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Sanitary Status and Compliance with the Standard Slaughter Practices in Karu Abattoir Abuja Municipal Area Council of the FCT, Nigeria

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Abstract

Background and Objective: The sanitary and hygiene conditions of abattoir are of public health concern because of its implications on the quality of meat being sold in the markets. In Nigeria, very few studies have provided a comprehensive assessment of the sanitary status in the abattoir premises. This study assessed the sanitary status and compliance with the slaughter practices in Karu Abattoir, Abuja Municipal Area Council of the Federal Capital Territory, Nigeria. Materials and methods: A descriptive cross-sectional study was conducted using semi-structured, interviewer-administered questionnaire and observational checklist adapted from Policy guidelines on market and abattoir sanitation by the Federal Ministry of Environment. Eighty (80) staff and workers of the abattoir were interviewed. Data obtained were analyzed using descriptive statistics.

Results: More than half (53.7%) of the respondents reported that there is inadequate water supply facility and sourced their water from tap (64.6%) and dispose their waste water in the nearby stream. More than two-third (77.6%) of the abattoir workers reported that there are adequate veterinarians and other health officers and routine post mortem examination is adequate in the abattoir. The study showed that the abattoir lacks infrastructure and compliance with slaughter practices as basic requirements for a good abattoir as stipulated in the Policy Guidelines on Market and Abattoir Sanitation.

Conclusion: The regulations on the operations of the slaughterhouse were below the standard requirements and that much was needed to be done to improve the system at the facility. There is an urgent need to enforce the minimum standards as stipulated in the policy guidelines.

Keywords: Karu Abattoir, Ante mortem, Post mortem, Sanitary status, slaughter practices.

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Introduction

Meat is a universal staple food item gotten primarily from animal farm after slaughtering and preparation in abattoirs or slaughter houses and it has greatly contributed to ill-health and death to human being upon consumption of poorly processed and unwholesome meat [1]. Sequel to lack of adequate sanitary facilities for management of animal waste in the abattoir, production of meat has led to contamination and pollution of the soil, air and water which make the environment unsightly and nauseating. It has been widely reported that poor environmental sanitation and food hygiene practices cause the spread and severity of diarrhea [2]. For Children under five, current estimates reported that there are about 1.4 billion episodes of diarrhoea per year with 123 million clinic visit annually and 9 million hospitalization worldwide, with a loss of 62 million disability-adjusted life years [3]. Environmental and health issues regarding abattoirs and meat processing plants as well as the ineffective meat inspection services and the resultant consumption of unwholesome meat by the public have become a major cause of concern to all stakeholders in the industry and general public at large [4].

An abattoir is a premise approved and registered by a government for hygienic slaughtering and inspection of animals, processing and effective preservation and storage of meat products for human consumption while the slaughtering of animals results in significant meat supplies and production of useful by-products such as leather, skin and bones [5, 6]. The processing activities sometimes result in environmental pollution and other health hazards that may ultimately threaten animal and human health [7]. The basic purpose of meat inspection and abattoir sanitation is to avoid spoilage and preventing meat borne disease and infection and reducing to a minimum, the opportunity micro-organisms particularly the pathogens from gaining access to the meat [8]. In Nigeria, establishment and management of abattoirs have always been regarded as social services by all the three tiers of government [9]. Each tier of government has for many years neglected its function and has been apathetic about taking over responsibilities. This development has resulted in deterioration of slaughter house, improper meat inspection, poor environmental hygiene and waste management and compromise of public interest. The slaughtering and handling of meat became generally poor and the slaughtering facilities where available deteriorated or were abandoned as a result of disuse and lack of maintenance [10, 11].

Sanitation is the process involved in the ensuring good health by means of preventing human contract with the hazards of wastes [12, 13]. The major goal for the food processing industries is to provide safe, wholesome and acceptable food to the consumers and control of microorganisms is essential to meet this objective [14, 15]. In Nigeria, the National Environmental Sanitation Policy identified market and abattoir sanitation as one of the key policy issues to address the enormous problems of environmental sanitation in the abattoir which include improper refuse disposal, inadequate water supply, and gross inadequacy of sanitary facilities that result in open defecation urination, overcrowding and exposure of meat to flies, rodents and contaminant [16, 17]. The sanitation challenges in Nigeria are linked to improper planning of abattoirs; the springing up of illegal abattoirs (including slaughter slab); lack of provision of adequate facilities such as portable water, inadequate road networks institutional regulations, enforcement and monitoring as well as corrupt and sharp practices by the government assigned supervisors of abattoirs [11, 18]. Abattoir meat inspection remains the only affordable technique for monitoring the prevalence of zoonotic diseases in Nigeria [17]. This remains the primary reason for both ante and post mortem examinations at slaughterhouse for protection of public health. During inspection, the animals are put in the lairage for 24-72 hours before they are slaughtered [19]. Meat inspection assists to detect

certain disease of livestock and prevent the distribution of infected meat that could give rise to disease in animal and human being and to insure competitiveness' of products in the local market [20]. It is also essential to remove gross abnormalities from meat and its products and to prevent distribution of contaminated meat, assist in detecting pathological lesion and eradication of certain livestock diseases of both economic and public health importance [21, 22, 23]. The result of meat inspection at slaughterhouse with appropriate trends indicate possible risks due to unsafe meat obtained from animal carcasses at the slaughterhouse and such risk are eliminated by strict ante mortem inspection of animal prior to slaughter as well as the post mortem inspection of meat and offal after slaughter. Therefore, this study assessed the sanitary status and compliance with the slaughter practices in Karu Abattoir, Abuja Municipal Area Council of the Federal Capital Territory, Nigeria.

Materials and Methods

Description of the Study Area

Karu is a satellite town in located about 15 kilometres east from the Federal City Centre (FCC) in Abuja Municipal Area Council (AMAC). It lies between latitudes 8^{o} 59' 38.6"N and 9^{o} 01' 39.6"N and longitudes 7^{o} 33' 17.19"E and 7^{o} 34' 49.61"E as shown in Figure 1. It has an area of about 275km^2 and it is located about 7km north east of the Federal Capital City (FCC), off the Abuja–Keffi express way. It is bordered to the north by Nyanya, to the south by Jikoyi, to the west by Kugbo and to the east by Mararaba (in Nasarawa State). The inhabitants of the Town are Gbagiyi, Gwandara, Hausa and are predominantly farmers, traders and public servants [24]. Karu abattoir was established in 1997. Before that period, slaughtering slab was in use for slaughtering of animals by the local people under the supervision of Sarkin Power" appointed by the local chief of Karu village. Sarikin Power controls the butchers and all other activities in the slaughter slab including revenue collection. Animals were slaughtered in unhygienic slab and as a result, FCT Administration, Agric and Rural Development Secretariat came in to improve on the slaughter slab and also took over the processing activities and meat inspection to ensure that meat presented for sale is wholesome and fit for human consumption. Currently, Karu abattoir is serving the whole of Abuja Municipal Area Councils. It is opened for operation between 6am and 6pm daily.

Study design and population

This is a descriptive cross sectional study involving the veterinarians, health officer, administrative staff, registered butchers and other allied workers in the abattoir.

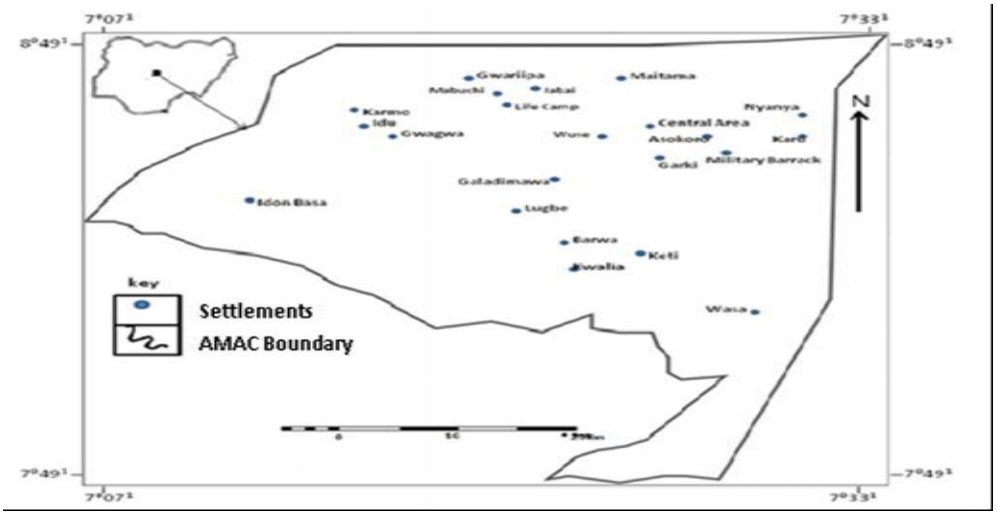


Figure 1. Location of the Study Area [25]

Sampling technique and instruments for data collection

This study employed the total sampling in which all the staff and workers (80) of the Karu abattoir were included. This technique was adopted due to small sampling frame of the abattoir. The study excludes the meat sellers who always come to the abattoir/slaughterhouse to but meat. A semi-structured, interviewer-administered questionnaire was used to elicit information on the socio-demographics, knowledge about the abattoir sanitation, water supply and waste management, sanitary facilities, hygiene status and safety and precautionary measures in the abattoir. The instrument was pre-tested from a group similar to the main study group. The Cronbach's alpha reliability test coefficient obtained was 0.76, which signified good reliability. Each question was translated into the local language (Hausa) for those that could not read English, to help the respondents to give true and accurate answers. However, at the end of the survey, sixty-eight copies of questionnaire were used for analysis due to non-response rate of 15%. Also, observation/inspection checklist prepared by Environmental Health Officers Registration Council of Nigeria (EHORECON) was used to gather some information in-situ during the reconnaissance walk which was carried out in February-April, 2017.

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences, version 21. The data were analyzed using descriptive statistics such as mean and standard deviation. The results were presented in tables and figures.

Ethical Approval

Ethical clearance for this study was obtained from the Federal Ministry of Health Ethical Review Committee. Informed consent was obtained from each respondent before administration of the questionnaires and testing, having clearly stated that participation in the study is voluntary. Willing participants were given assurance of their confidentiality; and that there won't be any consequences for not taking part in the study.

Results and Discussion

Table 1 showed the socio-demographic characteristics of the respondents. The mean age was 28.5± 5.24. More than half (58.2%) of the respondents were in age group of 21-30 and about one-third (32.8%) were in 31-40 age group. Majority (61.2%) of the respondents had tertiary education and more than three-quarter (78.8%) were butchers/allied workers. Majority of the respondents (38.8%) had spent less than a year in the abattoir as shown in Table 1.

Table 1. Demographic data of the respondents in the Karu Abattoir

Variables		Frequency	Percentage
Age (years)	21-30	39	58.2
	31-40	22	32.8
	41+	06	9.0
Sex	Male	31	50.0
	Female	31	50.0
Marital Status	Single	41	62.1
	Married	25	37.9
Religion	Christianity	43	64.2
	Islam	24	35.8
Education	Primary	9	13.4
	Secondary	17	25.4
	Tertiary	41	61.2

Designation	Veterinarians/Health Officers	12	18.2
	Administrative staff	1	1.5
	Butchers/Allied workers	52	78.8
	Cleaner	1	1.5
Working experience (year)	<1	26	38.8
	1-5	20	29.9
	>5	21	31.3

Majority (86.8%) of the respondents believed that the abattoir is adequate for worker's activities. Almost half (44.8%) believed that there is adequate water supply facility while more than half (53.7%) believed that there is inadequate water supply facility, although the deficit is not much. More than two-third (77.6%) reported that there are adequate veterinarians and other health officers and routine post mortem examination is adequate in the abattoir (Table 2).

Table 2. Operational awareness about the Karu abattoir's sanitation

Variables	Frequency	Percentage
Adequacy of the abattoir		
Yes	59	86.8
No	9	13.2
Availability of lairage		
Yes	55	80.9
No	13	19.1
Carrying out the ante-mortem activities		
Yes	47	71.2
No	19	28.8
Adequacy of toilet facility		
Yes	47	69.1
No	21	30.9
Adequacy of waste disposal facility		
Yes	16	33.3
No	32	66.7
Adequacy of water supply facility		
Yes	30	44.8
No	37	55.2
Availability of health personnel		
Yes	52	77.6
No	15	22.4
Carrying out environmental sanitation activities		
Yes	61	89.7
No	7	10.3
Routine Post-mortem examination		
Yes	62	91.2
No	6	8.8
Conversion of waste to wealth		
Yes	44	91.7

No	4	8.3
Current disposal methods		
Open dumping	50	73.6
Land filling	9	13.2
Composting	9	13.2

Most (64.6%) of the respondents reported that tap water is the source of the water supply in abattoir and it is available throughout the year (87%). Majority (87.5%) of the respondents alluded that chlorination is their method of water treatment although more than half (51.1%) were not satisfied with the quantity of water obtained for the abattoir activities. Almost all (95.7%) reported that the disposal of waste was being done once in a day and their wastewater is being channeled into the drainage. Majority (74%) reported that open dumping/burning is their current disposal method in the abattoir (Table 3). On the types of waste, dung, blood, bone and waste water were most generated as shown in Figure 2.

Table 3. Water Supply and Waste management in the Karu Abattoir

Variables	Frequency	Percentage
Sources of water supply		
Tap water	31	64.6
Borehole	17	35.4
Availability through the year		
Yes	40	87
No	6	13
Water treatment		
Chlorination	21	87.5
Exposure to sunlight	3	12.5
Satisfaction with quantity of water supply		
Yes	23	48.9
No	24	51.1
How often is the disposal of waste		
Once in a day	45	95.7
Once in a week	2	4.3
Disposal of wastewater		
Into the drainage	47	100

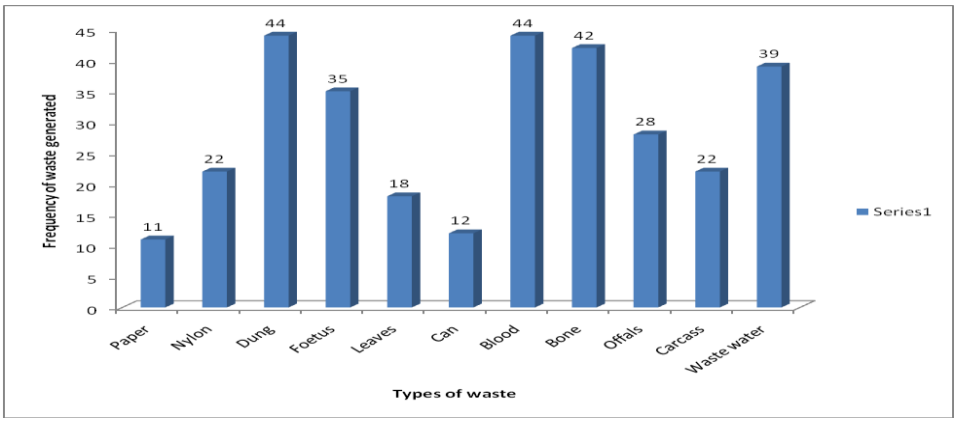


Figure 2. Types of waste generated daily in the Karu abattoir

Over seventy-five percent of the respondents confirmed that provision of hand washing, cold room, cloak room, sterilizers, first aid boxes and laboratory facilities in the abattoir were inadequate (Table 4).

Table 4. Availability of Sanitary facilities in the abattoir in the Abattoir

Variables	Frequency	Percentage
Accommodation (office)		
Yes	41	85.4
No	7	14.6
Cleaning and repair room		
Yes	18	37.5
No	30	62.5
Water supply facilities		
Yes	44	91.7
No	4	8.3
Toilet facilities		
Yes	47	97.9
No	1	2.1
Hand washing facilities		
Yes	11	23.4
No	36	76.6
Refuse /waste bin		
Yes	44	91.7
No	4	8.3
Drainage		
Yes	44	91.7
No	4	8.3
Cold room		
Yes	3	6.3
No	45	93.7
Cloak room		
Yes	11	25.0
No	33	75.0
Sterilizer		
Yes	10	20.8
No	38	79.2
Slaughter-bay		
Yes	40	83.3
No	8	16.7
Electricity		
Yes	40	83.3
No	8	16.7
First Aid box		
Yes	2	4.2
No	46	95.8
Laboratory		
Yes	1	2.1
No	47	97.9

Lairage		
Yes	45	93.8
No	3	6.2
Bleeding room		
Yes	15	31.9
No	32	68.1
Flaying section		
Yes	30	62.5
No	18	37.5
Eviscerating room		
Yes	17	35.4
No	31	56.6
Hoists		
Yes	18	37.5
No	30	62.5

Most (89.8%) of the respondents reported that they wear personal protective equipment (PPE) which include boot (96.9%), overall cloth (92.3%) and hand gloves (72.3%). Cleaning of the cutting instruments was done by everyone using water only (46%). Majority (80%) of the respondents said that "line" is being adopted for operation system for slaughtering. Most (2.3%) engaged the use of wood as material for roasting of the animal in the abattoir (Table 5).

Table 5. Personal hygiene and safety practices in the Karu abattoir

Variables	Frequency	Percentage
Is there any employed cleaner in the abattoir		
Yes	47	97.9
No	1	2.1
How often is the cleaning done		
Once in a day	41	85.4
Twice in a day	7	14.6
Washing of hand after each operation		
Yes	59	98.3
No	1	1.7
How often		
Frequently	44	68.8
Seldom	8	12.5
When I remember	2	3.1
When I want to eat/pray	10	15.6
Wearing of PPE		
Yes	53	89.8
No	6	10.2
Boot		
Yes	63	96.9
No	2	3.1
Overall cloth		
Yes	60	92.3
No	5	7.7

Nose mask		
Yes	11	19.0
No	47	81.0
Hand gloves		
Yes	47	72.3
No	18	27.7
Cleaning of cutting materials		
Yes	62	100
Cleaning materials		
Water only	29	46.0
Water and detergent	23	36.5
Water, sterilizer and detergent	11	17.5
Operation system for slaughtering		
Line	48	80.0
Booth	1	1.7
Don't know	11	18.3
Materials for roasting		
Kerosene	2	4.3
Tyre	11	23.4
Wood	34	72.3
Attendance of public health education programme on abattoir operation		
Yes	33	52.4
No	30	47.6

Demographically, it was indicated that there is high participation of the youth (21-40) years in Karu abattoir. This corroborated the reports of Salifu and Teye [26] who reported that meat handling and retailing business require a lot of physical strength and is being carried out by more energetic and active youth and middle age men. The reconnaissance walk survey showed that the road leading to Karu abattoir is tarred but lack drainage. There were shops of illegal structures made of wood, umbrella and canopy by the entrance of the abattoir which does not conform to the National policy on market and abattoir sanitation [16]. Food sellers around the abattoir premises were not organised and majority do so in an insanitary surroundings; thus exposing the food to flies. The abattoir lacks adequate fencing thereby creating access to human scavengers. There was an open space used as lairage which lacks drainage, concrete floor and scattered with cow dung. There was no evidence of ante-mortem examination at the lairage section. These findings agreed with Adeyemo [9], Lawan *et al*., [27] and Akpabio *et al*., [28] which all reported lack of lairage and absence of ante mortem inspection in some Nigerian Abattoirs. Animals were often brought in tied with ropes and chased into the abattoir. These findings are in agreement with the findings of Bello *et al*., [29].

The slaughter hall was smooth and provided with drainage but lack line slaughter system as required for modern and hygiene slaughter practice. The method of immobilizing the animals prior to slaughter is primitive as it involves the wrestling down of the animals which affect the quality of the meat [30]. However, the slaughter floor was clean at the commencement of animal slaughtering but lack subsequent cleaning with hot water after each animal slaughtering according to the hygiene and sanitation rule in slaughtering of animal. Slaughtering of other subsequent animals after the first one on each batch was done on top of

animal blood and dung due to non-careful stunning and non-hygienic evisceration, which can result in cross-contamination of carcasses [31, 32]. In the flaying of animal, mouth was observed being used to enhance flitting before flaying which likely to bring about zoonotic diseases due to direct contact with the carcass in contravention of the safety rules in meat handling [33]. Hoists were not available which made the draining of blood from the animal improper and affect the quality of the carcass [34].

Ante/ post-mortem examinations being carried out by health officers were not strict in applying some regulations like isolation/quarantine and elimination of suspected animals or diseased animals. The butchers were wearing boots and overall but lack head cover and hand gloves in contravention of the hygiene practices in slaughtering of animals. Water supply sources were tap and borehole which are okay but the adequacy of the water to meet the hygiene standard required to ensure safety and protection of the meat from contamination is lacking [33]. This was due to non-provision for overhead storage tank and enough water outlets points; thus making the "Gwandala women" working as labourers bring water for sale from outside the abattoir which is sourced from borehole. The water used for cleaning procedures must meet drinking standard [35]. The use of non-portable water in the abattoir might to contribute to carcass contamination as reported by Bello *et al*., [36] who observed increase in *E. coli* counts and isolation of *E. coli* O157H7 from fresh beef carcasses in some Nigerian abattoirs due to the use of non-portable water. The hides and skin of the animals were roasted using tyre materials, plastics and wood thereby producing black smoke which caused black stain on their nose, skin and their clothing. The bleeding was also on the spot with no collection container and channelled to the river causing the pollution of water sources. Evisceration is done on the ground and the intestine contents removed at the treatment bay which is in contravention of the abattoir hygienic principles.

Karu abattoir lacks facility for collection of waste materials generated in the abattoir like the animal dung, blood, hides etc. The wastes generated were dumped openly and channelled to the nearby stream. This is in agreement with Adelegan [37] and Adonu *et al*., [38] where it was found that in many developing nations (Nigeria and Ghana), many abattoirs and slaughterhouse dispose off their waste directly into streams or rivers and also use water from the same source to wash slaughtered animals. It was also observed that the unwanted offal which are disposed off at the refuse dump were responsible for the bad stench in the abattoir. Degrading heaps of gut contents at the site served as breeding grounds and shelter for pests that become a nuisance for slaughterhouse workers, visitors as well as residents around the facility. This observation confirmed the study of Chika [39] who reported that the stench that comes out from the Nigerian's abattoirs is unbearable. The environmental problem associated with wastewater from abattoir is the amount of solid matter and the obnoxious odour generated from it [40]. Water bodies such as streams and rivers are usually the recipients of this wrongful discharge of wastewater which contain blood and animal faeces and can cause increased rate of toxin accumulation [41], outbreak of waterborne diseases [42] and contamination of the groundwater [43, 44, 45].

There were adequate provision of toilet facilities but some people still go to lairage and nearby bush to practice open defecation, which is not in compliance for hygienic practices according to the National Policy on Abattoir sanitation. The findings are in line the Shival [46] who posited that there are modern methods of waste and feacal disposal but the apathy of the butchers to these methods. Although, most of the butchery claimed that they had receive any formal public health education and training on meat handling hygiene but the observational study indicated the need to organize training to sensitize the butchers on meat

sanitation and hygiene in order to improve their knowledge on standard sanitary and hygienic operations for production of quality and safe meat [47]. Training of food handlers regarding the basic concepts and requirements of personnel hygiene can play integral part in assuring safe products to the consumer and reduction of meat post-harvest losses due to spoilage.

Majority of butcheries in the Karu abattoirs cleaned their utensils with water only which confirmed the Adzitey *et al*., [48] who reported that only few (10%) butchery workers in Bawku Municipality, Ghana did clean butchery utensils appropriately using hot water with soap. Most of the butchers wear personal protective equipment such as boot, overall cloth while processing the meat. This is contrary to Ntanga *et al.*,[49] who reported that 62.5% of the butchery workers in Morogoro municipality, Tanzania did not use protective equipment while processing the meat. Also, Mirembe *et al.*, [50] reported that only 31.5% of butchery workers in Kampala district Uganda had personal protective wear. Supply of hot safe water in the abattoirs is crucial because of the fatty nature of products in the abattoir. Usage of hot water with detergent facilitates easy and quality washing of abattoir floor and equipment.

Training personnel in meat hygiene is essential to improving conditions in slaughterhouses and to reduce bacterial contamination of meat and disease exposure in workers [4, 51]. Abattoir's workers have been identified in occupational health studies for elevated risk of injury, lacerations and back injuries [52, 53]. Electricity is required in the abattoir for power supply in automated dressing line of carcass, cold room and lightening of slaughter hall for adequate visibility during operational activities and cleaning procedures. The absence of electricity among the other poor status and unhygienic conditions of the abattoirs raise serious public health concern, as hygiene problem are not only limited to slaughtering but are also associated with incorrect processing [22].

Conclusion and Recommendations

From this study, the operations of the slaughterhouse regarding the solid and waste water require appropriate and proper disposal to avert serious environmental and health effects for residents and workers. The regulations on the operations of the slaughterhouse were below the standard requirements and that much was needed to be done to improve the system at the facility. Encouragement of line slaughter system to maintain hygiene processing. Fencing of the abattoir and provision of sanitation facilities will improve hygiene and sanitation in Karu abattoir. It should have adequate waste collection, disposal and good drainage, adequate supply of water and electricity. Butchery utensils such as knives, axe and other equipment that have contaminated diseased carcass should be cleaned and sterilized before being used again. Racks and tables should be provided for heads. Waste water drainage, with proper trapping and sewage disposal should be adequate to maintain the abattoir in a sanitary condition. Personnel processing the carcass should wear clean garments and safety wears, and follow all hygiene and sanitation procedures.

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