


# Knowledge, Attitude and Practices of Abattoir Workers Towards Waste Management in Slaughterhouses in Kampala City, Uganda

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**Background:** The effective management of abattoir waste is crucial for environmental protection and public health. The existing poor waste management and related effects can be caused by insufficient knowledge and bad attitudes of the stakeholders involved in abattoir operations. This study evaluated the knowledge, attitudes, and practices of abattoir workers regarding waste management in the Wambizzi and Kalerwe abattoirs in Kampala, Uganda.

**Methods:** A mixed method cross-sectional design utilising qualitative and quantitative methods. The data collection involved questionnaires among 250 workers, 2 observational checklists, 12 key informant interviewees (KIIs), and 8 focus group discussion groups (FGDs). Study participants for quantitative research were recruited using a stratified random sampling technique and data analysed descriptively while purposive sampling was used for KIIs and FGDs and data analysed thematically.

**Results:** The study found that 71.6% of workers had good knowledge of abattoir waste management, although gaps in waste sorting were identified. Additionally, 71.2% of workers had positive attitudes towards waste management. However, challenges, such as inadequate infrastructure, poor abattoir design, and inconsistent waste collection, are prevalent. Despite these challenges, the workers demonstrated good practices, with 50.4% exhibiting effective waste management. From qualitative findings, existence of internal rules and regulations on waste management with penalties and punishments was also responsible for abattoir workers' practices towards abattoir waste management.

**Conclusion and Recommendations:** This study highlights the need for improved waste sorting knowledge, enhanced infrastructure, and logistical support since there was a disconnect between survey results and actual practices. Future research should explore the impact of long-term benefits of infrastructure improvements on waste management efficiency. These findings underscore the importance of addressing both knowledge and practical challenges in achieving sustainable waste management in abattoirs.

**Keywords:** abattoir, waste, waste management, knowledge, attitude, practices

## Introduction

The amount of waste produced by abattoirs has increased due to the increased production of meat and meat products for human consumption.<sup>1</sup> Although operating an abattoir can be very beneficial to humans by generating meat for consumption and other important byproducts, the wastes generated by these facilities can nevertheless constitute a major threat to public health.<sup>2,3</sup> Poor abattoir waste disposal degrades aquatic life, agricultural land, potable water sources, and air quality.<sup>4,5</sup> If proper treatment and relocation policies are not implemented, abattoirs may contaminate freshwater quality nearby thereby increasing the risk of contracting serious health effects from the pollutants produced by the abattoir's operations.<sup>6,7</sup> Furthermore, increased offensive odors and contaminated water ways are some of the consequences of failure to implement efficient waste treatment and disposal protocols for abattoir waste.<sup>8</sup> In developing countries, including Uganda, inadequate waste management is often exacerbated by insufficient knowledge, negative attitudes, and suboptimal practices. The observed poor waste management and related effects in Kampala City abattoirs is usually caused by lack of knowledge and poor attitude among the responsible stakeholders involved in abattoir operations.<sup>9</sup> While research such as that by Tolera et al in Ethiopia has explored the knowledge, attitudes, and practices of abattoir workers regarding waste management, there is a notable lack of specific information on slaughterhouses in Kampala.

Therefore, the purpose of this study was to determine the level of knowledge, attitude, and practices of abattoir workers regarding the management of waste in Wambizzi and Kalerwe abattoirs in Kampala.

## Methods and Materials

### Study Area Description

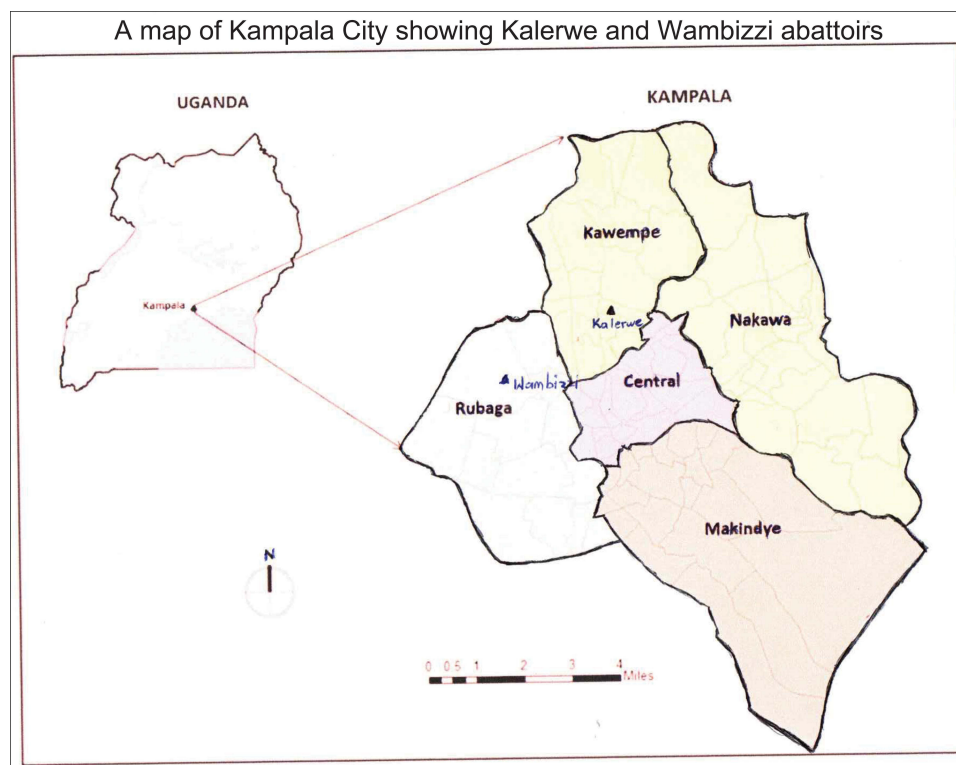
This study was conducted at the Kalerwe and Wambizi abattoirs in Kampala, Uganda (Figure 1). Kalerwe abattoir is situated at latitude: 0.3517888, Longitude: 32.5735959 along the Northern Bypass (Kampala-Bombo Road) across the Kalerwe Community Market in Mulago Parish, Kawempe Division, with an estimated 360 workers. Wambizzi Abattoir is situated at N 0.294484°, E 32.542500° in Nateete parish, 10 km from the shores of Lake Victoria in the southwest of Kampala, the capital city of Uganda, with an estimated 300 employees.

### Study Design and Target Population

A cross-sectional study employing both qualitative and quantitative methods of data collection was conducted within the abattoirs of Kalerwe and Wambizzi from June 2<sup>nd</sup> to 30<sup>th</sup> 2024. This study was conducted on abattoir workers, including slaughters, dressers, trimers, loaders, cleaners, supervisors, and managers.

### Sample Size and Sampling Technique

Yamane's (1967) formula ( $n = \frac{N}{1+Ne^2}$ ) for sample determination was used because the estimated population of abattoir workers in both Wambizzi and Kalerwe is known, where  $n$  is the estimated sample size,  $N$  is the population size (300 in wambizzi and 360 in Kalerwe), and  $e$  is the preferred level of precision or allowable error of the estimate at the 95% confidence level. Therefore,  $n = \frac{N}{1+Ne^2} = 250$  workers. A qualitative sample size of 12 key informants and 8 focus group discussions was also conducted. A proportionate sample was used to obtain 114 workers from Wambizzi and 136 from the Kalerwe abattoir, followed by a stratified random sampling method in which respondents were drawn from existing groups (based on their departments and



**Figure 1** A map of Kampala City showing Kalerwe and Wambizzi abattoirs.

registers) of workers in appropriate proportions to represent the population. Qualitative responses were obtained purposively among 12 Key Informant interviewees (KIIs) and 8 focus group discussion groups (FDGs).

## Data Collection Technique and Instrument

Key informant interview guide and focus group discussion guide were used for qualitative data from Key Informants (KIs) and Focus Group Discussions (FGDs), respectively, through face-to-face interviews between the respondents and principal investigators. The study also employed observation checklists integrated with a questionnaire through an electronic Kobo Collect to collect more practical quantitative data.

## Data Quality Control

Data collection tools were translated in “Luganda” the commonest local language spoken by residents and workers in Wambizzi and Kalerwe. All data collection tools were pretested prior to actual data collection in an area outside the study area. Competent research assistants were trained on the research protocol for 2 days, and completed questionnaires were checked for completeness during and after the process of data collection before submission to the servers. Measures to minimize data entry errors, such as guiding notes and footnotes, were used.

## Ethical Consideration

Ethical clearance was obtained in the form of approval letters from the Makerere University College of Veterinary Medicine Animal Resources and Biosecurity (COVAB) and Kampala Capital City Authority (KCCA), together with the leadership and management clearance of the Wambizzi and Kalerwe abattoirs. All target respondents had to first give consent before participating in the research, and the names of the participants were not stated during data collection, analysis, and presentation to ensure confidentiality. Participants’ informed consent included publication of anonymized responses/direct quotes. Additionally, informed consent was obtained from the legal guardians of minors aged < 18 years, together with assent prior to the commencement of the study.

## Data Analysis

The survey data was exported into a Microsoft Excel data sheet, which was then exported and reviewed within the Statistical Package for Social Sciences (SPSS) version 22.0. Descriptive statistics, such as frequency (%) for categorical data and mean (standard deviation [SD]) for numerical data, were used primarily to summarize and define the data to make it more understandable. To obtain knowledge attitude and practice scores, responses were coded with “1” for right response(s) and “0” for a wrong response(s). Three categories were used to categorize the knowledge levels: little knowledge (less than 4 points), fairly knowledge (4–6 scores), and good knowledge (7–10 scores). Three levels of attitude were determined by classifying the scores using a likert scale: positive, neutral, and negative. Scores ranged from 39 to 50 for a positive attitude, 33 to 38 for a neutral attitude, and 0 to 32 for a negative attitude.<sup>10</sup> Practices were categorized as follows: poor practice: 0–4, fair practice: 4–6 and good practice: 7–10; 2 points.<sup>10</sup> Qualitative data were transcribed verbatim, imported into Excel, and read several times to identify the initial codes based on repeated and emerging issues. Conventional content analysis was used, in which codes and categories arising from the data were used. Related codes identified from the data were manually grouped to form several categories that emerged into themes. These themes are then presented as narration.

## Results

### Social Demographic Characteristics of Respondents

Male workers constituted the majority of the abattoir workers (61.6%). Most workers were aged 25–34 years (60.8%), and secondary education had the highest level of education (49.6%). Additionally, 56.0% of workers were primarily involved in slaughter (Table 1).

**Table 1** Social Demographic Characteristics of Respondents

Variable	Frequency (n=250)	Percentage (%)
<b>Age of the respondent</b>		
18 years and below	14	5.6
18–24 years	42	16.8
25–34 years	152	60.8
35 years and above	42	16.8
<b>Gender</b>		
Male	154	61.6
Female	96	38.4
<b>Highest level of education</b>		
Primary	98	39.2
Secondary	124	49.6
Tertiary	28	11.2
<b>Position in the abattoir</b>		
Cleaner	14	5.6
Slaughter	140	56.0
Supervisor	14	5.6
Trimmer/carcass dressers	67	26.8
Other*	15	6.0
<b>Years of experience</b>		
Less than 1	14	5.6
Between 1 and 5	166	66.4
Between 5 to 10	56	22.4
More than 10	14	5.6

**Notes:** \*Included: merchants, off-loaders, offal cleaners, and inspectors.

## Knowledge of Waste Management Among Abattoir Workers

The majority of abattoir workers (71.6%) had good knowledge of abattoir waste management, with scores of 7–10 while the rest (28.4%) had fair knowledge, with scores of 4–6 (Figure 2).

All the 250 abattoir workers (100%) from Kalerwe and Wambizzi reported awareness of abattoir waste and its proper disposal methods. However, less than half of the respondents recognized that abattoir waste pollutes the air and generates bad odors (39.2%) and that these odors can negatively impact human health (44.0%). Conversely, more than half of the respondents (56.0%) understood that improper handling of abattoir waste can lead to surface water pollution (Table 2).

From qualitative findings, it was found out that there is limited knowledge on waste sorting into the different categories prior to disposal as a strategy for proper abattoir waste management.

A challenge of waste sorting at the initial stage before dumping in the different categories such as plastic, metals, decomposable, among others the challenge is that people are not knowledgeable and they do not appreciate the importance of that. However, we try to sensitize them. Abattoir supervisor

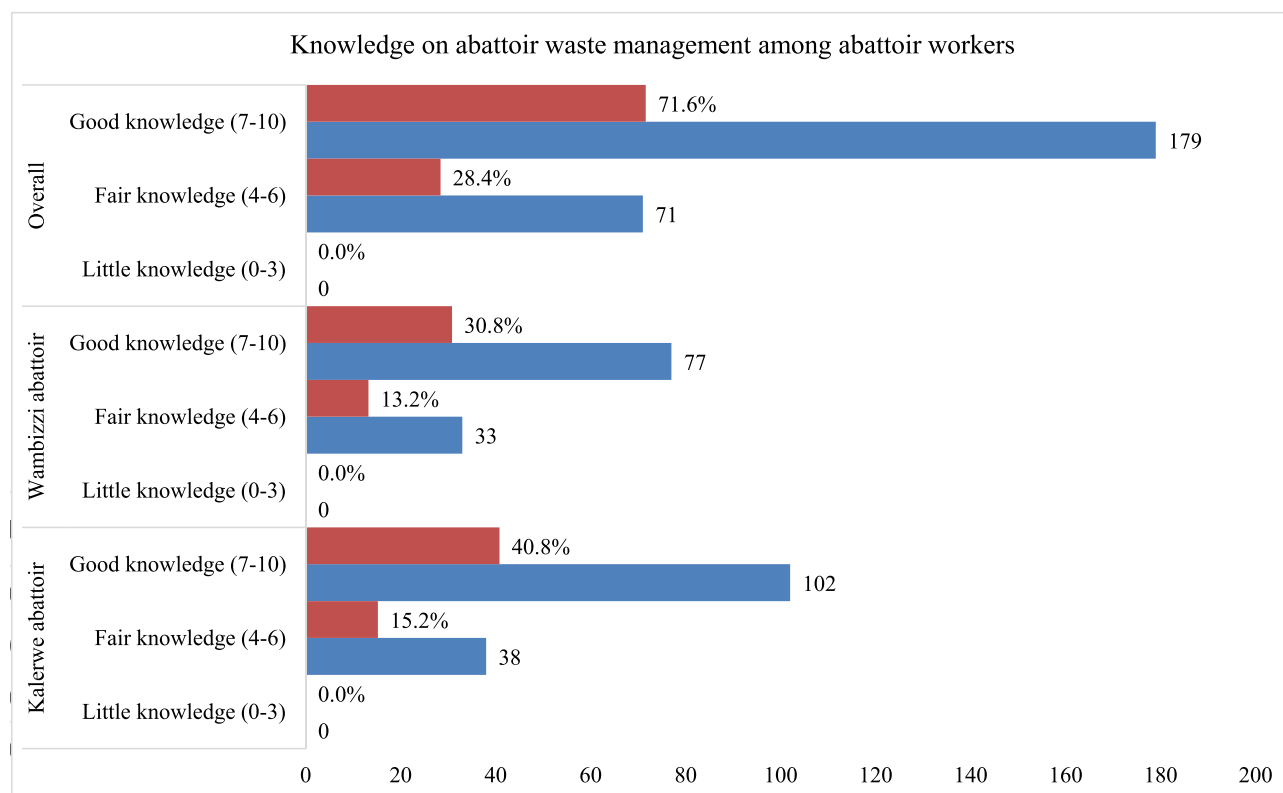
## Attitudes Towards Abattoir Waste Management Among Abattoir Workers

The majority of abattoir workers (71.2%) from Kalerwe and Wambizzi had a positive attitude towards abattoir waste management with scores of 39–50 while the rest (28.8%) had a neutral attitude towards abattoir waste management with scores of 33–38. Ten variables were used to assess attitude, as shown in (Figure 3).

From qualitative findings, it was noted that the attitude towards abattoir waste management was good despite it being challenged by the resources since open burning was done instead of incineration.

Since incineration facilities are not yet improved, we manage waste by open burning with paraffin. Abattoir supervisor

We are managing waste in an appropriate way because if it wasn't so, we would be locked and that is a failure to us. Abattoir supervisor



**Figure 2** Knowledge on abattoir waste management among abattoir workers. Red represents Percentages (%) while Blue represents Frequencies.

## Waste Management Practices Among Abattoir Workers

Upon coding abattoir workers' responses for the 10 variable questions used with "1" for a good response(s) on waste management practice and "0" for a poor response(s), half of the abattoir workers (50.4%) had good practices with scores of 7–10 while the rest of the workers (49.6%) had fair practices with scores of 4–6 and none had poor practices with scores of 0–3 (Table 3).

**Table 2** Knowledge on Waste Management Among Abattoir Workers

Variable	Frequency (n=250)	Percentage (%)
<b>Knew what abattoir waste was</b>		
Yes	250	100
No	0	0.0
<b>Knew how abattoir waste should be disposed</b>		
Yes	250	100
No	0	0.0
<b>Known types of wastes generated at the abattoir*</b>		
Liquid	222	88.8
Solid	236	94.4
Fats/oils	208	83.2
<b>Knew proper methods of disposing of wastes</b>		
Yes	236	94.4
No	14	5.6

(Continued)

**Table 2** (Continued).

Variable	Frequency (n=250)	Percentage (%)
<b>Known abattoir waste management practices (n=236)</b>		
Rendering	124	49.6
Composting	236	94.4
Incineration	222	88.8
Aerobic digestion	56	22.4
Others	13	5.2
<b>Frequency of receiving trainings on waste management</b>		
Never	28	11.2
Once a year	138	55.2
Twice a year	70	28.0
Quarterly	14	5.6
<b>Abattoir waste pollutes the air/generates bad odor</b>		
Yes	98	39.2
No	152	60.8
<b>Bad odor from abattoir waste affects human health</b>		
Yes	110	44.0
No	140	56.0
<b>Abattoir waste pollutes surface water if improperly handled</b>		
Yes	140	56.0
No	110	44.0
<b>Abattoir waste could be utilized as animal feed or as a biofertilizer</b>		
Yes	250	100
No	0	0.0

**Note:** \*Multiple response variable.

From qualitative findings, waste management was a responsibility of the cleaners who are equipped with all the necessary equipment. An existence of internal rules and regulations on waste management with penalties and punishments were also responsible for abattoir workers' practices towards abattoir waste management. On the other hand, KCCA and Nabugabo were reported as the available service providers that support in waste management through transportation for final disposal.

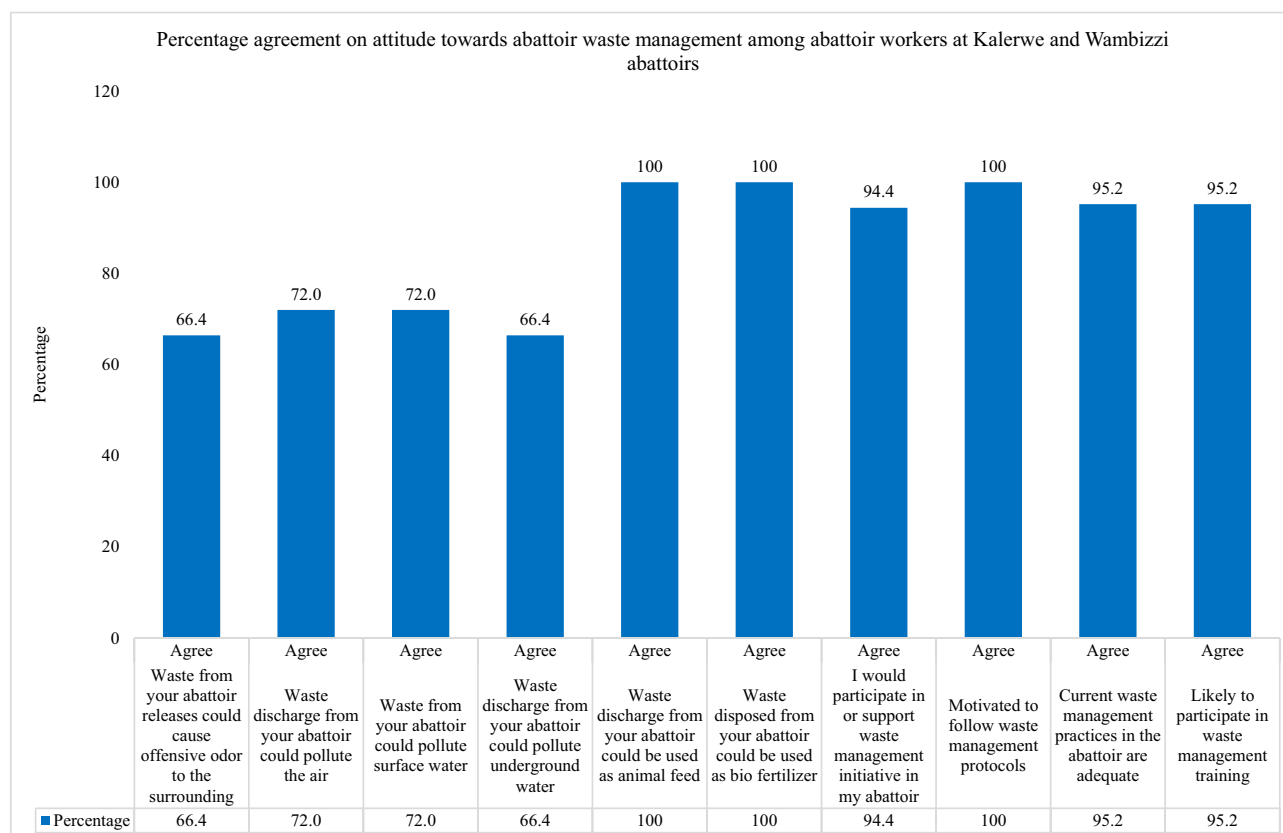
We have cleaners well equipped with the necessary equipment and are responsible for the cleanliness of the place. And waste is handled appropriately because this place produces food products. Abattoir worker

We can't say the internal rules and regulations are followed by every worker since some can't be forced to do something, it is everyone's responsibility to ensure the place is clean. In addition, we have people responsible for waste management in all department. Abattoir worker

We have penalties to all those who are not adhering to proper waste management such as fines of money, clean up exercises for a period of time, desilting drainage channels, suspension, among others. If it wasn't for these penalties, we are unruly. Abattoir worker

Nabugabo and KCCA are responsible for periodic collection of waste from this place at an interval of every after 3 days. They also provide us drums for collection of the waste. Abattoir worker

As management together with our staff, we know what to do regarding management of waste. However, in the market part of the abattoir, we welcome a lot of people who do uncontrolled waste littering. Despite those actions, we have a cleaner who is responsible for cleaning out. Abattoir supervisor



**Figure 3** Attitudes towards abattoir waste management among abattoir workers. Blue represents Percentage (%) of abattoir workers.

## Challenges Faced in Managing the Wastes

The major challenges included poor abattoir designs with insufficiently demarcated waste collection areas (72.0%), poor funding for waste management facilities (69.1%), and deterioration of slaughterhouses and facilities (50.1%) (Table 4).

From qualitative findings, the process of abattoir waste management was affected by floods, and irregular schedules while collecting waste by the service providers. Therefore, the beneficiaries recommended for construction of the

**Table 3** Waste Management Practices Among Abattoir Workers

Variable	Frequency (n=250)	Percentage (%)
<b>Segregate semi-solid/liquid parts from solid waste before disposal</b>		
Yes	208	83.2
No	42	16.8
<b>Frequency of using protective gear when handling waste</b>		
Always	194	77.6
Often	56	22.4
Never	0	0.0
<b>Process of disposing of solid waste</b>		
Incineration	152	60.8
Landfill	222	88.8
Composting	194	77.6
Rendering	42	16.8

(Continued)

**Table 3** (Continued).

Variable	Frequency (n=250)	Percentage (%)
<b>Process of disposing of liquid waste</b>		
Soak pit	0	0.0
Open channel	236	94.4
<b>Frequency of waste collection from the abattoir</b>		
Daily	13	5.2
Twice a week	166	66.4
Weekly	71	28.4
<b>Following of specific guidelines/procedure for waste disposal</b>		
Yes	236	94.4
No	14	5.6
<b>Ever been reprimanded for improper waste disposal</b>		
No	180	72.0
Yes	70	28.0
<b>Abattoir management provides sufficient resources for waste management</b>		
Yes	250	100.0
No	0	0.0
<b>Frequency of inspections on waste management</b>		
Always	42	16.8
Often	192	76.8
Rarely	14	5.6
<b>Nature of the waste management facility allows for modification</b>		
Yes	222	88.8
No	28	11.2

**Table 4** Challenges Faced in Managing Wastes

Variable	Frequency (n=250)	Percentage (%)
Poor abattoir designs with insufficient demarcated waste collection area	180	72.0
Poor funding for waste management facilities	173	69.1
Deterioration of slaughter houses and facilities	125	50.1
Lack of effective abattoir waste disposal equipment	125	50.1
Inconsistencies in waste collection by the service providers	123	49.3

drainage channel and also construction of a pit for temporary waste storage. A request for logistical support in form of PPE was also raised by the abattoir workers to facilitate their services.

When it rains, floods are a problem to this facility and they end up affecting proper abattoir waste management. Therefore, if KCCA can enlarge and construct this Nateete drainage, it can help us in the prevention and control of floods. Abattoir supervisor

There is also a need for logistics such as aprons, overalls, gumboots, gloves, masks, among others so that we can perform our duties effectively Abattoir workers

## Discussion

Overall, the knowledge of abattoir waste management among abattoir workers from Kalerwe and Wambizzi was good, as shown in Figure 1. Workers understood what abattoir waste was, how it should be disposed of, and the side effects of

poor management, including air pollution, bad odors, health impacts, and surface water pollution.<sup>11</sup> Continuous capacity building through trainings, meetings, and support visits from authorities is essential to improve knowledge and practices.<sup>12</sup> The knowledge levels could be linked to education levels of the workers thereby highlighting a need for targeted educational interventions.<sup>13</sup> Despite these challenges, workers are generally aware of the consequences of poor waste management such as health risks and environmental pollution.

The majority of abattoir workers (71.62%) exhibited a positive attitude towards abattoir waste management, as shown in [Figure 2](#). This corresponds to the knowledge levels, as evidenced in different studies where attitudes towards abattoir waste are significantly associated with knowledge levels, education, and work experience.<sup>10,14</sup> Similar to a study by Tolera et al that assessed the impact of abattoir waste on the environment and public health, the current study evaluated the same variables.<sup>9</sup> The current study reported higher proportions of positive attitudes, possibly due to the reported continuous support supervision visits from governing authorities such as KCCA. Most participants had at least primary level of education and received multiple awareness sessions on waste management, unlike the previous study by Tolera et al where continuous awareness sessions on waste management were not done.<sup>9</sup> Both studies found that most abattoir workers agreed that waste from abattoirs serves as a breeding ground for flies and mosquitoes and attracts animal scavengers.<sup>9,15</sup> Therefore, improper means of abattoir waste disposal greatly affects surface and ground water quality through leachate and other products. Waste is frequently disposed of incorrectly, without regard for adequate environmental management techniques, creating threats to humans and wildlife on land and water.<sup>16</sup>

The study revealed that Half of the abattoir workers exhibited good waste management practices ([Table 2](#)). A previous study at Kalerwe abattoir identified four methods of waste management: rendering, incineration, composition, and land spreading.<sup>17</sup> In Ethiopia, 88.4% of study participants properly separated edible from non-edible parts in their daily activities, while 54.0% and 75.0% of them did not use abattoir waste for biogas or composting, respectively.<sup>9</sup> Similar observations were made in the current study, as waste is collected and managed offsite by Nabugabo and KCCA. It is estimated that bovine slaughterhouses generate solid waste of 27.5% of animal weight. Therefore, in the absence of proper mechanisms for proper abattoir waste management at the Kalerwe and Wambizzi abattoirs, the generated waste becomes a nuisance and a hazard to public health.<sup>7,18</sup> The treatment of abattoir wastewater remains the main reliable and efficient means of reducing environmental pollution, which may consequently cause.<sup>14</sup> Poor abattoir waste disposal practices results into pollution of surface and underground waters and affects air quality, indirectly harming the health of nearby residents.<sup>19</sup> Additionally, improper means of solid waste disposal greatly affects surface and ground water quality by leachate.

The major recurring challenges captured by the Kalerwe and Wambizzi abattoirs include poor abattoir designs with insufficiently demarcated waste collection areas, poor funding for waste management facilities, deterioration of slaughter houses and facilities, lack of effective abattoir waste disposal equipment, and inconsistency in waste collection by the service providers, as shown in [Table 3](#).<sup>17,20</sup> Besides the reported needs for a constructed waste collection area, the existing waste collection areas at Kalerwe and Wambizzi were a public nuisance to the abattoir workers because they attract scavengers such as birds and stray dogs, among others. In addition, it has been reported that there are few collection bins for abattoir waste because these bins are not in all operation areas. With these challenges unaddressed, worse public health challenges are likely to be set, such as zoonotic diseases and outbreaks.<sup>18,21,22</sup> However, the existing knowledge on abattoir waste does not correspond to existing practices; therefore, knowledge transferable approaches need to be administered while improving knowledge among abattoir workers.

## Conclusions and Recommendations

While a significant proportion of abattoir workers demonstrated good knowledge of abattoir waste management, there were gaps in the understanding of specific practices, such as waste sorting, which might pose a danger to public health. A positive attitude towards abattoir waste management can be attributed to workers' educational levels and exposure to multiple awareness sessions on waste management. Poor waste disposal practices, including open wastewater drainage, contribute to environmental pollution and pose public health risks. These significant challenges continue to hamper the implementation of appropriate waste-disposal methods. Investment is needed to upgrade abattoir facilities, including the construction of properly demarcated waste collection areas and provision of adequate waste disposal equipment. The

government should allocate sufficient funds to ensure that these facilities meet required standards in line with the national policies including the National Environment Act 2019.

This study was limited by the Hawthorne effect, in which respondents modified their behavior during the administration/utilisation of a checklist by pretending to adhere to proper waste management practices. This was minimized by not informing them that they were being observed. Additionally, the study was limited by reporting bias since data were collected through face-to-face interviews, which were minimized through a thorough explanation of the questions to the respondents in Luganda, the language they easily understood, in order to obtain the appropriate responses. Qualitative methods and an observation checklist were used to ascertain variations in the data results. Therefore, future studies should focus on assessing step-by-step compliance with abattoir waste management practices among abattoir workers using multiple methods.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare that they have no conflict of interest. This paper is based on the thesis of Sserubula and John Paul and has been published on an institutional website (<https://dissertations.mak.ac.ug/handle/20.500.12281/18929>).

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