An assessment of the availability of water sources and hygiene practices in response to the Cholera outbreak in Harare City, Zimbabwe, 2018

Tsitsi Juru[1,&], Tsitsi Kagodora[1], Christyna Tambanemoto[1], Tendai Chipendo[1], Tapiwa Dhliwayo[1], Memory Mapfumo[1], Arthur Kashiri[1], Notion Tafara Gombe[1], Gerald Shambira[1], Ruby Tapera[2], Mufuta Tshimanga[1]

[1]Department of Community Medicine, University of Zimbabwe, [2]City Health Directorate, City of Harare, Zimbabwe

[&]CORRESPONDING AUTHOR
Tsitsi Juru, Department of Community Medicine, University of Zimbabwe. Email: tsitsijuru@gmail.com

RECEIVED
30/01/2019

ACCEPTED
16/04/2019

PUBLISHED
23/04/2019

LINK

www.afenet-journal.net/content/article/2/8/full/

CITATION
Tsitsi Juru et al. An assessment of the availability of water sources and hygiene practices in response to the Cholera outbreak in Harare City, Zimbabwe, 2018. J Interval Epidemiol Public Health. 2019 April; 2(1):7

Abstract

Introduction: Cholera is an acute diarrheal disease that has a substantial impact on public health. Harare city reported the first cholera case on the 5th of September 2018, and by the 23rd of September 2018, 6403 cases and 43 deaths had been reported (case fatality rate 0.67%). Health promotion on hygiene practices was given through social media and door to door campaigns; however, cases continued to increase in the city. We therefore assessed the availability of water sources and hygiene practises in Harare city. **Methods:** We conducted a mixed methods study that combined quantitative and qualitative methods. A structured researcher-administered questionnaire and an observational checklist were used to collect data. Systematic random sampling of 156 dwellings was done in Glen View 3, 8 and Budiriro 1 and 2 was done. Epi Info ™ statistical software was used to capture data from records and to generate, frequencies, means and proportions. **Results:** Forty-eight percent (74/156) and 34% (53/156) of the respondents used borehole water and piped water as their main sources of drinking water respectively. Sixty percent (93/156) of the households did not use any water treatment method. Sixty-two percent (96/156) of the respondents washed their hands after using the toilet whilst fifty-two percent (81/156) of the households did not have clean toilets. A proportion of 63% (98/156) of the households did not have soap for hand washing. The predominant methods of refuse disposal were; disposal on a dumpsite (52%) and burning (47%). **Conclusion:** The main source of drinking water in Glenview and Budiriro was borehole water; inadequate sanitation and hygiene practices were being practiced in Harare city. The city Council should consistently provide residents with safe and clean water and should ensure consistent refuse removal in the city.

Introduction

Cholera is an acute diarrheal disease that has a substantial impact on public health. It is caused by the bacteria *Vibrio Cholerae,* through the faecal oral route [1]. The onset of symptoms ranges between several hours and five days, with an average incubation period of 2-3 days. Rapid loss of body fluids is common, and without treatment cholera can cause in death within several hours [2].

Globally, cholera represents an estimated burden of 1.4 to 4.0 million cases, and 21 000 to 143,000 deaths per year [3]. Africa bears the highest burden of cholera in the world, accounting for 54% of the 132,121 cholera cases in 2016 [4]. Outbreaks occur in any part of the world where water supplies, sanitation and hygiene practices are inadequate. Communities with poor sanitation and unsafe water supplies are most frequently affected [5].

According to the World Health Organisation, access to safe water is a basic requirement for health. Efforts must be made to provide safe water for drinking and food preparation since contaminated water is the usual source of cholera infection [6]. In urban areas, properly treated drinking water should be made available to the people through a piped system, where there is no source of treated water people should be empowered to make water safe by boiling or adding chlorine releasing chemicals [6-7].

Peaks in cholera cases are seen in areas that do not have piped water system and household chlorination of water is more dependent on the hygiene practices of the people [8]. Furthermore, appropriate facilities for human waste disposal are needed in communities and in their absence there is high risk of cholera outbreaks [6, 9].

The cholera outbreak in 2008 was by far the largest and most extensive outbreak recorded in Zimbabwe [10-12]. Unlike previous outbreaks, most cases appeared in urban centres far from the borders with endemic neighbouring countries. The underlying cause for the rapid emergence of cholera in urban areas was believed to be through contaminated water, food, and the breakdown of water supply and sewage disposal [10, 13].

On 5th of September 2018, Harare city reported the first cholera case and by the 23rd of September 2018, 6403 cases and 43 deaths (case fatality rate of 0.67%) had been reported. Most cases came from Glenview 3 and 8, and Budiriro 1 and 2. An analysis of the cholera epi-curve as at 10 September 2018, suggested a point source outbreak; however, the epi-curve as at 15 September indicated a propagated outbreak. The change in the mode of spread of the cholera highlighted probable person-to-person transmission of cholera, an indication of poor hygiene practices in the city. Cholera transmission continued despite the efforts of the city in providing health education on hygiene practices through social media and door-to-door campaigns to the public. We assessed the hygiene practices on cholera prevention and availability of water sources in Harare city, 2018.

Methods

Study Design and Setting

We conducted a mixed methods assessment that combined quantitative and qualitative methods. The study was conducted in the highly populated Glenview and Budiriro suburbs which are located in the West South West district of Harare City. The population for Glenview and Budiriro is approximately 250,000 according to the Central Statistics Office census report (2012). The main source of livelihood for the people is small-scale entrepreneurship and vending. Glenview suburb has a large furniture industry offering informal employment to the residents in Harare including Glenview and Budiriro. The district has socio-development challenges such as dilapidated roads, run down general infrastructure including the water and sewer system amidst a high population density. We conducted the study during September – October 2018 cholera outbreak.

Study population

The study population was residents of Glenview and Budiriro suburbs.

Sample size

We calculated a minimum sample size of 156 respondents using the Dobson's formula according to a study by Mudau *et.al* (2017) [14]

Sampling

We conducted a proportionate stratified sampling in selecting our respondents. We came up with a sampling frame of 7205 households in Glen View and 4295 households in Budiriro. Ninety-seven (97) households in Glen View and fifty-nine (59) households in Budiriro were proportionately sampled according to the cholera burden for each suburb, using the September 30th situation report. We conducted a systematic random sampling method to recruit participant dwellings in each suburb. The first dwelling was selected randomly using the lottery method. Subsequently, every tenth dwelling after the first had been selected was systematically selected for inclusion into the study. The head of each household was interviewed and if they were not available, a representative member of the household was interviewed.

Data collection

Data collection occurred in October 2018. Interviewer administered questionnaires were used to collect information on water sources and hygiene practices from residents. An observational checklist was used to assess hand-washing practices, household water storage, cleanliness of the toilets, and refuse disposal methods of the residents. A focused group discussion was done with residents to assess their views on water supply and sanitation services by the city council.

Data Analysis

Epi Info ™ 7 statistical software was used to capture and analyse data. The software was used to calculate frequencies, measures of central tendency and proportions.

Permission and Ethical considerations

Names of interviewed study participants were not captured. This was achieved by assigning an anonymous identification number to each data collection tool during data capturing, and analysis. Written informed consent was sought from the study participants before proceeding with data collection. Ethical approval and Permission to proceed was obtained from the City Health, Harare City IRB and the Health Studies Office IRB.

Results

Descriptive Epidemiology

A total of 156 respondents were interviewed in Glenview and Budiriro. The median age of the respondents was 32 years (Q1=27 years; Q3=39 years). The median number of people in each of the dwelling was 11 (Q1=8, Q3=13) Table 1.

The sources of drinking water

Forty-eight percent (74/156) of the respondents used communal borehole water whilst 34% (48/156) used piped water as their main sources of drinking water. Thirteen percent (20/156) of the respondents relied on wells as their source of drinking water whilst only 1% (2/156) had bottled water as their source of drinking water. Figure 1

Household water treatment methods

Sixty percent (93/156) of the households did not use any water treatment method during the outbreak. Twenty percent (31/156) of the respondents used water guard (a chlorination solution for drinking water treatment) to treat water. Twelve percent (18/156) of the respondents used aqua tabs (effervescent tablets which kill microorganisms in water to prevent cholera, typhoid, dysentery and other water borne diseases), whereas 6% (9/156) of the respondents boiled their water before drinking. Figure 2.

Sanitation and hygiene practices

Sixty-two percent (96/156) of the respondents reported washing their hands after using the toilet whilst 72% (112/156) of the respondents washed their hands before handling food. Fifty-two percent (81/156) of the households did not have clean toilets. Sixty-three percent (98/156) of the households did not have soap for handwashing. Table 2.

Methods of refuse disposal

The predominant methods of refuse disposal were; disposal on a dumpsite (52%) and burning (47%). Twenty seven percent (42/156) of the households had their refuse collected by council whilst 10% (15) buried the refuse in the yard as shown in Figure 3.

Results from focused group discussions with residents

The following was noted from the focused group discussions with the residents in Glenview and Budiriro:

• There was inconsistency in the supply of piped water from the city council hence the residents resorted to using communal borehole water.

• The residents perceived borehole water to be safe for drinking and as such did not use any treatment methods.

• Residents reported that the city council piped water they collected in containers had sediments that settle at the base of the containers. These sediments were also observed in some of the water storage containers in the interviewed households during data collection. As a result the residents perceived piped water not to be safe for drinking.

• The residents reported that they cleaned toilets with used laundry water due to inadequate water supply. They also reported using dishwashing water more than once.

• Sewer bursts were observed in the low lying areas of Budiriro. Residents in these areas reported that the sewer bursts were frequent and not being attended to by the city council.

Discussion

In our study, the main source of drinking water was communal borehole water despite the study area being in an urban setting where the main source of water should be through a piped water system. This could be due to inconsistencies in the supply of piped water by the city council reported by the residents. Due to erratic supplies of water and unavailability of boreholes in some areas, residents resorted to using shallow wells as a source of water. Similar findings were highlighted in a study conducted in Nigeria where erratic supplies of piped water were noted and residents resorted to using unsafe alternative sources of water [14].

Furthermore, we found out that the majority of the residents did not use any water treatment methods. This could be attributed to the perception by the residents that borehole water is clean thereby using it without any treatment. Consistent with our findings, Mudau et al noted inadequate water treatment by communities after an outbreak, as they perceived it to be unimportant [15]. This highlights the need for effective interventions to improve household knowledge of preventive behaviours including household water treatment.

The spread of cholera continued despite health education messages through social media. The messages were based on the assumption that there were sufficient facilities to boil water and that chlorine based chemicals were accessible. It is however a challenge for people in Budiriro and Glen View to meet some of these criteria. The residents mostly relied on the chlorine based chemicals distributed by the Ministry of Health and international partners during the outbreak. In a study carried out in Malawi, the low rate of household drinking water treatment was noted and this was attributed to lack of regular access to household chlorination products, including water guard [16]. Findings from the study revealed that only 6% of the residents boiled their water before drinking. Consistent with our findings, a study carried out in Tanzania noted that only 14% of the respondents boiled their water for drinking [17].

Although most of the respondents in our study reported practicing handwashing before handling food and after visiting the toilet, there was no soap available for handwashing in the majority of the households. Access to basic commodities such as soap is a challenge in the community as most of the residents depend on small scale vending for a living. Our findings are consistent with a study by Zohura et al where soap was observed at only 7% of handwashing stations [18]. Handwashing with soap after toileting events and before eating and handling food can reduce rates of diarrheal disease by nearly a third [17]. Therefore, interventions targeting improved hand hygiene in high-risk communities are of critical public health importance.

Additionally, the majority of the households in our study did not have clean toilets. Inconsistencies in the supply of water, coupled by the large household size of 11 people sharing the same toilet, could have resulted in the residents not prioritising maintenance of their sanitary facilities. In a study carried out in

Kpakungu, Nigeria (2014) an inadequate water supply was shown to prevent good sanitation and hygiene [14]). Poorly maintained toilet facilities contribute directly to environmental faecal contamination and results in serious and widespread cholera and other diarrheal diseases [19].

In our study, we noted improper refuse disposal to be predominant in the households interviewed. We also observed heaps of rubbish in the streets where residents dispose of their waste. This could be due to inconsistency in the collection of refuse by the city council as reported by the residents. These dumping sites are major threats to human health and the environment. Consistent with our findings, Adeleye et al noted a lack of a proper waste disposal system in Nigeria which left the inhabitants with no choice but to dispose their waste either into water channels or open spaces [14].

Limitations

Our study was carried out in Budiriro 1 and 2, and Glen view 3 and 8 only, hence our results cannot be generalised to other settings.

Conclusion

Cholera outbreak in Glen view and Budiriro high density surburbs was attributable to unavailability of constant water supply by city authorities. Sanitation and hygiene practices such as handwashing and toilet cleaning, were compromised due to unavailability of water and soap. Refuse disposal was not routinely done and this resulted in residents disposing refuse by either burning or dumping.

Recommendations

The study recommends that Harare City Council consistently provide their residents with safe and clean water. The city council should ensure consistent refuse removal from the households. We also recommend an evaluation to assess evidence of behaviour change following hygiene messages to be done.

Public Health Actions

We also conducted Health education sessions at households in the community during data collection. Feedback was given to the Harare city health department, Ministry of Health, partners, and leaders in the Glen View, Budiriro community. Based on the recommendations the city council managed to collect refuse at least once a week whilst planning to implement long term sustainable measures for refuse collection.

Competing interests

The authors declare no competing interest.

Funding

This study was funded by AFENET through its support for ACoDD activities.

Authors' contributions

TK, CT, TC, AK, TD, MM, RT and TJ: conception, design, acquisition, data collection, analysis and interpretation of data. TC, CT, TK, AK, TD, MM, RT and TJ wrote the first draft of the manuscript. GS, NG, TJ and MT critically revised the draft for important intellectual content. All authors read and approved the final manuscript.

Acknowledgements

We would like to express our sincere gratitude to our field supervisors, for their guidance and to the staff at Harare city health department. Special thanks to the residence of Glen View 3, 8 and Budiriro 1, 2 for their support through participation in the study. Many thanks to AFENET for the support during the study. We would also want to express our gratitude to the Department of Community Medicine, University of Zimbabwe and Health Studies Office, Zimbabwe for all the help they rendered to us.

Tables and figures

Table 1: Demographic characteristics of residents in Glenview and Budiriro, 2018
Table 2: Sanitation and hygiene practices in Glenview and Budiriro, 2018
Figure 1: Sources of drinking water in Glenview and Budiriro. 2018

Figure 2: Household water treatment methods in Glenview and Budiriro, 2018
Figure 3: Methods of refuse disposal in Glenview and Budiriro, 2018

References

1. WHO. Water-related Diseases. WHO. 2019. Accessed January 2019.

2. UNICEF. . Water, Sanitation and Hygiene - Common water and sanitation-related diseases. UNICEF.2003. Accessed January 2019.

3. WHO. Number of reported cholera cases. WHO. 2019. Accessed January 2019.

4. WHO. Cholera. WHO. 2019. Accessed January 2019.

5. The Global Handwashing Partnership (GHP). Cholera and Handwashing Fact Sheet. The Global Handwashing Partnership.2017. Accessed January 2019.

6. Naidoo A, Patric K. Cholera: a continuous epidemic in Africa. The journal of the Royal Society for the Promotion of Health. 2002 Jun;122(2):89–94. **Google Scholar**

7. Phaswana-Mafuya N, Shukla N. Factors that could motivate people to adopt safe hygienic practices in the Eastern Cape Province, South Africa. The journal of African Health Sciences. 2005 Mar;5(1):21-8.**PubMed | Google Scholar**

8. Izadi S, Shakeri H, Roham P, Sheikhzadeh K. Cholera Outbreak in Southeast of Iran: Routes of Transmission in the Situation of Good Primary Health Care Services and Poor Individual Hygienic Practices. Japanese Journal of Infectious Diseases. 2006 Jun;59(3):174-8. **Google Scholar**

9. Hemson D, Dube B. Water services and public health: the 2000-01 cholera outbreak in KwaZulu-Natal, South Africa. 2004. Accessed January 201. **Google Scholar**

10. Mason PR. Zimbabwe experiences the worst epidemic of cholera in Africa. The Journal of Infection in Developing Countries. 2009 Mar;3(2). **Google Scholar**

11. Watyoka NN. An Assessment of the factors that lead to cholera outbreak in Harare urban district: A focus on International non-governmental organisations and United Nations personnel perspective. Global Journal of Advanced Research. 2016 Mar;3(3):189-99.

12. Mukandavire Z, Liao S, Wang J, Gaff H, Smith DL, Morris JG. Estimating the reproductive numbers for the 2008-2009 cholera outbreaks in Zimbabwe. Proceedings of the National Academy of Sciences. 2011 May;108(21):8767–72. **PubMed | Google Scholar**

13. WHO. Cholera country profile: Zimbabwe. WHO. 2009. Accessed January 2019.

14. B Adeleye, S Medayese, O Okelola. Problems of Water Supply and Sanitation in Kpakungu Area of Minna (Nigeria). Journal of Culture, Politics and Innovation. 20 Accessed January 2019. **Google Scholar**

15. Lutendo SM, Mukhola MS, Hunter PR. Cholera and household water treatment why communities do not treat water after a cholera outbreak: a case study in Limpopo Province. Southern African Journal of Infectious Diseases. 2017 Mar;32(1):5–8. **Google Scholar**

16. Bennett SD, Lowther SA, Chingoli F, Chilima B, Kabuluzi S, Ayers TL, *et al.* Assessment of water, sanitation and hygiene interventions in response to an outbreak of typhoid fever in Neno District, Malawi. PLoS One. 2018 Feb;13(2). **PubMed | Google Scholar**

17. Mpazi Veronicaa M, Mnyika Kagoma S. Knowledge, Attitudes and Practices Regrading Cholera Outbreaks in Ilala Municipality of Dar es Salaam Region, Tanzania. East African Public Health Association. 2008. Accessed October 2018. **Google Scholar**

18. Zohura F, Bhuyian SI, Monira S, Begum F, Biswas SK, Parvin T, *et al.* Observed Handwashing with Soap Practices among Cholera Patients and Accompanying Household Members in a Hospital Setting (CHoBI7 Trial). American Journal of Tropical Medicine and Hygiene. 2016 Dec;95(6):1314–8. **PubMed** | **Google Scholar**

19. Luby S, Mahbub-UI A, Farzana Y, Farzana B, Mahbubur R, Fosiul A N, Winch P, Unicomb L. Can behaviour change approaches improve the cleanliness and functionality of shared toilets?.Accessed January 20.

Table 1: Demographic characteristics of residents in Glenview and Budiriro, 2018

Variable		**Frequency (n=156)**	**Percentage (%)**
Sex	**Male**	43	27
	Female	113	73
Area of residence	**Budiriro**	62	40
	Glenview	94	60
Median age (Interquartile range)		32 (Q 1= 27, Q3=39)	
Median number of people in a dwelling		11 (Q1=8, Q3=13)	

Table 2: Sanitation and hygiene practices in Glenview and Budiriro, 2018 (n=156)

Variable	Yes (%)
Washing hands before eating	114 (73)
Washing hands after toilet use	96 (62)
Washing hands before handling food	112 (72)
Availability of soap for hand washing	58 (37)
How hand washing is done:	
Pour water from a cup	88 (56)
Outside the washing basin	36 (23)
In the washing basin	25 (16)
Clean toilet	75 (48)
Visible faecal residues around the drop hole	22 (14)
Visible faecal residues in the floor or wall	3 (2)
Visible used toilet paper	25 (16)
Surface flow of sewage	3 (2)

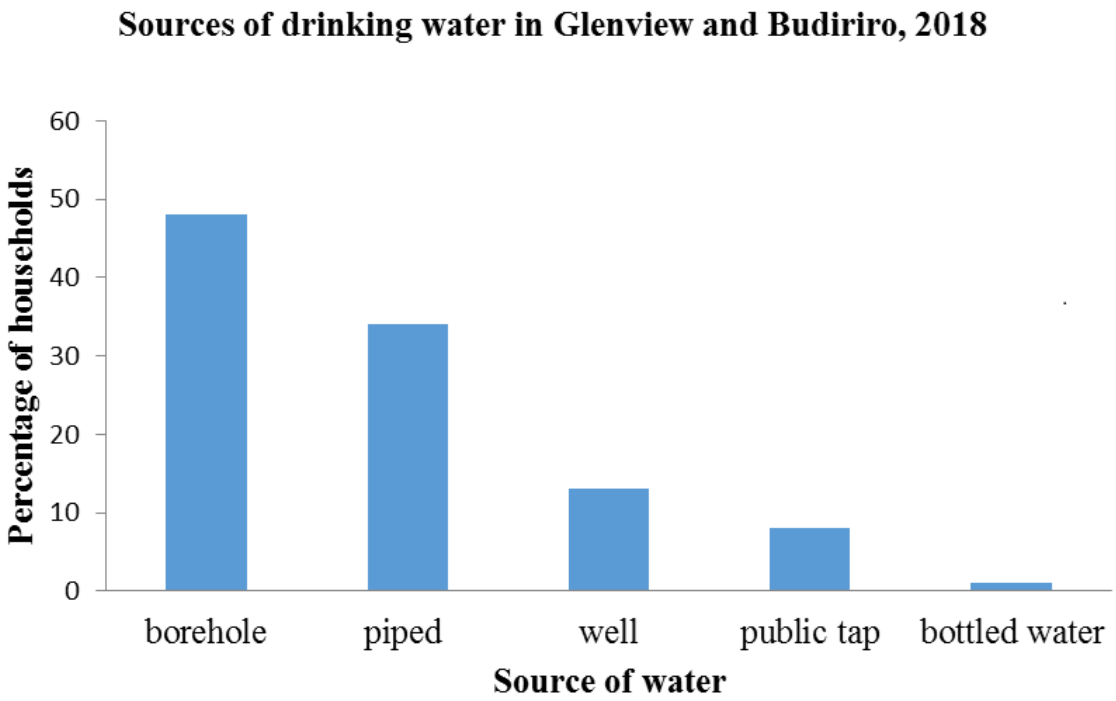

Figure 1: Sources of drinking water in Glenview and Budiriro. 2018

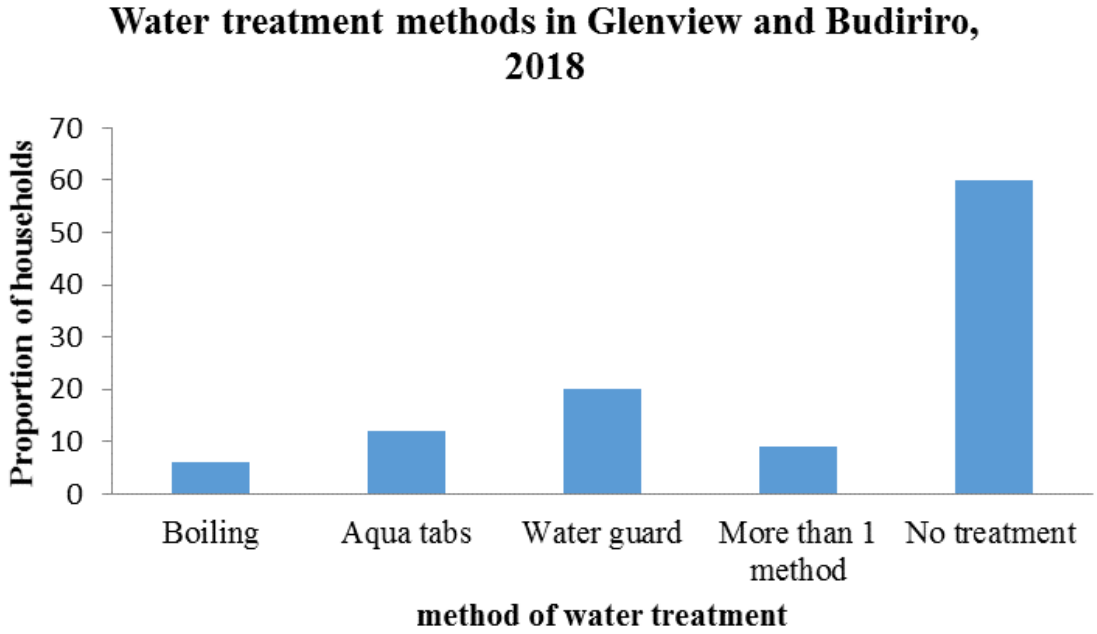

Figure 2: Household water treatment methods in Glenview and Budiriro, 2018

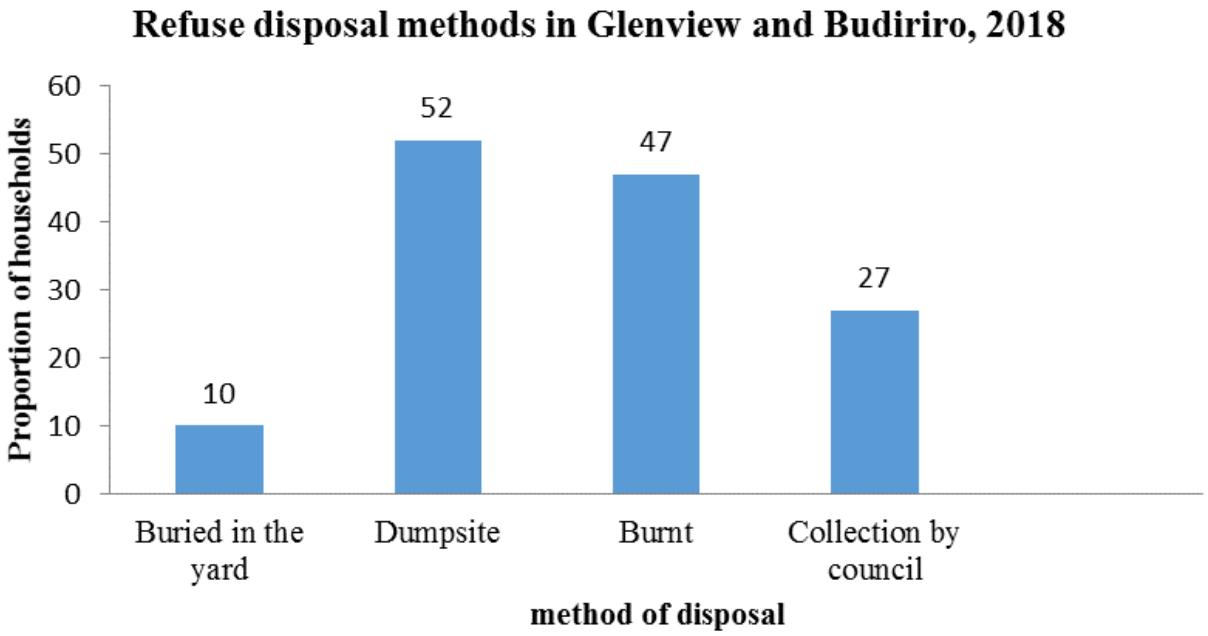

Figure 3: Methods of refuse disposal in Glenview and Budiriro, 2018