deeply observed the real situation in addition to questionnaire and interviews. Regarding the secondary data, relevant published and unpublished documents were reviewed.

3.5. Data Analysis

The collected data were processed, analysed and interpreted in both qualitative and quantitative methods of data analysis. The investigator used descriptive statistics like mean, percentage, graphs, and frequency distribution to analyse quantitative data. The qualitative data generated from open-ended questionnaire, interview and field observation was organized, summarized and explained thematically for the comparison and analysis of attributes.

3.6. Ethical Considerations

While conducting research, it is important to consider the underlying ethical issues. By elaborating the purpose of the study (as a fulfilment of the requirements for writing Journal Article and not for any other hidden agenda by the researchers and requested the respondents to participate in the study on a voluntary basis), consent was guaranteed from the administrating body and the respondents. This helped protect the concern, integrity, consents and other human elements of research participants. Thus, the researchers firstly, tried not to expose participants from any physical or psychological harm. Secondly, request respondent's consent and participate only on a voluntary basis. Thirdly, respected the participants' right to privacy and report the findings in a complete and honest fashion. During the interview period, the investigator had tried to capture the

data based on the needs of the participants through clarification and arranging the time they feel free of jobs.

4. Results and Discussion

4.1. Results

Out of total respondents, the majority 232 (58.4 %) were male household while 165 (41.6 %) were females. As far as age is concerned, the majority of respondents 164 (41.31%) were between 30 and 49 years old. Regarding the education level, the majority 93 (23.4%) of respondents were diploma holders followed by first degree and above 82 (20.6%).

4.1.1. Socio-Demographic Characteristics

A summary of socio-economic and demographic characteristics of the respondents was presented below. Description of the socio-economic and demographic characteristics of the target population gives some basic information about sex, age, education level, house ownership condition, monthly income and household size of respondent which have their own implication on the management of solid waste (Table 2).

Table 2. Socio-economic and demographic characteristics of respondents

Variable Percent	Frequency	
Sex		
Male	232	58.4
Female	165	41.6
Age groups		
15-29	149	37.53
30-49	164	41.31
50-64	69	17.38
≥65	15	3.78
Education level		
Un able to read and write	35	8.8
Can read and write without formal education	18	4.5
Grade 1-4	37	9.3

Grade 5-8	33	8.3
Grade 9-10	40	10
Grade 11-12	53	13.3
Certificate	7	1.8
Diploma	93	23.4
First degree and above	82	20.6
House ownership		
Own private house	304	76.6
Private rental house	93	23.4
Monthly income		
Up to 1650	73	18.4
1651-3200	130	32.7
3201-5250	114	28.7
≥ 5251	80	20.2
Household Size		
1-3	116	29.2
4-6	202	50.9
7-9	48	12.1
≥ 10	31	7.8

Source: Own Field Survey, 2023

4.1.2. Solid waste separation at source

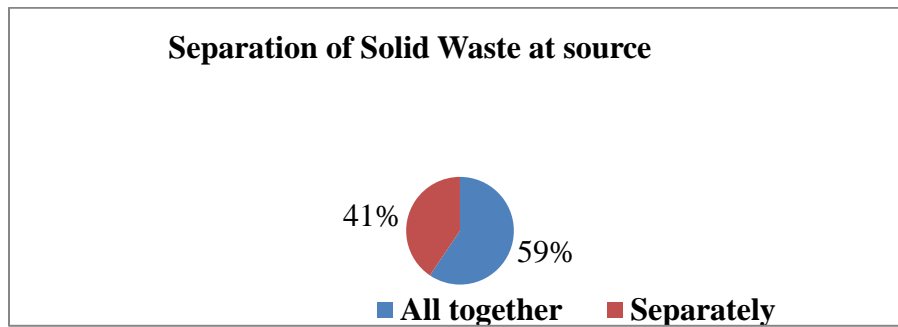


Figure 1. Separation of Solid Waste

Source: Own Field Survey (2023)

The majority of households in the sample 236 (59%) never separated solid waste components compared to a smaller proportion of 161 (41%) respondents who did the action. There were different types of solid wastes generated by households in the study area. The three dominant separately stored solid waste items include: plastics, retired clothing and/or old shoes, and metals, accounting for 27.4% and 20.8 and 17.9% respectively. Together, these items share 66.1% of separately stored solid waste items. The purposes of separate storage of solid organic waste in selected households include: use as fuel, animal feed, fertilizer, giving to other users and volume reduction representing 24.5%, 22.4%, 20.5%, 12.2% and 8.2% of the households of the selected enterprises in that order. The purpose of sorting solid waste was different for the selected households. Similarly, the study by Mohamed (2015) found out that few households separate organic wastes such as vegetable origin for use in the garden as fertilizer and as fuel after drying the waste. Others also feed domestic animals.

Selling to recyclable solid waste collectors "*Quraleos*" and exchanging for household utensils with "*Liwach*" were the first two main purposes, accounting for 47.4 per cent and 39.4 per cent respectively. A study conducted in Gondar city by Mohammed (2015) reveals that more than half per cent of separately stored solid waste was sold to "*Quraleos*" and exchanged with "*Liwach*" to generate income and acquire new equipment. Since more than three-quarters of the separately stored solid waste was sold to "*Quraleos*" and exchanged with "*Liwach*" in Fiche Town, the purpose was to generate income and get new equipment for their house.

4.1.3. Solid Waste Handling and Storage at Source

Table 3. Household Solid Waste Storage at source

Solid waste storage	Categories	Frequency	Percent
Have temporal storage tools	1. Yes	352	88.7
	2. No	45	11.3

	Total	397	100.0
Storage tools	1. Sack (<i>Madaberiya</i>)	170	48.3
	2. Basket	65	18.5
	3. Metal container	7	2
	4. Plastic (' <i>festal</i> ')	100	28.4
	5. Others	10	2.8
	Total	352	100.0

Source: Own Field Survey (2023)

Table 3 reveals that the majority respondents 352 (88.7 percent) have temporal waste storage for their daily generated solid waste whereas only 45 respondents (11.3 percent) did not have waste storage and they directly dispose on roads, open fields, under bridges, nearby ditches and other illegal solid waste disposal areas. The same Table clearly described that about half of households that have temporal solid waste storage stock up their solid waste in sack known locally as "*Madaberiya*" (48.3 percent). Next to sack, about 28.4 percent of total households who possess storage tool use plastic bag '*festal*' which was followed by basket 18.5 percent. Following these there were households that use other methods like private pit which account 2.8 percent. Metallic container was insignificantly used which surprisingly accounts only 2 percent essentially because of its difficulty for transportation, high cost and low access in market.

It is possible to conclude that households who have and have not temporal storage tools dispose their solid waste at illegal disposal areas. For instance, around stadium there is one container for temporal solid waste storage. However, people of the area thrown their solid waste outside the container.

In line with this, Ketsela (2020) stated that Fiche is one of the town by which proper provision of Municipal solid waste management practice is still unsatisfactory and incomplete. In Fiche, illegal dumping of waste on open areas, street, ditches and river courses is considered as routine task of residents. The efforts made by the municipality to change the situation in the town are also insufficient as it compared to the extent of the problem. According TARSC and CFH (2010); plastic bags, cardboard, sacks, and baskets are informal means and as measures for managing solid waste, many of these storage materials at source are not durable receptacles. According to him, the cost of more formal durable waste collection receptacles is a disincentive to household's use in many developing countries.

Generally speaking, it was clearly indicated that households were using a range of informal means for waste storage in their houses.

The reason why households deposit solid waste include: more than half 119 (50.4%) could not imagine the importance of separation, 58 (24.6%) do not think it is their responsibility, 44 (18.6%) did not have the know-how of waste separation and the rest 15 (6.4%) provided their responses as there were additional reasons like considering solid waste separation as cultural taboos. This study reveals that the majority 352 respondents (88.7%) have temporal waste storage for their daily generated solid waste whereas only 45 respondents (11.3%) did not have waste storage and they directly dispose on roads, open fields, under bridges, nearby ditches and other illegal solid waste disposal areas. About half of households that have temporal solid waste storage stock up their solid waste in sack known locally as “*Madaberiya*” (48.3%). Next to sack, about 28.4% of total households who possess storage tool use plastic bag ‘*festal*’ which was followed by basket 18.5%. Following these, there were households that use other methods like private pit which account 2.8%. Metallic container was insignificantly used which surprisingly accounts only 2% essentially because of its difficulty for transportation, high cost and low access in market.

4.1.4. Solid Waste Composting Activities of Households

Table 4. Solid waste composting activities of households

Composting	Categories	Frequency	Percent
Knowledge of compost	1. Yes	102	25.7
	2. No	295	74.3
	Total	397	100.0
Practicing compost	1. Yes	31	7.8
	2. No	366	92.2
	Total	397	100.0

Source: Own Field Survey (2023)

During the study, it was observed that nearly three fourth of total respondents did not know composting. Though there were people who know at least as compost can be made from solid waste 102 (25.7%), only insignificant number 31 (7.8%) of respondents were practicing. The major limitation for not practicing compost as indicated by the respondent was lack of market and a piece of land for urban agriculture.

4.1.5. Solid Waste Collection and Transportation System

Table 5. Solid waste collection and transportation

solid Waste collection and transportation	Responses	Frequency	Percent
Access to collection and transportation service from municipality	1. Yes	117	29.5
	2. No	280	70.5
	Total	397	100.0
Regularity of service from municipality	1. Regular	0	0.0
	2. Not regular	117	100.0
	Total	117	100.0
Largely undertaken Alternatives in the absence or irregularity of collection and service from municipality	1. Do not use official disposal sites	256	64.5
	2. Informal collectors	71	17.9
	3. The member of the family	53	13.3
	4. Other	17	4.3
	Total	397	100.0

Source: Own Field Survey (2023)

Table 5 also shows those households who were not enjoying municipal services but have their own way of household solid waste collection and transportation. Currently in Fiche town, households were asked the alternatively used services for solid waste collection and transportation in the area where there was inaccessibility or irregularity of service from municipality. Hence, nearly two third of households did not use official dump site 256 (64.5percent). The second largest option 71(17.9) that was used by respondent was informal worker sector which was followed by households' family members accounting 13.3 percent. In line with this, Samuel (2022) stated that lack of door-to-door solid waste collection service by town municipality was found to be the potential risk factor for improper solid waste management practice in Fiche town.

The interview with the head of municipality also reveals that in the absence of motorized collection services institutions, commercial centers and residents have used human powered and animal powered equipment.

The municipality has performed periodical solid waste collection two times within a year through cleanup campaigns that involves public participation in which residents collect solid wastes around their respective neighboring. However, data on the estimated quantity of solid wastes removed or collected and transported through this program was not available, head of municipality have verbally reported that a large quantity of solid wastes were collected by the residents which played a lion share in the municipal solid waste management of the town.

From household respondents, the investigator was able to realize that only 29.5% of the respondents obtain waste collection and transportation services from the municipality which was insignificant in comparison with 70.5% who did not get. All respondents who received municipal services agreed that the services were inconsistent and not provided at regular intervals, which is another very crucial concern. According to the interview held with the FTMO, there was only one truck performing solid waste collection and transportation throughout the town and the main challenge in this regard includes the very minimum carrying capacity at a time to disposal site, insufficient and negligence of the workers and the system was old-fashioned.

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4.1.6. Households' Solid Waste Disposal Practices in Fiche Town

Figure 2 shows that solid waste disposal site management in Fiche town was inadequate and below the standard. It displays an array of problems; lack of proper screening, there were dogs inhabiting the dumping sites which could attack and injure someone and access was particularly difficult during the rainy season.

Disposal of solid waste is one of the important functional elements of municipal solid waste management from environmental, social and economic point of view. It is the final functional element and an ultimate fate of solid wastes collected from various sources.

4.2. Discussion

From this data, it is possible to say this study was dominated by male household respondents. In this case it is almost similar with the study conducted by Nigatu (2020) in which 64.6% of respondents were male households. In Fiche Town, more than 80% of the workers in the

association of waste collectors are women. This did not, however, mean that men were not involved in this line of work. From this data, it can be concluded that the solid waste management jobs were dominated by females than males. This plays a crucial role in solid waste management as women are more waste managers than men. According to Bernache (2003) in different countries of the world women have the domain in household works and many are generally confined to the household. The investigator farther explained that women are charge of the responsibility of taking care of the home and the health of the family members that can be taken as waste managers. Therefore, gender matters in solid waste management.

The data on age indicates that solid waste management in Fiche town is never discriminative by age. This is because all age groups of people participated in working for a clean environment in the town. A study that has been done by Ashenafi (2011) in Ambo town stated that household age and effective household solid waste management have a significant negative relationship. It implies that when the household age increases, the effectiveness of household solid waste management would decrease. Moreover, according to the study so far done by Gotame (2012) in Kathmandu, old people do not have access to waste bins and often have difficulties of paying the waste collection charges.

It is possible to conclude that since the majority of respondents (86.7%) were educated people and more educated respondents were diploma, first degree and above holders, their responses play a significant role in this study. Since waste management is a function of people's attitude and their socio-cultural development, society's attitude towards SWM; the degree of separation and response to laws is developed through education. This is because people's knowledge and interest in a clean and healthy environment has changed as their level of education has increased (Abiyot, 2014).

Since the majority of respondents lived in their home, they were expected to play significant roles in solid waste management thinking for their own property. A study done so far by Shabani (2015) in Lindi showed that as they have higher value for their property, people living in their houses are expected to be more involved in solid waste management than their tenants. Ownership of the respondent's home in which the household lives have its own impact on the effectiveness of household solid waste management practices.

The average number of household members in the sample was more than 5, which was much higher compared to the national, regional and zonal average family size of 4.6, 3.7 and 3.6, respectively (CSA, 2008). In line with this, Yohanis and Genemo (2015) explained the effect of higher population levels on waste production rates. The Investigators argue that although developing countries have lower rates of waste production compared to developed countries, their amount of waste is high due to their high population. Gotame (2012) also explained that the number of household members is an important aspect in solid waste management. The increase in family members in the household contributes to a certain extent to the increase in waste.

Solid waste management has become a major concern for many developing countries such as Ethiopia. Solid waste management is mainly the responsibility of municipalities, which has resulted in inadequate service delivery in Ethiopia (Kassa, 2010). The same source also describes that in many cities in Ethiopia, waste management is poor and only 2% of the population receives solid waste collection, transportation, and disposal services. This study was aimed at assessing solid waste management practices in Fiche town. The present study is consistent with a study conducted in Ethiopia by Lema, (2019). The main types of solid waste reported to have been generated by households in this study were plastics, retired clothing and/or old shoes, and metals which causes a visual nuisance, soil deterioration, blockage of drainages, and contamination of surface water (Noufal, 2020). The present finding is supported by studies conducted in Ethiopia (Lema et al., 2019). In this study, only 161 (41%) of households separated their solid waste at the source. This finding is supported by studies conducted in Assela and Woldia town who reported (27.2%) and (35.2%) of household's separate waste at the source (Lema *et al.*, 2019). For recycling activity to take place, the waste has to be separated. The failure of sorting waste by type at the source is one of the problems in waste management (Banga, 2011). It can be said that in the town of Fiche, the segregation of solid waste was generally not satisfactory, and the segregation of non-marketable and exchangeable solid waste was also insignificant. It can be concluded that all concerned bodies such as municipality, Fiche town kebele administrators and others should work together on awareness creation for households and solid waste collectors on how to store solid wastes, advantages and disadvantages of solid waste separation as it is their responsibility rather than externalizing it.

It is possible to conclude that both households who have and have not temporal storage tools dispose their solid waste at illegal disposal areas. For instance, around stadium there is one container for temporal solid waste storage. However, people of the area throw their solid waste outside the container. In line with this, Ketsela (2020) stated that Fiche is one of the towns by which proper provision of Municipal solid waste management practice is still unsatisfactory and incomplete. Generally speaking, compost as solid waste management option was found that participation of the society was still very low even as compared to separation of solid waste. In Fiche, illegal dumping of waste on open areas, street, ditches and river courses is considered as routine task of residents. The efforts made by the municipality to change the situation in the town are also insufficient as compared to the extent of the problem.

This study shows that 64.5% of the city's residents practice poor solid waste management. The high level of inappropriate solid waste management practices is consistent with the results of studies conducted in Assela 82.8% (Lema et al., 2019), Uganda 58.7% (Semugabo, 2020), Ghana 82.7% (Yoada, 2014), Gondar 69.7% (Gedefaw, 2015) and in Nigeria 83.3% (Adoguet *et al.*, 2015). This could be explained by differences in the research context, the development of the study site, and the socio-economic and demographic characteristics of the respondents. It is possible to conclude that since the majority of respondents (86.7%) were educated people and more educated

respondents were diploma, first degree and above holders, their responses play a significant role in this study. Since waste management is a function of people's attitude and their socio-cultural development, society's attitude towards SWM; the degree of separation and response to laws is developed through education. This is because people's knowledge and interest in a clean and healthy environment has changed as their level of education has increased (Abiyot, 2014).

Since the majority of respondents lived in their home, they were expected to play significant roles in solid waste management thinking for their own property. A study done so far by Shabani (2015) in Lindi showed that as they have higher value for their property, people living in their houses are expected to be more involved in solid waste management than their tenants. Ownership of the respondent's home in which the household lives have its own impact on the effectiveness of household solid waste management practices. When the monthly household income is divided by individual family members, more than half of the respondents (51.1 percent) earn less than 3,200 Ethiopian birr. According to Medina (2000), there are differences in the amount and type of municipal solid waste among different income groups. The high-income group of the society consumes much more than the low-income groups of the society. To this extent, they properly manage the generated waste and dispose of it using formal or informal collectors. In contrast, the author further stated that the low-income group of the society produces a small amount of solid waste.

Yohanis and Genemo (2015) explained the effect of higher population levels on waste production rates. The authors argue that although developing countries have lower rates of waste production compared to developed countries, their amount of waste is high due to their high population. Gotame (2012) also explained that the number of household members is an important aspect in solid waste management. The increase in family members in the household contributes to a certain extent to the increase in waste.

This study is consistent with a study conducted in Tanzania and Ethiopia, where 62% and 75% of residents, disposed of their waste in an unauthorized location, respectively (Kasala, 2014). However, a study conducted in Kenya showed that the majority of respondents (94.2%) were aware of the dangers posed by improper solid waste management practices (Mukui, 2013). In addition, about 95.9% of the respondents were aware that improper waste management leads to disease; such as diarrhea and malaria in Malaysia (Fadhullah, 2022). A possible explanation for this could be the lack of awareness on the danger posed by improper solid waste disposal in the Fiche town.

Lack of door-to-door solid waste collection services by town municipality and lack of enough containers were found to be the potential risk factors for improper solid waste management practice in Fiche town. In Addis Ababa, the capital, there is a better transport infrastructure, which is accessible to most households and the service is available to those willing to pay (Dika et al., 2019). All of the respondents dispose either in undesignated places (basically road, open field, throwing in the ditch and dispose at temporary dump sites) or burn.



Figure 2. Solid waste disposed around stadium of Fiche Town

Source: Own Field survey, 2023

There were no respondents that dispose their wastes in official dump site. In line with this, Samuel (2022) stated that lack of door-to-door solid waste collection service by town municipality was found to be the potential risk factor for improper solid waste management practice in Fiche town. Unless such illegal solid waste disposal is well-managed, it creates health-related problems and pollutes the environment. Generally, most of the solid wastes generated in the town by households were, therefore, disposed illegally.

5. Conclusion

The majority 256(64.5%) of the inhabitants of Fiche town have poor solid waste management practices. Key factors relevant to solid waste management practices were knowledge of solid waste separation at source, solid waste handling and storage at source, solid waste composting, access to door-to-door solid waste collection and transportation, knowledge of SWM rules and regulations, absence of enough container and solid waste disposal practices. Therefore, there is a need to raise awareness about solid waste management at the community level using different pieces of training. In addition, the city municipality needs to strengthen door-to-door waste collection services and provide enough containers in the town. The results of this study can be used as a reference to conduct a similar study in Fiche Town or other towns in Ethiopia. Moreover, the finding of this study could help stakeholders and policy makers to devise solutions for solid waste management-related problems.

❖ **Area of Further study:** The impact of illegal solid waste disposal (particularly on human health, environment and climate change).

Recommendation

- The residents of Fitch town have low awareness and knowledge about solid waste management issues. This clearly indicates the need of wider public awareness creation activities.

- Better if municipality encourages NGOs to involve or participate in solid waste management of the town.
- There should be a rule and regulation follow up to overcome problems of illegal waste disposal in the town.
- It is preferable if communities are involved in doing waste separation at source, waste reduction and recycling as a habit and way of life.
- It is better if waste enough containers are placed in some parts of the town.
- The municipality, Fiche Town kebele administrators, communities and NGOs ought to cooperate on solid waste management practices of Fiche town
- The municipality should encourage the private sectors to involve or participate in solid waste management of the town.
- The community should be involved in doing waste separation at source, waste reduction and recycling as a habit and way of life.
- The municipality in collaboration with Community Based Organizations, Non-Government Organizations and private sector should educate people on simple household compositing systems

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Authors Contributions

We developed the proposal, analysed the data and wrote the report and the manuscript. We read and approved the final manuscript.

Availability of Data and Materials

The datasets analysed during the current study are available from the authors upon request.

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