

Assessment of Solid Waste Management Trends of Bishoftu Households Community, Ethiopia, June 2017



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Abstract

Background: Poor waste management has been major problem to human existence. By 2025 urbanization in Africa, will have progressed from 32% to 50% with the urban population increasing from 300 million-ton to 700million proper waste disposal management is essential to sustain health living condition in any environment.

Method: It was a descriptive quantitative cross-sectional study applied to total of 403 residents of Bishoftu. The sample size was calculated using single population formula and allocated proportional to each study kebeles. Ethical issue was secured from concerned institution, official and respondents. Descriptive analysis was undertaken to answer the study objectives.

Result: Open dump inside the yard was the most popular method of waste disposal known to the respondents 193 (49.0%) followed by open burning 97(24.6%). Majority of the respondents 398(98.8%) agreed that proper waste disposal as it can be better to their health. About 399(98.9%) respondents believe private solid waste collectors were a lot contributor for proper waste management. Majority of respondents collect their waste in sack 370 (91.8%) and 16 (4.0%) were used plastic bag, about 382 (94.8%) dispose their waste in other day.

Conclusion: Majority of the residents had a positive attitude towards proper waste management, even though there was evidence to the contrary considering the discovery that the most prevalent methods of disposal were open dumping inside the yard and open burning. Strict adherence to appropriate waste management practice in any community will insulate the inhabitant from detrimental and hazardous environmental conditions and improve the living standard of the people.

Keywords: Waste management; Solid waste; Bishoftu; Ethiopia

Abbreviation BTM: Bishoftu Town Municipality; CBO: Community Based Organization; CI: Confidence Interval; CO: Carbon Monoxide; FID: Foreign Direct Invest; HC: Hydro Carbon; HH: House Hold; ISWG: Industry Solid Waste Generation; MSSE: Micro and Small Scale Enterprise; MSW : Municipal Solid Waste; NOx: Nitrogen Oxide; PM: Particulate Matter; SBPDD: Sanitation Beautification and Parks Development Department ; SO2: Sulfur Dioxide; SPSS : Statistical Package for Social Science; SW: Solid Waste; SWM: Solid Waste Management; TPD: Tons per Day; TPY: Tons Per Years; UK: United Kingdom; UNDP: United Nations Development Program; WUP: World Urbanization Progress

Introduction

In the last fifty years, the world urban population has increased fourfold, and now around 50% of the world's population lives in urban areas, proportion that is expected to increase to 66% by 2050 (UN, 2014). While urban population grew rapidly without proper expansion of sanitation services. Spending on sanitation has not kept pace with growth and there are dramatic differences in infrastructure expenditure between cities in low and high in came countries. As a result, it is estimated that between 30% and 60% of the urban population in most nations is not being adequately served [1].

The present status of waste management in India, waste generation rates and waste generated in 360 Indian cities total represent 70% of India's urban population. The total MSW generated in urban India at 68.8 million tons per year (TPY) or 188.500 tons per day (TPD) [2]. The data collected indicate a 50% increase in MSW generated within a decade since 2001. In "business as usual scenario", urban India will generate 160.5 million TPY (440,000 TPY) by 2014 [2].

The composition of urban MSW in India 51% organics, 17.5% recyclable (paper, plastic, metal, and glass) and 31% of

inert. The moisture content of urban MSW is 47% and the average calorific value is 7.3Mj/ kg (1745kca/kg). The composition of MSW in the North, East, South and western regions of the country varied between 50-51 % organics, 16 -19% of recyclables, 28-31 % of inert and 45- 51% of moisture [2].

The study also found that open burning solid wastes and land fill fires emit nearly 22.000 tons per year of pollutants to the air in the city of Mumbai alone. These pollutants include Carbone monoxide (CO). Hydrocarbon (HC) particulate matters (PM), nitrogen oxide (NO_x) and sulfur dioxide (SO₂) plus an estimated 10, 0000 TEQ grams of dioxins (Furens) [2].

By 2025 urbanization in Africa, will have progressed from 32% to 50% with the urban population increasing from 300 million to 700 million (WUP, 2003). If such current trends prevail, majority of urban dwellers living with poverty and without access to basic sanitation services that affect public health adversely.

Southern Africa is expecting the world's highest population growth rates and in addition to this 40% of the population in southern Africa is now resident in urban areas (UNDP), 2001. This 40% is increasingly being joined by more and more people in search of a better living standard in the city (UNDP), 2001.

According to Galazewski South Africa is producing 500 million tons of solid waste per year, of the waste 2 million tons are classified as being hazardous. Ninety five percent (95%) of this waste generated be it hazardous, domestic or industrial waste is disposed of in the most common and cheapest method utilized in south Africa which is land filling. South Africa has an estimated total number of 1, 200 land falls which are being operated by municipalities (2012).

Solid waste has become an environmental threat in Zimbabwe as well. In Harare alone about 1040-1400 tons of waste are produced every day. The waste composition in Zimbabwe is mostly characterized by organic wastes with a moisture content of 55-75% making it very suitable for composting. However, of the 1040 tons of waste produced daily, only 180 tones is collected for disposal at open dumps which are the most prevalent disposal site of waste [3].

In china with fast economic growth driven by rapid industrialization, the total amount of ISWG has increased (with an average annual increase rate of 11.5%) from 587.59 million tons in 1990 to 2409.44 million tons in 2010 [23]. Due to the constant increase of ISW disposed and utilized (the amount of increase was 4.9 and 4.58 times, respectively, during 1991-2010), the amount of ISWD in the last couple years showed a decreasing trend which can be divided in to two phases; during 1991-1997, it showed decreasing trend, after 1997, the amount of discharge looped forward 70.48 million tons in 1998, then the continuous decreasing trend appeared again during 1998-2010 [4].

In general, China has made great progress in ISW management which is represented by the significant decrease of discharge and increase of utilization ratio. As the second largest economy in the world, China has become the largest SW generator in the world since 2004 owing to the unprecedented rate of urbanization. Industrialization and steadily improving living standards.

According to the projection of the world Bank (2005), the total amount of SW in China will be over 480 million tons in 2030. The investment in SW treatment equipment and infrastructure increased 7.94 times, over 3.95 times more SW was treated or disposed of safely from 1991-2010. However, compared with developed countries, such as Germany, Japan, Sweden, the Netherland, China still has a long way to go in the sustainable management of SW (especially for municipal solid waste, MSW) with respect to reduction, recycling, reuse and safely treatment technology and strategy [2,4,5].

Zimbabwe has a total population of 11.63 million. 36% of this population resides in urban centers. Those who reside in rural areas make up about 64% of the total population. The various solid waste methods in Zimbabwe, municipal convection 87.5% the municipality never collected, only 12% of the waste collected by municipality, 46% waste disposed in open damping, 17,5% recycling and reusing practices 35% waste separation practice, 36.4% composting of waste practice [2].

Assessment done on waste management practices among residents of owerri municipal IMO state of Nigeria. Majority of the respondents 90.1% (254) were aware of waste managements. Open damping was the most popular method of waste disposal known to respondents to under 79(98.9%), followed by burning 94.7% (267). Incineration recorded the list known waste disposal method. Majority 97.5% (275) agreed that proper waste disposal can better their healthy and 98.9% agreed that the practice of waste management is of great importance.

Addis Ababa's per capital solid waste generation rates is 0.45 kg/c day and more than 200,000 tons of waste is collected each year. From this amount of waste 76% produced from households, 18% from institutions, commercial centers, factories and hotels, and the rest 60% is from street sweeping [6].

The study done in Dessie town that indicate Dessie town municipal solid waste management service is very weak in terms of status, special coverage and solid waste management facility. Presently, in the town there are no public solid waste storage containers and roadside dust bins. As substitution of these facilities there are 9 communal solid waste transfer station that give service only to MSSE waste collectors. Very pure solid waste management practice of the town house holds [7].

The rapid and mostly uncontrolled demographic growth and spatial expansion of large cities in developing countries often results in considerable damage to environmental sanitation.

This particularly true in Oromiya region, Eastern shewa zone Bishoftu town [8].

Geographical condition of Bishoftu city

The construction of the railway (between 1896- 1917) was immediate factor for the city was establishment. There for, the city was established at 1917 and its attainment of municipal administration in 1943. Bishoftu is a city and separate district located in the East shewa zone at 47km south of the capital city of the country. Addis Ababa on the main road to Adama. According to the population and housing censuses of 2007, the total population of the city was 100,114 of whom 52.1% were women. The absolute location of Bishoftu is 8° 45'N latitude and 38°59'E longitude. Topographically the city is located in tepid to cool sub-moist mid high land at an altitude of about 1920 meters above sea level with moderate weather condition. The temperature of the area falls within a range of 16°C and 24°C. Bishoftu is truly a sort city, known for 7 crater lakes; Bishoftu, lake Hora, lake Bishoftu guda, lake Kuriftu, lake kilole, lake Hado, and the seasonal lake chaleleka.

Bishoftu town is characterized by rapid population growth caused by high birth rate migration emerging of industrial areas. According to 1994 national census report the town had 11,163 total population, while in 2009 national census it reached 131,612 with a growth rate of approximately 2.9% annum, such rapid increase in population together with rapid development of the town has produced an increasing volume of solid waste and in turn it induced greater infrastructural demand [7].

Existing situation and management of solid waste disposal site of Bishoftu town

Solid waste collection and transportation is not an end to solid waste management. Proper solid waste management also requires proper disposal of waste in an appropriate place. In view of this Bishoftu town solid waste disposal site and its management were inadequate and below the standard. The site called Golba is located about 2 km from the center and is generally described as an open and unsanitary land fill site. Under such conditions the site has been functioning for the last 26 years [7] (Figure 1).



Figure 1: Partial view of traditional open land fill of the city called Golba solid waste site of Bishoftu town.

Institutional arrangement and capacity of municipal solid waste management of Bishoftu Town

It is a common perception that improving solid waste management means making waste collection and disposal system more efficient, raising public awareness and enforcing solid waste management laws. However, a prerequisite for all these factors are well planned management operating within an enabling institutional framework and capable of generating financial resources required to meet operating, maintenance, and investment costs [7].

Organizational structure of sanitation, beautification and parks development Bishoftu town

It is obvious that for municipal solid waste management of

any town, there should be a well arranged and capable institution. The opening place towards building of this type of institution began from building a clear, short and efficient organizational structure of responsible institutions of the town solid waste management.

In line with these issues, Bishoftu town municipal solid waste management system is organized under the jurisdiction of the municipality in one of its work processes called sanitation, beautification, and parks, Development department. SBPDD structure with constituting solid waste management town beautification and parks development together. The town SBPDD is directly accountable to Bishoftu town municipality office. Its internal arrangement constitutes one work process manager and two different case teams [7] (Figure 2).

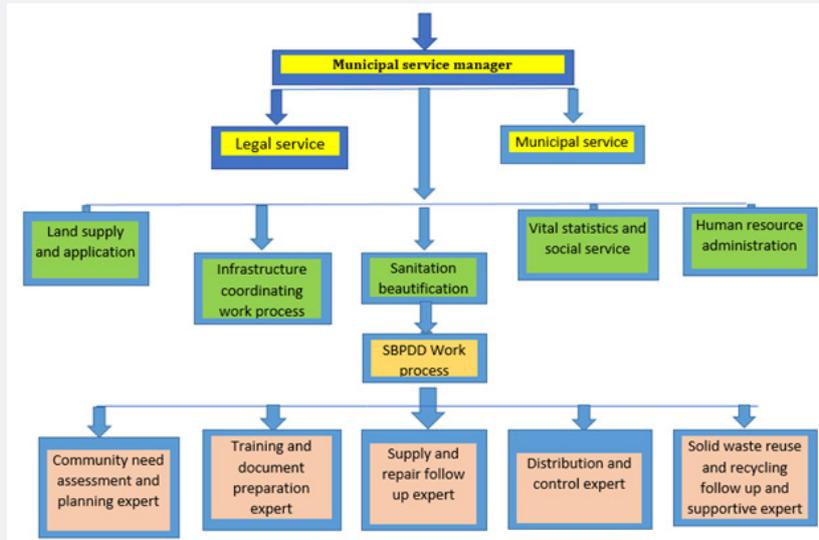


Figure 2: Bishoftu town SBPDD organizational structure 2015.

Institutional mandate of bishoftu sanitation, beautification and parks developments [8]

- a) Contrary to the crucial goal and objective of SBPDD, the mandate given to the department is only limited to MSWM service provision i.e. collection, transportation and disposal of town’s solid waste. But other related critical mandate is given to the town’s law and order enforcing office and health office according to the new organization structure.
- b) For instance, law and order enforcing office has the responsibility to control illegal solid waste disposal and penalize dwellers when they throw wastes in UN authorized place. Whereas health office has the following mandates.
 - i. Formulate rules and regulation related to solid waste management.
 - ii. Undertake public awareness creation programs.
 - iii. Monitor and supervise town sanitation service.
 - iv. Contact municipality to pickle waste frequency, and to construct solid waste infrastructures for those who do not

have such facilities.

Inter - organization linkage of sanitation, beautification and parks development department of bishoftu

Based on the strategic plan of SBPDD of Bishoftu town, there are several organizations which are identified for cooperation in solid waste management of the town. These are town administration office, head office, law and order securing office urban agricultural office, micro and small enterprise office, information and communication office and kebele. Based on this strategic plan, all the above organizations have their own responsibilities which are expected to play in sanitations, beautification and park development of the town [8].

Primary collection and transfer stations of solid waste disposal in Bishoftu town

- a) The door to door collection of solid waste from households, institutions and commercials area is conducted by 15 privet association solid waste management 3 private association within segregation.



Figure 3: Part of solid waste collection activities of the study city.

b) The responsibility of the waste generators to accumulate the solid waste within bags and wait till the collector comes and regularly collect the garbage (Figure 3).

i. Some part of the street sweeping was outsourced to small and micro business group; the remaining are covered

by the city temporary 62 employees covered by the city service itself.

ii. Currently there is limitation for large containers for solid waste (garbage) storage in the city [8] (Figure 4).



Figure 4: Solid waste storage container of the study city.

c) Bishoftu town is characterized by rapid population growth caused by high birth rate migration emerging of industrial areas. According to 1994 national census report the town had 11,163 total populations while in 2009 national census it reached 131612 with growth rate of approximately 2.9% annum. Such rapid increase in population together in rapid development of the town has produced increasing in volume of solid waste and in turn it induced greater infrastructure demand, institutional set up and community participation for its management. But, the town sanitation, beautification and parks development department (SBPDD) which runs the solid waste management activities of the town could not fulfill the above requirement. For instance, currently SBPDD has practice its activity by supplying 2 trucks for the transportation and disposal of the town solid waste, in addition to this, there is a limitation of public solid waste storage container and almost no road side dust bins, so that is highly suffered from shortage of solid waste management. Therefore, this study is focused on assess and ex-

amining status and coverage of municipal solid waste management service of the knowledge attitude and practice side by side with household solid waste management [8].

Composition of municipal of solid wastes of Bishoftu town

a) As it indicates in review of literature past municipal solid waste is a term usually applied a various mixture of solid waste produced in urban areas. But commonly urban waste can be sub divided in to two major components called biodegradable and non-biodegradable

b) The biodegradable components of urban solid waste constitute organic waste such as food waste, garden waste, agricultural waste which undergoes biological degradation under controlled conditions and can be turned in to compost or organic fertilizer. While non-biodegradable wastes include inorganic materials which can't be decomposed and degraded [8] (Table 1).

Table 1: Solid waste generation per day, 2015, Bishoftu town [30].

No	Keble	Total No of Population	Male	Female	Waste Generation per Day(kg)	Waste Generation per Year (kg)	Waste Generation per Year (ton)	Yearly Waste Generation (m ³)
1	1	18925	9084	9841	9084	3315660	3315.6	10526
2	2	21464	10301	11160	10301.28	3759967	3159.96	11936.4
3	3	8907	4275	4632	4275.36	1560506	1544.56	4953.98
4	4	8816	4232	4582	4231.68	1544563	2383.42	4903.37
5	5	13604	6530	7074	6529.92	2383421	2082.42	7566.41
6	6	11886	57059	6181	5705.28	2082427	3394.14	6610.88
7	7	19373	9299	10074	9299.04	334149.6		10775

8	8	9722	4667	5055	4666.56	1703294	1703.29	5407.28
9	9	15204	7298	7906	7297.92	2663741	2663.74	8456.32

Method

Study area

The study was conducted in Bishoftu town. Although a Woreda administrative center, Bishoftu town is the fourth largest urban center in Oromia region in population size next to Adama, Jimma and Shashamene and indeed one of few towns in the country with a population of over 100,000.

The geographical location of Bishoftu town is at 8°44'40' N, Latitude and 38°59'9' E Longitude and covers about 5,444 hec-

tors of area [8]. It is found in Oromia region, east Showa zone of Ada'aworeda. The town has got a first rank urban grade level as per the classification of urban grade levels of Oromia region urban centers. Bishoftu town is found at about 47kms to the south east of Addis Ababa and situated between Dukam and Modjo town along Addis Ababa -Djibouti road. Due to its proximity to the national capital, Bishoftu was very important for the attraction of both domestic and foreign direct investment (FDI). It shares part of the Great East Africa Rift valley, hence, endowed with several lakes, hot springs and crater lakes (Figure 5).

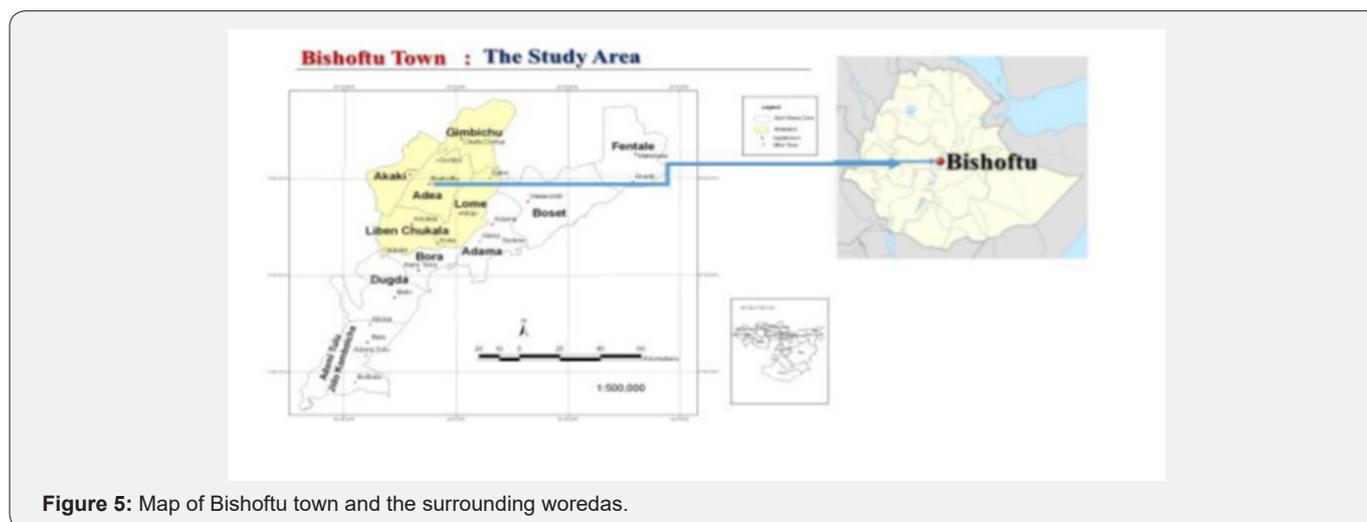


Figure 5: Map of Bishoftu town and the surrounding woredas.

Study design

This was cross sectional quantitative study design with the use of interviewer method

Source population

The study population was bishoftu municipality solid waste collectors, micro and small-scale enterprises, and Bishoftu town household.

Study population

The population that was studied Bishoftu municipal solid waste collector, micro and small-scale enterprise those are found on the study period and the study included households who are residents in Bishoftu municipal for at least a period of one year.

Sampling procedure

In order to collect primary data, we are used three different sample size with different sampling procedure. The first sample size was designed for collection of data from households on their solid waste management practice, and their attitude towards

MSWM practice of the town.

For deciding this sample size, we used three stages.

- a) We identified the total kebele of the town and identify total number of households in the town.
- b) The second stage was identified number of households in each kebele.
- c) We took a total sample size of 403 household from nine kebeles in general. This was calculated in a means of single population formula approaches.

The second sample size determination was used for examining institutional arrangement and capacity of the town sanitation, beautification and parks development which is responsible for town Solid waste management. According to the manual SB-PDD of Bishoftu town, the department has a total of 62 employees who work on solid waste management aspect for this study. We were taking Bishoftu municipal beautification and park supervisor (Table 2).

Table 2: Proportionally allocated sample household bishoftu, 2017.

Kebele	1	2	3	4	5	6	7	8	9
Number of households in each kebele	4318	3681	1528	1662	2333	2036	2100	1667	2608
Sample proportionally allocated to each kebeles	79	67	28	31	43	37	39	31	48

Sample size determination

The sample size of the study was determined by using single population proportion formula considering 50% with the marginal error of 5% and non-response rate of 5% at 95% CI.

$$n = \frac{Z\alpha^2xp(1-p)}{d^2} = (1.96)^2 \times 0.5(1-0.5)/(0.05)^2 = 384$$

Where n=the total sample size.

P=population proportion estimated to have characteristics being 0.5.

Z=value of that corresponds to 95% confidence interval 1.96.

d=the level of statistical significance (allowable error) (0.05).

So, if 5% non-response rate is assumed $384 \times 0.05 = 19.2$ then $384 + 19 = 403$.

Data source and method of collection

In this study we used both primary and secondary data source. For gathering primary data employed questionnaires, interviews, and filed observations. Regarding to questioners, there were two types of questioners (both open and close ended) which were prepared in order to look the MSWM practices and capacity of town together with households' solid waste management activities. These questioners were first prepared in English but later it translated into Amharic for making it easily understandable to samples. After preparation around 30 questioners were randomly distributed as per test in order to correct unclear and misleading questions. Then all questioners were brought to samples with the help of six group member's data collector. Moreover, primary data were also gathered with the help of semi-structured and unstructured interviews with SBPDD head and workers about the overall, solid waste disposal issues institutional setting, capacity and constraints of SBPDD. Apart from these, we are used field observation and field assessment as a major data sources for this study. Field observation who's employed for assessing spatial distribution of MSWM, infrastructures, households solid waste handling practices, illegal dumping, solid waste collection and transportation systems and disposal site of the town. Photographs were taken during field observation for partial exposure of transfer station, disposal site, illegal dumping of residents.

On the other hand, secondary data were extracted from different sources including published and unpublished materials from administrative office, SBPDD, municipality and health office of Bishoftu town.

Inclusion Criteria

- Those household available during data collection period.
- Those volunteers to participate on the data collection.

- Those houses hold owner or any participant that had full information about the study subject and age greater than 18.

Exclusion Criteria

- Solid waste collectors whom couldn't able to communicate Amharic language.
- Involuntary house hold.
- Those not present during data collection period.
- Those less than the age of 18 years and not have rich information about the study subject or any new comer to that house hold.

Study variable

Dependent variable

- Trend of solid waste disposal.

Independent variables

- Demographic variables.
- Knowledge and Perception about wastes and its managements impact.

Data analysis

The collected where coded on a prearranged coding sheet and entered to version 20th SPSS statistical software. Data was cleaned, and the missing values were evaluated, a descriptive statistical percentage and frequency distribution and dependent and independent variables were done; appropriate tables and charts figures was constructed for selected variables.

Ethical consideration

Permission for this study was obtained from the Bishoftu municipality though the head, kebele administer, informed consent was gotten from the respondents and confidentiality of information was maintained. The collection procedure did not have any harm to the study participant and the community.

Results

Socio demographic characteristics

A respondent rate was 100%. Most of the study population 131 (32.5%), age ranges between 38-47 with mean age of 44 ± 14.334 SD. females were made up of 45.9% (185), of the respondents whiles 54.1% (218) were males.

Regarding to religion 320 (79.6%), 57 (14.2%) and 26 (6.4%) were followers of Christian and Muslims and others religious respectively among the study subject 218 (54%) were Oromo, 73 (18%) Amhara, 10 (2.4%) Tigre, 102 (25.3%) were others.

Three hundred and fifty-six (87%), were literate, among those 85 (21.1%) graduated of higher education, 50 (12.4%)

were technical or vocational, 151 (37.5%) were completed secondary school (9th-12th), 67 (16.6%) were primary school (1th-8th) grade and the remaining 50 (12.4%) are illiterates. among the respondent 184 (45.7%) were private employees, 113 (28.0%) governmental employees, 52 (12.9%) retired, and the remaining 54 (13.3%) unemployment (Table 3).

Table 3: Socio demographic characteristics of respondent of study participants in Bishoftu household, Ethiopia, 2017.

Sociodemographic Variable	Frequency(f)	Percentages (%)
Age		
18-27	56	13.9
28-37	80	19.9
38-47	131	32.5
48-57	70	17.4
58-67	40	9.9
68-77	18	4.5
78-87	8	2
Mean and SD	44±14.334	
Gender		
Male	218	54.1
Female	185	45.9
Religion		
Christian	320	79.6
Muslim	57	14.2
Others	26	6.4
Ethnicity		
Amhara	73	18
Tigre	10	2.4
Oromo	218	54
others	102	25.3
Educational Status		
Who can't read and write	34	8.4
Who can read only	7	1.7
Who can read and write	9	2.2
Primary school (1th - 8th grade)	67	16.6
Secondary school (9th -12th grade)	151	37.5
Technical or vocational school	50	12.4
Higher education	85	21.1
Occupation		
Unemployment	51	12.7
Governmental employment	113	28
Private employees	184	45.7
Retired	52	12.9
Others	3	0.6

Awareness, knowledge and attitude towards waste management

Most of the respondent 277(58.7%) were aware of proper waste management. Open dump inside the yard the most popular method of waste disposal known to the respondents

193(49.8%), followed by open burning 97(24.6%). Incineration which is the least known waste disposal method. Majority of the respondents 398(98.8%) agreed that proper waste disposal as it can be better to their health and 394 (97.8%) agreed that the practice of waste management has great importance. Also

399(98.9%) respondents believe private solid waste collectors association contributed for proper waste management.

On over all attitude rating, 269 (66.7%) had good attitude while 134 (33.3%) had poor attitude toward waste management.

Figure 2 Described that mass media (TV, Radio, Newspaper) was the commonest source of information 162 (37.5%) on waste management, followed by health personal health education which is 128 (33.2%) exhibition in good practice on sorting of recycling recorded on the third option which is 48 (12.5%) door

to door education recorded the least common means 6 (1.6%).

Table 3 Shows that majority of respondents collect their waste in sack 370 (91.8%) and 16 (4.0%) were used plastic bag, about 382 (94.8%) dispose their waste every alternate day. The commonest methods of solid waste disposal include open dumping 193 (44.8%).

Majority of respondents 392 (97.3%) said they satisfied about the solid waste primary and /or secondary collection service (Table 4 & 5, Figure 6).

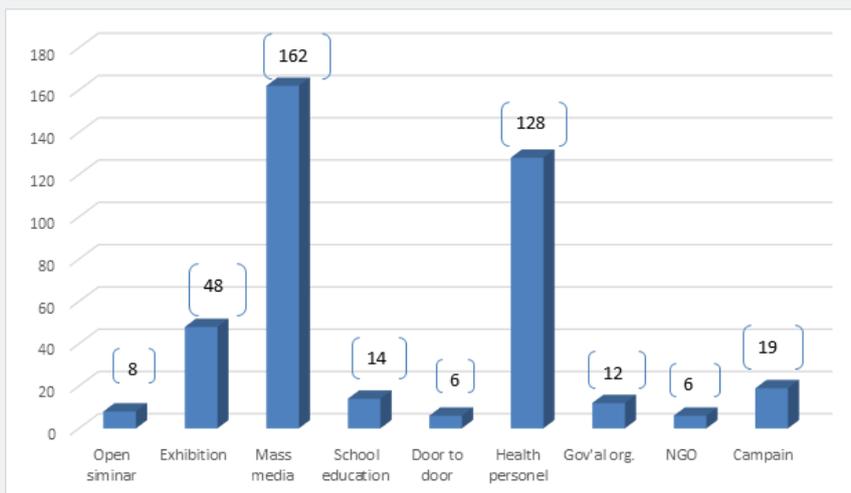


Figure 6: Source of information the respondent regarding solid waste management Bishoftu community, Household Ethiopia, 2017.

Table 4: Awareness and Attitude to Wards Waste Management study participants in Bishoftu household, Ethiopia, 2017.

Awareness and Knowledge Assessment Variable Question	Frequency(f)	Percentage (%)
Awareness		
Yes	277	58.7
No	126	31.3
Overall knowledge of waste management methods		
Good knowledge	224	55.6
Poor knowledge	179	44.4
Overall Attitude toward waste management		
Poor	134	33.3
Good	269	66.7
Specific attitude items		
Do you worry about access to solid waste primary and or secondary collection service?		
Yes	392	97.3
No	269	2.7
Are you satisfied with municipal solid waste containers available in your neighborhood?		
Yes	337	83.7
No	66	16.3
Do you value the benefit of proper waste management?		
Yes	398	98.8
No	5	1.2

Do you think that waste has a value?		
Yes	312	77.4
No	91	22.6
How important is spending money for solid waste collection to your family health?		
Leads to good health	394	97.8
I do not know	9	2.2

Table 5: Waste management practice study participants in Bishoftu household, Ethiopia, 2017.

Practice Assessment Variable	Frequency(f)	Percentage (%)
Method of Waste Collection		
Metal bin	4	1
Plastic bin	5	1.2
Plastic bag	16	4
Sack	370	91.8
Others	8	2
Frequency of Waste Management in a Week		
Every day	382	94.8
With two-day interval	10	2.5
With three-day interval	5	1.2
With one-week interval	4	1
Other	2	0.4
Method of Solid Waste Disposal Practiced		
Open dump outside the yard	4	0.99
Open spaces such as open ditch, river, roadside	3	0.74
Open dump inside the yard	193	49.8
Municipal container	51	12.7
Open burning	97	24
Use as compost	53	13.15
Other	2	0.49

Discussion

Socio demographic variables

Majority of the respondents were aged between 38-47(32.5%) followed by ages of 28-37(19.9%), the range of between 78-87 years (2.0%) recorded least occurrence.218 (54.1%) of respondent were males while 185(45.9%) were females. The great number of male respondents in this study is a reflection of higher level of interests expressed by the male gender unlikely as reported on the study done in Addis Ababa only female for household tasks [6]. Men again it takes responsibility regarding to solid waste in the home. However, women commonly reported performing the job of moving the lawn or taking out the rubbish better than their partners, and as a result assumed the responsibility of completing these taxis themselves [6]. This study also revealed that a sizable of the respondent 151(37.5%) had secondary school, higher education 85(21.1%), primary school 67(16.6%) and just about 34 (8.4%) with no formal education. This is unlike the work done by Margaret banga on house

hold knowledge of solid waste segregation in urban Kampala which should that only about 30.5% of the respondent had attend secondary school and 43.8% attend primary level education, while 17.5% had attend tertiary level education [9].

Awareness, knowledge and attitude towards waste management

The most popular method of waste disposal known to the respondents 193(47.8%) were open dump inside the yard, followed by open burning 97 (24%), while the least known method was incineration. This scenario is not very different from findings on other studies. Open dumping remains the simplest and the most commonly used method for disposing municipal solid waste [10]. In most low to medium income developing nations like Nigeria, almost 100% of generated waste goes to landfills [11]. In spite of the of the recycling and composting of greater amount of municipal solid waste in the united states in the last couple of year, the majority of waste generated still end up in landfills [12]. While wastes are deposited in open dumps in de-

veloping nations; these have become obsolete in the developed countries. Sanitary landfill which are well engineered facilities (with liners, leachate collection treatment system, and gas collection of human health and the environment. These modern landfills are often under strict federal and state regulations and are there for special sited, designed and operationalized to ensure environmental performance [12].

Most of the respondents had a positive attitude towards waste management as 269(66.7%) of the respondents agreed that proper waste disposal can better to their health and 398(98.9%) believed that the practices of waste management are of great important.

Household waste management practices

Majority numbers of our respondents 91.8 % (370) collect their waste in sack and few number 4.0% (16) used plastic. This is in line with outcome of study done by Solomon Cheru which reported that 90% of the house in Dessie stored their wastes in very poor condition outside the houses [7]. This study has created a general picture of poor waste management practices among residents of Bishoftu town municipal because 49.0% (193) of the respondent practice open dumping inside the yard while 24.6% (97) preferred to open burning their wastes.

These are not ideal since they constitute potential source of infection, air pollution as well as constitute aesthetic blithe. This finding however does not agree with the Modebe et al. [13], which showed that majority of the respondents in Awka (73%) disposed their waste through government waste management agency and only 27% dumped there in unauthorized area. This is an indication that the residents of Awka enjoy the benefit of existing strong and functional government waste management agency. The result is a better coordinated waste management practice in Awka than obtain in Bishoftu municipal.

Currently there is limitation for large containers for solid waste (garbage) storage containers the study that is done in Dessie town indicated this. In this study male were found to be more aware and knowledgeable about waste management than females [14-32].

Conclusion

- a) The study found that large number of the residents was aware of waste management and also knowledgeable about various methods of waste disposal. Majority of the residents had a positive attitude towards proper waste management, even though there was evidence to the contrary considering the discovery that the most prevalent methods of disposal were open dumping inside the yard and open burning. These are inappropriate as they pollute and constitute aesthetic blithe in the environment.
- b) Proper waste disposal management is essential to sustain health living conditions in any environment. Strict ad-

herence to appropriate waste management practices in any community will insulate the inhabitants and improve the living standard of the people.

Limitation of the study

- a) The study didn't include some private sector because we didn't get their address during our study period and another limitation the municipality that used as a technology composting site not included in the study period due to time burden.
- b) it's also better if it was triangulated with qualitative data but we missed this.

Recommendation

Based on the findings of this, the following majors are very important to overcome MSWM problem of Bishoftu town.

Education related measures: The resident Bishoftu town have lack of awareness and practice about solid waste management issues this clearly indicates the need public awareness creation activities. So that the SBPDD as well as healthy office of the town should delivery adequate training and awareness creation to residents about side effects of solid waste and application of sustainable solid waste management practice

Institution related measures: Give majority of MSWM related mandates to SBPDD of the town since the fundamental part of MSWM activities are performed by this body. Prepare sound SBPDD institutional arrangement that is free from high interferences of higher officials and bureaucracy which have both horizontal and vertical integration and kebele specific teams, allows participation and characterized by real decentralization of tax and authority. Prepare specified rules and regulations that focused on local problem such as institutional issues about the towns MSWM service responsible body stakeholders' participation and sustainable solid waste management option and strictly enforce this rules and regulation under close supervision and enter organizational linkage.

Stakeholder related measures: Promote and initiate communities and different CBOs of the town to involve in solid waste management. In addition, organize voluntary groups that work on MSWM through giving different incents and providing necessary equipment's that used for solid waste management. Recognizing and encouraging the emerging role of crafts through reduction of taxes, and by providing space and equipment's to produce recycle materials and creation of market for it.

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