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Household solid waste management practices and associated factors in southwestern Uganda

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Abstract

Background: Solid waste management remains a major challenge in developing regions due to rapid urbanization, inadequate infrastructure, and irregular waste collection, which reduces incentives for waste sorting. The study assessed solid waste management practices and the associated factors among households in Isingiro Town Council, Isingiro District, Uganda.

Methods: A cross-sectional study was conducted in July 2024 in Isingiro Town Council, southwestern Uganda. Data was collected from 429 households using a structured questionnaire and an observational checklist. Data was entered, cleaned, and coded in MS Excel before analysis in Stata version 17. Descriptive, bivariate and multivariable analyses were performed at 95% confidence interval.

Results: The study included 429 participants, with most households generating organic waste (49.2%), followed by plastics (37.7%) and paper (8.7%). Improper disposal methods, such as burning (53.0%) and open dumping at 30.6%, were profiled. In terms of associated factors, occupation, plot size, proximity to disposal sites, and the presence of a household helper at home significantly influenced waste management practices. Households that engaged in home-based commercial activities were more likely to exhibit poor disposal practices (aOR = 1.8, 95% CI: 1.1–2.9; *p* value = 0.014), while those on medium-sized plots demonstrated better practices (aOR = 0.5, 95% CI: 0.3–0.97; *p* value = 0.041).

Conclusion: The study revealed poor solid waste management practices within Isingiro Town Council, with organic waste and plastics constituting most of the household waste. Socio-demographic factors such as occupation, land size, and household supervision play a significant role in shaping waste disposal behaviors. Effective waste management strategies should consider not only accessibility but also the capacity of households to manage waste based on their economic activities and living conditions.

Keywords: Solid waste management, Household practices, Waste disposal, Rural Uganda

1 Introduction

Waste in any form is currently impacting global efforts towards the attainment of environmental sustainability and public health goals [1, 2]. Solid waste refers to discarded materials such as refuse, garbage, sludge, and other solid residues produced from industrial, commercial, and agricultural activities [3], and it remains a major environmental challenge worldwide. The burden of solid waste is particularly pronounced in low and middle-income countries (LMICs) [4, 5], where rapid urbanization, inadequate urban planning and limited prioritization of solid waste management (SWM) by governments have resulted in widespread waste accumulation [6]. Globally, about 2 billion tonnes of waste are categorized as municipal solid waste [7], yet safe waste management systems and resources are lacking in many countries [8]. This exposes the majority of the population to public health threats due to improper waste management [8].

While solid waste management has been relatively well handled in developed nations, a significant portion of LMICs lack fundamental infrastructure for solid waste management [9–11]. Uganda, like many other developing countries, is facing rapid urbanization at 4.5% per annum [12].The practice of solid waste disposal in most urban areas in Uganda is such that wastes are disposed of by households and the general public in gardens, open dumps, fields, along roadsides, and in drainage channels, while municipal authorities also contribute through the use of open dumping sites for collected waste [13, 14]. Additionally, approximately 71% of Ugandan cities and municipalities rely on open dumping as a municipal waste management method, meaning that local authorities dispose off collected waste at unengineered and non-sanitary disposal sites that lack proper environmental controls such as lining, covering, or leachate management [14, 15]. At the household level, the majority (92%) of households also dispose of waste improperly, often through indiscriminate dumping in open spaces or unauthorized areas [16]. This requires urgent attention to protect the environment and enhance Public Health and safety.

Isingiro Town Council generates over 100 tons of solid waste each month, yet there is a lack of proper regulation [17, 18]. The existence of open dumps in the area serves as a breeding ground for disease vectors and contributes to the blockage of drainage channels, resulting in unpleasant odours' and an unsightly environment. Notably, this situation has facilitated the breeding of mosquitoes, accounting for a significant portion of malaria infections in the area [19]. In addition, evidence shows that ineffective household solid waste management impacts public health, resulting in contaminated soil, air, and water, further exacerbating the situation, creating a conducive breeding ground for biological vectors such as flies, rodents, and insect pests [15, 20]. These factors contribute significantly to the overall public health risks associated with poor solid waste management practices [1, 21].

Previous literature has documented several key factors contributing to the unsustainable waste issue in remote communities, and these included inadequate waste collection and recycling facilities, a rise in trade and local economic activities, insufficient environmental awareness regarding the effects of consumer waste and disposal, and challenges in accessing financial resources [22–24]. The current state of solid waste management practices in Isingiro Town Council is characterized by a lack of comprehensive information on household-level waste collection and disposal [25]. Additionally, there is limited

documentation on the practices and factors influencing solid waste management in the area. Considering this gap, the study was conducted to assess the existing solid waste management practices and identify the associated factors within Isingiro Town Council.

2 Methods

2.1 Study design and setting

This was a community-based cross-sectional study conducted in Isingiro Town Council. The Town Council is in Isingiro District, approximately twenty miles away from Mbarara City, with a total population of 47,763 people distributed in five wards (Kamuri, Mabona, Rwekubo, kyabisho and Kaharo) (Fig. 1). The population in Isingiro is rapidly growing due to the influx of refugees from Nakivale refugee settlement who have settled in the town council due to business opportunities. The Town Council has about 12,721 households, with an approximate size of 143 square kilometers. According to Isingiro Town Council development plan for 2020/2025, the town generates 100 tons of solid waste according to monthly reports during March and April 2024 [17]. Poor solid

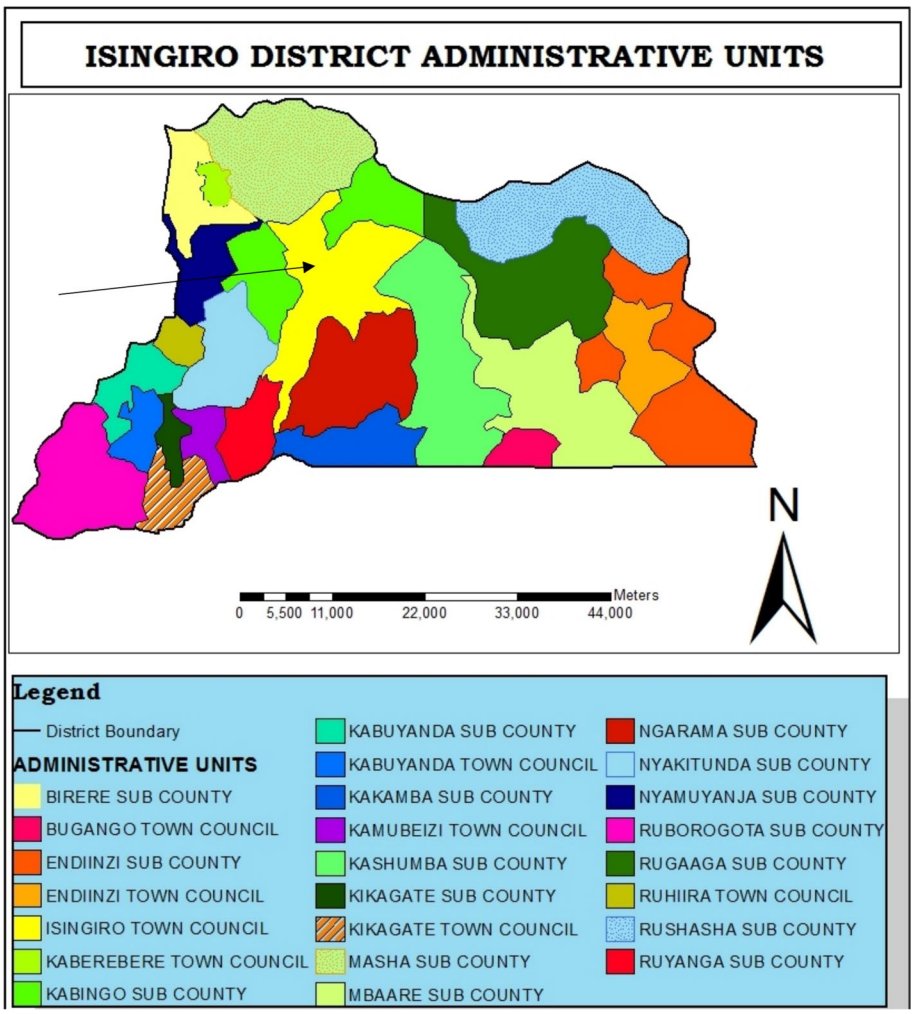

Fig. 1 A map of Isingiro District showing the study area

waste management in the town council arises from weak enforcement of existing regulations, inadequate waste collection systems, and the absence of properly engineered disposal facilities, resulting in widespread indiscriminate dumping by both households and municipal authorities [18]. This has resulted in pollution of the environment, air and aquatic life, creating a smelly and unsightly community [26].

2.2 Study population, sample size and sampling strategy

The study recruited household heads aged 18 years and above within wards of Isingiro Town Council who had stayed in the area for at least 6 months. We excluded household heads who were sick and unable to provide consent during the study period.

The study employed the Kish–Leslie formula (1965) for cross-sectional studies to calculate the sample size with assumptions of a 95% confidence level, a margin of error of 5%, and an estimated 50% prevalence for proper waste management. The calculated sample size after adding 10% for potential non-response was 429 participants.

Systematic simple random sampling was used to recruit study participants within the town council. The Town Council is divided into five wards of Mabona, Kyabishoho, Kamuri, Kaharo and Rwekubo. The households were chosen from each ward by getting to the Centre of the ward, rolling a bottle and following the direction in which the bottle pointed. From the first household in the given direction, the research assistants would skip five households, and this was done repeatedly until the targeted number of households per ward was achieved. Only one person was selected from each household. The household head or a representative was approached and asked for consent after an explanation of the study and its purpose.

2.3 Data collection process

Data was collected by four trained research assistants using a structured, interviewer-guided questionnaire and an observation checklist. The questionnaire collected variables like age, gender, occupation, marital status, educational level, type of house, ownership, size of plot, nature of activities at home, quantity of waste generated, distance to disposal ground, person always at home and presence of private waste collectors. Business activities included small-scale, home-based commercial activities such as retail shops, food vending, tailoring, hairdressing, and carpentry conducted within residential compounds. Accessibility of public waste bins was assessed using a self-reported item in the questionnaire on whether waste bins were accessible in the participant's locality. In addition, respondents were asked to identify the main types of solid waste generated in their households, including organic waste (food remains, agricultural residues), plastics, paper, and other waste categories. This information was self-reported by household heads based on the waste most produced in their households. An observation checklist was completed by research assistants at both households visited and selected town centre locations, including commercial areas and waste handling points. Observations were recorded at each site visited. Availability of waste containers was defined as the presence of a designated receptacle such as plastic bin, sack, or basket specifically used for temporary household solid waste storage at the time of observation. Overfilling was defined as waste exceeding the container's rim or waste visibly spilling outside the

container at the time of observation. Each item was recorded as present or absent based on direct observation.

The tools were pre-tested in Bwizibwera–Rutooma Town Council in Mbarara District to ensure coherence and clarity and the results of the pretest were used to adjust the tool. The research assistants used the observational checklist to check the use of waste bins placed near business premises, shops, and houses.

2.4 Data management and data analysis

Data was entered into Microsoft Excel, cleaned and then exported into Stata version 17 for analysis. Descriptive analysis was performed for the types of waste and solid waste management practices and presented in terms of frequency and proportions. In this study, good solid waste management practices referred to the systematic administration of activities that provide for the collection, source separation, storage, transportation, processing, treatment, and disposal of solid waste. Poor solid waste management practices involved the collection of waste without considering segregation, burning of waste at households and indiscriminate disposal in the environment [27].

We conducted a bivariate logistic regression analysis to identify the factors associated with the outcome variable. The independent variables included community factors, Town Council related services, policy/guidelines and social demographic factors. The outcome variable was categorized as "poor" and "good" solid waste management practices. Factors with a p value less than 0.2 at bivariate analysis were included in the multivariable logistic regression model. All factors that retained a significance ($p < 0.05$) were considered signficantly associated with the outcome .

3 Results

3.1 Participant and household characteristics

A total of 429 household heads were recruited into the study. More than half of the respondents were male (239, 55.7%) and most were aged above 26 years (315, 73.4%). The majority were married (329, 76.7%) and self-employed (319, 74.4%). Most households comprised 1–5 members (297, 69.2%), and in nearly half of the homes the mother was the person most frequently present (208, 48.5%). The majority of households generated less than 10 kg of solid waste (343, 80.1%), with disposal sites commonly located within 5 m of the dwelling (298, 69.5%) (Table 1).

3.2 Solid waste management practices at the household level in Isingiro Town Council

The most reported type of solid waste generated by households was organic waste, including food remains and agricultural residues (271, 49.2%), followed by plastics (208, 37.7%), paper (48, 8.7%), and other waste types such as hair, clothing, medical waste, glass bottles, and metal (24, 4.4%). Solid waste management practices at the household level showed important gaps in service access and disposal methods. While most households reported collecting the waste they generated (300, 70.1%) and over half sorted waste before disposal (235, 54.9%), safe disposal remained limited. Only a few households used designated disposal sites (74, 17.3%), whereas many burned waste at home (227, 53.0%). Access to formal waste collection services was

Table 1 Sociodemographic characteristics of the household heads in Isingiro Town Council in July 2024, $n = 429$

Variable	Category	Frequency (%)
Gender	Male	239 (55.7)
	Female	190 (44.3)
Age	18–21 years	20 (4.7)
	22–25 years	94 (21.9)
	>26 years	315 (73.4)
Marital status	Married	329 (76.7)
	Divorced/separated	54 (12.6)
	Single/never married	46 (10.7)
Occupation	Employed	91 (21.2)
	Self-employed	319 (74.4)
	Unemployed	19 (4.4)
Type of house participants live in	Temporary	41 (9.6)
	Semi-permanent	198 (46.2)
	Permanent	190 (44.3)
Ownership of the house	Rented	263 (61.3)
	Personal	166 (38.7)
Number of people in the household	1–5 people	297 (69.2)
	6–10 people	125 (29.1)
	>10 people	7 (1.6)
Person always at home	Children	84 (19.6)
	Maid	52 (12.1)
	Shamba boys	33 (7.7)
	Mother	208 (48.5)
	Father	52 (12.1)
Quantity of solid waste generated	<10 kg	343 (80.1)
	10–50 kg	80 (18.7)
	51–100 kg	5 (1.2)
Size of plot	Small < 50 * 100 ft	92 (21.4)
	Medium 50 * 100 ft	278 (64.8)
	Big ≥ 100 * 100 ft	59 (13.8)
Distance to disposal ground	Within 5 m	298 (69.5)
	>5 m	131 (30.5)

low, with most participants reporting absence of private collectors (351, 82.0%), and nearly all households lacked waste bins (416, 97.0%) (Table 2).

3.3 Assessment of waste disposal practices in Isingiro Town Council

We observed low availability of solid waste management containers in the surveyed areas, most households (301, 92.9%) lacked proper labelling or color coding on their bins, which in this study meant color-coded or clearly marked signs for organic, recyclable, hazardous, or general waste. Without labelling, bins were likely treated as general waste. However, even where labelling or color-coding existed, the absence of regular collection services for segregated waste meant that source-level separation had limited practical value.

Table 2 Solid waste disposal practices among households in Isingiro Town Council

Disposal practice	Category	*n* (%)
Availability of private waste collectors who pick solid waste from households	Yes	77 (18.0)
	No	351 (82.0)
Payment of private waste collection services ($n=77$)	Nothing	58 (75.3)
	Payment made by the council	5 (6.5)
Payment in US dollars	<2.85	10 (13.0)
	≥2.85	4 (5.2)
Accessability of public waste bins in the town (self-reported)	Yes	13 (3.0)
	No	416 (97.0)
Storage of solid waste immediately after producing it	Yes	192 (44.9)
	Sometimes	203 (47.4)
	No	33 (7.7)
Specific participant practices[a] $n=429$	Collect the solid waste	300 (70.1)
	Sorts solid waste before disposal	235 (54.9)
	Take waste to disposal collection site	74 (17.3)
	Dump in a composite/manure pit	131 (30.6)
	Burning waste	227 (53.0)
	Recycling waste	37 (8.6)
	Other[b]	34 (7.9)

[a] Multiple response variable presented as percent of cases

[b] Other: Dispose in the plantation (24), feed to the animals (2), sell as scrap (3), open damping (3), throwing in the bush (1)

Evidence of waste segregation at the source was observed in 29.4% of households. The situation was further exacerbated by the high number of overfilled waste storage containers, accounting for 263 (81.2%), and the presence of disease vectors around them. Additionally, most waste handling workers, 261 (80.8%), did not use personal protective equipment. The primary source of waste in the town council is residential, which accounts for 195 (60.2%), and there is a significant lack of educational programs on waste segregation (Table 3).

3.4 Factors associated with solid waste management practices in Isingiro Town Council

The association of independent variables with solid waste disposal practices was investigated using both bivariate and multivariate logistic regression techniques. In bivariate logistic regression analysis, the following variables were found to have differences with p values < 0.2 and were introduced into the multivariable logistic regression: self-employed participants, tertiary level education, medium-sized plots of land, big-sized plots of land, business activities carried out at home, disposal ground > 5m from the household, children always at home, maid or shamba boy always at home, and the presence of private waste collectors in the area.

At multivariable analysis, several variables retained statistical significance. Participants who engaged in home-based commercial activities were more likely to have poor disposal practices compared to those involved in farming activities (aOR = 1.8). Self-employed participants were more likely to have good solid waste disposal practices compared to unemployed participants (aOR = 0.3). Participants staying on medium-sized plots of land were associated with a higher likelihood of good disposal practices compared to those on small plots (aOR = 0.5). Additionally, households with disposal

Table 3 Environmental and operational solid waste management conditions observed at household and town centre levels ($n = 324$)

Characteristic	Category	Frequency (*n*)	Percent (%)
Presence of designated household waste storage container	Yes	97	30.0
	No	226	70.0
Proper labeling or color coding of waste bins	Yes	23	7.1
	No	301	92.9
Evidence of solid waste segregated	Yes	95	29.4
	No	228	70.6
Overfilled waste storage containers[a]	Yes	263	81.2
	No	61	18.8
Flies and other vectors around the container areas	Yes	273	84.3
	No	51	15.7
Sources of waste	Commercial	103	31.8
	Industrial	26	8.0
	Residential	195	60.2
Educational programs for employees/residents on waste segregation	Yes	72	22.3
	No	251	77.7
Visible and clear instructional signage	Yes	14	4.3
	No	309	95.7
Use of personal protective equipment (PPE) by the waste handling workers	Yes	62	19.2
	No	261	80.8
Adherence to health and safety protocols	Yes	41	12.7
	No	282	87.3

[a] Overfilled container defined as waste exceeding container rim or visibly spilling outside at time of observation

grounds within 5m were significantly associated with poor disposal practices compared to those with disposal sites farther away (aOR = 2.6). Finally, having a house helper or gardener always at home was associated with poor disposal practices compared to when a mother or father was always at home (aOR = 2.4) (Table 4).

4 Discussion

In this study, we assessed the solid waste management practices and associated factors in Isingiro Town Council. The study found that despite most households reporting waste collection (70.1%) and sorting (54.9%), safe disposal remained limited, with most households resorting to burning (53.0%) or open dumping (30.6%) and only 17.3% using designated disposal sites. These poor practices were largely shaped by occupation, plot size, proximity to disposal sites, and the level of household supervision.

Although more than half of the households in this study reported sorting waste before disposal (54.9%), this finding was notably higher than the 22.9% reported in a study in South Africa [28]. However, self-reported sorting did not translate into safe disposal, as observational data revealed that most waste bins (92.9%) lacked proper labelling or color-coding, and evidence of waste segregation at the source was observed in only 29.4% of households. Lack of proper waste separation and labelling bins hinders effective waste management and recycling efforts [28, 29]. Furthermore, even where households attempted to segregate waste, the absence of regular collection services for segregated waste reduced the practical value of these efforts. Indeed, nearly all households (97.0%)

Table 4 Solid waste management practices and associated factors among households in Isingiro Town Council

Variable	Category	Disposal practice		cOR (95% CI)	*p* value	aOR (95% CI)	*p* value
		Poor *n* (%)	Good *n* (%)				
Occupation	Employed	76 (83.5)	15 (16.5)	0.6 (0.1–2.9)	0.517	0.3 (0.1–1.3)	0.108
	Self employed	219 (68.7)	100 (31.3)	0.3 (0.2–1.1)	**0.073***	0.3 (0.04–0.8)	**0.025****
	Unemployed	17 (89.5)	2 (10.5)	1		1	
Marital status	Married	235 (71.4)	94 (28.6)	0.5 (0.2–1.1)	**0.115***	1.1 (0.4–2.6)	0.894
	Separated/ divorced	39 (72.2)	15 (27.8)	0.5 (0.2–1.4)	0.222	1.1 (0.4–3.1)	0.884
	Single	38 (82.6)	8 (17.4)	1		1	
Education level	Primary	110 (65.9)	57 (34.1)	1			
	Secondary	117 (74.5)	40 (25.5)	1.5 (0.9–2.5)	**0.090***	1.3 (0.7–2.2)	0.361
	Tertiary	84 (80.8)	20 (19.2)	2.2 (1.2–3.9)	**0.009***	1.5 (0.8–3.1)	0.192
Type of house	Temporary	33 (80.5)	8 (19.5)	1.8 (0.8–4.2)	**0.161***	1.5 (0.6–4.1)	0.397
	Semi-permanent	147 (74.2)	51 (25.8)	1.3 (0.8–2.0)	0.297	1.3 (0.7–2.2)	0.429
	Permanent	84 (80.8)	20 (19.2)	1		1	
Ownership of house	Rented	198 (75.3)	65 (24.7)	1.4 (0.9–2.1)	**0.135***	1.2 (0.7–2.0)	0.591
	Personal	114 (68.7)	52 (31.3)	1		1	
Size of plot	Small	77 (83.7)	15 (16.3)	1		1	
	Medium	192 (69.1)	86 (30.9)	0.4 (0.2–0.8)	**0.007***	0.5 (0.3–0.9)	**0.041****
	Big	43 (72.9)	16 (27.1)	0.5 (0.2–1.2)	**0.112***	0.6 (0.2–1.4)	0.204
Nature of activities at home	Farming	101 (64.3)	56 (35.7)	1		1	
	Business	210 (77.5)	61 (22.5)	1.9 (1.2–2.9)	**0.003***	1.8 (1.1–2.9)	**0.014****
Quantity of solid waste generated	<10 kg	251 (73.2)	92 (26.8)	1.1 (0.7–1.9)	0.632		
	≥10 kg	60 (70.6)	25 (29.4)	1			
Distance to disposal ground	Within 5 m	239 (80.2)	59 (19.8)	3.2 (2.1–5.0)	**<0.001***	2.6 (1.6–4.2)	**<0.001****
	>5 m	73 (55.7)	58 (44.3)	1		1	
Person always at home	Children	68 (81.0)	16 (19.0)	2.1 (1.2–3.9)	**0.013***	1.7 (0.9–3.1)	0.115
	Maid or shamba boy	71 (83.5)	14 (16.5)	2.5 (1.4–4.8)	**0.003***	2.4 (1.2–4.6)	**0.011****
	Mother or father	173 (66.5)	87 (33.5)	1		1	
Presence of private waste collectors	No	260 (74.1)	91 (25.9)	1.5 (0.9–2.5)	**0.164***	1.5 (0.8–2.8)	0.181
	Yes	51 (66.2)	26 (33.8)	1		1	

Bold value are *p* -values which were significant

OR odd ratio, *aOR* adjusted odd ratio, *CI* confidence interval

* *p* value <0.2

** Significant at *p* value <0.05

reported lack of accessible public waste bins, 82.0% had no access to private waste collection services, and 81.2% of the existing containers were overfilled. This points to a systemic gap in waste collection infrastructure likely driven by limited municipal funding, inadequate collection vehicles, and competing demands on local government resources. Our findings suggest that although there is basic awareness and willingness among residents to manage waste responsibly, the lack of accessible, reliable waste disposal services compels many to adopt unsafe practices like open-air burning of solid waste. These practices also reflect the challenges noted by a previous study that highlighted poor or

improper waste disposal practices in a slum community of the capital city [30], and lead to unsanitary conditions and environmental pollution with direct impacts on community health. Addressing these systemic infrastructure gaps including sustained investment in collection services, adequate vehicles, and appropriately placed and maintained waste bins should be a priority for the local government.

Our study identified organic waste (49.2%) as the most common type of waste generated by households in Isingiro Town Council. This can largely be attributed to the agriculture-based economies and consumption patterns in low- and middle-income countries, where households rely heavily on fresh produce and unprocessed foods. This finding aligns with Thabit's observation that developing countries, including those in the Middle East and North Africa, typically produce high proportions of organic waste, constituting approximately 50–60% of their waste composition [29]. The proportion of organic waste identified in this study was lower than that reported in a study conducted in the Kampala capital city, which found organic waste to constitute 88.5% of household waste [31].The higher proportion in the capital city may be attributed to its larger urban population, higher food consumption patterns, and consequently greater volumes of food-related waste. Although rural households may generate organic residues from agricultural activities, such waste is often reused as animal feed or compost and may not enter the formal disposal stream. This may explain the higher proportion observed in urban areas. Nonetheless, the finding that nearly half of household waste in Isingiro Town Council is organic reflects the consumption patterns typical of semi-urban and agricultural settings, where fresh produce and biodegradable materials dominate household waste streams. Plastics were the second most common waste type (37.7%), consistent with findings from Boralesgamuwa Urban Council in Sri Lanka, where plastics accounted for 45% of total waste [32].This high proportion of plastic waste is likely driven by increased use of packaged goods and limited recycling infrastructure, underscoring the need for improved waste segregation, recycling initiatives, and strengthened enforcement of plastic waste management regulations. Given that organic waste constitutes nearly half of all household waste, there is significant potential for community-based composting initiatives that could convert this waste into fertilizer for agricultural use. This would be particularly relevant in Isingiro Town Council, where agriculture-based livelihoods are predominant, and households could directly benefit from locally produced compost. Such interventions would simultaneously reduce the volume of waste requiring formal disposal and support household food production.

Households engaged in home-based commercial activities had higher odds of poor disposal practices than those involved in farming activities. This association may be attributed to the nature and complexity of waste generated by business operations, which often includes packaging materials, plastics, food residues (for food vendors), and other non-biodegradable items. Unlike farming households, whose waste is largely organic and easier to compost or repurpose, business-related waste tends to require more sophisticated and structured waste management systems, including segregation, collection, and recycling, which are often unavailable or unaffordable at the household level [33]. Additionally, individuals running businesses from home may prioritize profit and convenience over proper waste management, leading to inappropriate disposal practices such as burning, open dumping, or indiscriminate littering. These results

underscore the need for targeted interventions that provide support and guidelines for home-based businesses, including access to waste sorting bins, collection schedules, and community waste management programs to promote responsible disposal behavior.

Self-employed participants were more likely to exhibit good solid waste disposal practices compared to unemployed participants. This could be explained by the fact that self-employed individuals often have financial stability and can invest in appropriate waste disposal methods [34]. It could also be attributed to the fact that most employed individuals have received education and acquired knowledge, making them more aware of the adverse environmental effects and financially capable of implementing more effective waste disposal methods, such as consistent utilization. Similarly, a previous study indicated that employed individuals were more likely to engage in sustainable waste management practices, such as recycling and composting, than those who were unemployed [35].

Households with medium-sized plots of land were more likely to have good disposal practices compared to those on small plots, possibly because larger plots allow for more space to store, segregate and manage solid waste. This is almost identical with findings of a study done in Uganda where participants with larger sizes of land had better waste management practices compared to those with smaller ones [36]. Households on smaller plots may face spatial constraints that limit their ability to separate and store waste effectively, forcing them to dispose of waste in less environmentally sound ways due to convenience or necessity. These findings point the importance of integrating land use planning with waste management strategies, especially in densely populated urban and peri-urban settings. Policies that encourage the provision of communal waste storage facilities and promote vertical or space-saving waste sorting solutions could help mitigate the challenges faced by households on smaller plots.

Contrary, households with disposal grounds within five meters were significantly associated with poor disposal practices, indicating that proximity to disposal sites does not necessarily correlate with better waste management. When the disposal grounds are near the households, individuals may forget to segregate the waste and dump the mixed waste at the nearby disposal site. This observation is in agreement with findings from a study in Ghana, which found that scattered waste and waste burning were common in areas near waste disposal sites [37]. However, this finding disagrees with that from Ethiopia, which found poor waste disposal among households far from waste collection centers [38]. This variation could be attributed to the different policies and waste management strategies in the different countries. Policies should therefore not only focus on increasing access to disposal points but also emphasize the importance of waste sorting, regulated use of these sites, and community-level engagement to foster sustainable waste practices.

Finally, households where the house helper or gardener was always at home were associated with poor disposal practices compared to those where a house head was always at home. This difference may stem from the varying levels of responsibility, authority, and personal investment in household welfare between household heads and hired helper. Household heads hold a higher responsibility and authority and are more likely to invest in ensuring proper waste management practices for a healthy and clean environment for their family. Mirembe emphasizes the importance of household dynamics in promoting

proper waste management practices [39]. These results suggest the need for community-based sensitization programs that include both primary caregivers and domestic staff, ensuring that everyone involved in waste handling within a household is adequately informed, trained, and motivated to adopt and maintain proper disposal practices.

4.1 Study limitations

This study has some limitations that need to be accounted for in the interpretation of its findings. First, the cross-sectional design limits the ability to establish causal relationships between household characteristics and waste management practices; the associations observed only reflect conditions at a single point in time. Second, data on household practices were largely self-reported and may be subject to recall or social desirability bias, leading some participants to overstate positive behaviors such as waste sorting or proper disposal. Although observational checklists were used to complement self-reports, observations were limited to visible conditions at the time of the visit and may not fully reflect routine household practices. In addition, the study did not comprehensively assess institutional or policy-level factors, such as municipal capacity for waste collection, availability of waste disposal infrastructure, or enforcement of environmental regulations, which may also influence household-level behaviors.

Future research should consider longitudinal or mixed-methods designs to better understand causal pathways and changes in waste management practices over time. Studies that incorporate direct measurement of waste generation and disposal practices, alongside qualitative inquiry into community perceptions and barriers, would provide deeper insights into behavioral drivers. Further research should also examine structural and system-level factors, including the adequacy, accessibility, and utilization of waste collection services, municipal resource constraints, and policy enforcement mechanisms. Such evidence would support the development of more comprehensive and context-specific interventions to improve sustainable household waste management practices. Despite these limitations, the study provides valuable, context-specific insights into solid waste management practices in Isingiro Town Council and highlights key household and community factors that warrant further investigation.

5 Conclusion

The study found that households in Isingiro Town Council generate multiple types of waste, with organic waste, plastics, and paper being the most common. Most households reported using open dumping and burning as their primary waste disposal methods, highlighting important gaps in access to formal and environmentally safe waste management services. However, these poor practices are largely a consequence of inadequate waste collection infrastructure and limited private collection services meaning that households have few viable alternatives. Addressing these systemic gaps through sustained investment in collection services and infrastructure should be a priority for the local government. Even in areas where some disposal options exist, limited awareness of proper waste handling practices may also contribute to continued reliance on unsafe methods such as burning and open dumping.

The analysis further showed that socio-demographic factors, including occupation, land size, and level of household supervision, were significantly associated with waste

disposal practices. These findings highlight the need for context-specific interventions that not only expand and sustain waste management infrastructure but also promote community awareness, behavior change, and enforcement of existing waste management policies. Effective strategies should address both structural barriers and behavioral factors to ensure feasible and sustainable household solid waste management practices.

Abbreviations

aOR	Adjusted odds ratio
cOR	Crude odds ratio
GDP	Gross domestic product
HMIS	Health Management Information System
MUST	Mbarara University of Science and Technology
REC	Research and Ethics Committee
SWM	Solid waste management
WHO	World Health Organization
LMICs	Low- and middle-income countries

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Author contributions
All authors made significant contribution on this research project. PM, EMM and MN conceptualized the study, PM developed the proposal development, sought ethical approvals, collected data, analyzed data and drafted the first version of the manuscript. JK supported PM and AM in data curation and analysis. JK, AM, ET, TM, and EMM provided critical reviews and edits in the manuscript. All authors reviewed and approved the final version of the manuscript.

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Data availability
The data set and data collection tools used in this study are available upon reasonable request from the corresponding author.

Declarations

Ethics approval and consent to participate
This study was conducted in accordance with established ethical standards for research involving human participants. It was approved by the Mbarara University Research Ethics Committee (MUST REC-2024-1574) and administrative clearance to conduct the study was obtained from the town clerk, Isingiro Town Council and Isingiro district. All procedures were carried out in accordance with the ethical principles outlined in the Declaration of Helsinki. Written informed consent was obtained from all participants prior to their inclusion in the study. Participants were informed about the purpose of the study, procedures involved, potential risks and benefits, and their right to withdraw at any time without any consequences. Confidentiality and anonymity were strictly maintained throughout the study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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