

# Environmental Hazard and Risk Factors Associated with Some Practices in Maiduguri Abattoir Borno State – Nigeria

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**Abstract:** Animal slaughtering for communal consumption is inevitable in most part of the world. In most countries government at different levels enacts laws aimed at ensuring a healthy steady supply of meats and meat products, these laws may include the involvement of trained personnel such as veterinarians, butchers, meat inspectors and laboratory scientists in the abattoir, yet some problems abound with meat handling procedures in most abattoirs in developing nations. The study was aimed at assessing the types and effects of waste generated in Maiduguri abattoir. The study adopted the survey research design through mixed method approach. Questionnaires were designed and distributed. The data collected were analysed using descriptive statistics and presented appropriately in required places of discussion. The result of the study indicates that Camels, Cattles, Sheep, and Goats are the major animals slaughtered, and blood, paunch and dung content, condemned meat and carcasses are the major waste generated in the abattoir. The study reveals that despite the associated dangers in the high volume of abattoir waste generated yet it also provides employment opportunity and increased agricultural production. Furthermore, the study recommends the need for relocation and construction of a modern abattoir outside the city away from residential area and enactment of laws restricting indiscriminate encroachment by property developers.

**Keywords:** Abattoir, Solid Waste, Liquid Waste, Waste Management

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## 1. Introduction

Naturally, abattoir as a food processing institution, it would be assumed that it should maintain a standard hygiene and safety measure as much as possible just as most of us take extra care of what we consume [1, 2, 4]. The slaughtering of animals for communal consumption is inevitable in most nations of the world [10]. In Nigeria, the development and growth of livestock production, has been on the increase [5, 7, 19] and has guaranteed steady supply of food animals meant for slaughter and processing for human consumption under a hygiene environment [3, 6].

Despite availability of legislature and involvement of trained personnel such as veterinarians, butchers, meat inspectors, laboratory scientists e.t.c in Maiduguri Central abattoir, some problems abound with meat handling procedures in most abattoirs of Nigeria and Maiduguri abattoir in particular. These problems range from: slaughtering on the floor, absence of stunning and ripening operations, inadequate slaughtering facilities [5], lack of proper sewage disposal systems [16], inadequate clean water supply [12], lack of refrigeration system, lack of proper ventilation and electricity [8], lack of adequate transport system for meat products to lack of quality environmental

practices among the abattoir workers [3, 9, 13, 17, 18], often times, the drainage in and around the abattoir were clogged with abattoir debris hindering free flow of influents and thereby leading to accumulation of maggots which often migrated onto the slaughter floor [21-23]. In addition, butchers and other abattoir workers were sometimes seen spitting on the floor constituting unhealthy/unhygienic and health hazards to those working within the abattoir and meat consumers as well [11-13]. It is against this background that this study is designed to determine the environmental hazard and risk factors associated with some practices in Maiduguri abattoir, Borno State, Nigeria.

A field investigation carried out by Nwanta *et al.* [18], indicates that there are about 30 abattoirs, 132 slaughter houses and 1,077 slaughter slabs in Nigeria with a total annual slaughter capacity of 14,127,868 animals. As one of the meat processing facilities in the country, the Maiduguri main abattoir supplies meat to the teeming population in the region, majority of whom are not knowledgeable in possible health hazards that could be associated with poorly handled meat during processing. It is against this background that this study is designed to determine the environmental hazard and risk factors associated with some practices in Maiduguri abattoir, Borno State, Nigeria.

## 2. Materials and Method

The study adopted the survey research design, mixed methods (qualitative and quantitative) approach. The design was chosen due to the large number of subjects to be investigated, analyzed and objectives of the study.

**Table 1.** Showing population stratum and their sample sizes.

Population Stratum	Population	Sample size
Slaughter men	1000	12
Meat buyers	10,000	119
Veterinary unit	10	3
Neighbouring resident	22,040	260
Total	33,050	393

Questionnaire was distributed to 393 of the total population, 313 was retrieved in useful form and used for the study. The data collected was analyzed using Statistical Package for Social Sciences (SPSS) and presented in tables and percentages.

**Table 3.** Distribution of the waste generated from the slaughtered animals in the abattoir:

S/n	Types of Waste generated from the slaughtered animal in Maiduguri abattoir house	Frequency	Percentage (%)
A	Blood, Paunch and Dung content	130	42
B	Condemned Meat and Carcass	141	45
C	Bones, Hooves, Horn and Hide (skin)	28	9
D	Meat and Skin trimmings	14	4
	Total	313	100%

Table 3 presents the types of the waste generated in the abattoir, majority of the respondents reported blood, paunch, dung content, condemned meat and carcasses as the waste generated from the slaughtered animals. 42% stated that, blood, paunch and dung content are the waste generated,

## 3. Results and Discussion

Section A: Demographic Characteristics of the Respondents.

**Table 2.** Distribution of the age of the respondents.

Socio-economic Composition of the Study Area		
Variables	Frequency	Percentage (%)
1 Age		
A <20	7	2.2
B 21-30	40	13
C 31-40	108	34.5
D 41-50	124	39.6
E >50	34	10.8
2 Gender		
A Male	257	82
B Female	56	18
Total	313	100%
3 Educational Status		
A Primary	33	11
B Secondary	58	19
C Tertiary	97	31
D No formal education	125	39%
Total	313	100%
4 Occupation of the respondents		
A Farmers	119	38%
B Traders	64	20%
Students	39	12.5%
Civil servants	91	29.1%
Total	313	100%

Table 2 shows the distribution of the age of the respondents. Out of 313 respondents interviewed, majority (34.5%) and (39.6%) were within the age group of (31-40) and (41-50) respectively. (2.2%) of the respondents were less than 20 years. 40 people (13%) were within (21-30) years of age and (10.8%) of the respondents were above 50 years of age. Majority (82%), which is 257 people out of the respondents are married while (18%) which include about 56 people are single. 19% and 11% attended secondary school and primary school respectively, 31% completed tertiary education and 39% with no formal education. 38% are farmers, 20% are traders involve in buying and selling of meat, 12.5% are students and 29% are civil servants.

Section B: Types of Waste Generated in Maiduguri Abattoir from the Slaughtered Animals.

most of them 45% agree that, condemned meat and carcasses are the waste of the slaughtered animals. Few of the respondent 9% stated that bones, hooves, horn and hide are the waste of the slaughtered animals. Only 4% agreed on meat and skin trimmings as waste from slaughtered animals.

With this result above, it is observed that those that mentioned blood and paunch content, condemned meat and carcasses as the waste generated have the highest percentage.

The waste materials generated from abattoir operations was estimated based on calculations by Abiade & Adewoye [1] and Ezeoha & Ugwuishiwu [12]. The computations were done using average data on body weight for the Respective

ruminants and carcass weight per 1,000 kg as shown in Table 8. This study assumed that volume of waste generated from the slaughter of sheep and camel is equal to that of goat and cow respectively. The estimated figures from Abiade *et al.* [1], Ezeoha & Ugwuishiwu [12] and Omole & Ogbiye [19] were therefore applied to sheep and camel.

**Table 4.** Showing estimated waste materials per head slaughtered.

S/n	Waste category	Cow/Camel (kg)	Goats/Sheep (kg)
A	Blood per head (kg)	12.6	0.72
B	Intestinal content per head (kg)	8.0	1.25
C	Waste tissue per head (kg)	6.4	0.80
D	Bone per head (kg)	11.8	2.06

The responds of the population on the number of animals slaughtered daily in Table 4 was used to calculate Table 4 the quantity of waste generated in the abattoir daily, based on most of the respondents 51% stated that about 300 Cattle, 30 Camel, 500 Goat, and 500 Sheep are slaughtered daily. This will result into discharge of about 5ton of blood, 4ton of intestinal contents, 6ton of bone and 3ton of waste tissues daily in Maiduguri main abattoir. While few of the respondent 10% stated that about 80 Cattles, 40 Camels, 120 Goats, and 100 Sheep are slaughtered daily which will also

result into discharge of about 2ton of blood, 1.2ton of intestinal contents, 2ton of bone and 1ton of waste tissues daily in the abattoir (Fieldwork, 2020). Therefore, if there is high number of animal slaughtering especially during the festival period there will be generation of large quantity of waste generation in the abattoir daily. The number of tons is obtained by dividing the quantity of waste (kg) by 1000, this will give the number of tons generated.

Section C: Environmental Sanitation Practices in Maiduguri Abattoir

**Table 5.** Types of Solid Waste Disposal.

S/n	Method of Solid Waste Disposal	Frequency	Percentage (%)
A	Burning	50	16.0
B	Dump on Vacant Land (Beside Slaughter house)	89	28.4
C	Dump in Nearby Bush	44	14.0
D	Dump along Drainage	130	41.6
	Total	313	100.0%

Table 5 reveals the methods of solid waste (condemn meat, undigested ingesta, bones, horns, hairs and aborted fetuses etc.) disposal in slaughterhouses revealed that 16.0% of the slaughterhouses burn their waste, 28.4% dump their waste on vacant land beside the slaughterhouses, 14.0% of the respondents dump their waste in the bush, 41.6% dump their waste in the drainage. Further findings revealed that all the

slaughterhouses sampled dump their solid waste on the vacant land in the premises of the slaughterhouses. Undigested ingesta, dungs, bones and horns comprise major proportion of wastes generated in Nigerian slaughterhouses. This could be responsible for the highly pungent odour, infestation of flies and diseases vectors as a result of heaps of waste around the slaughterhouses.

**Table 6.** Frequency of Disposal of Solid Waste.

S/n	Frequency of Disposal of Solid Waste	Frequency	Percentage (%)
A	Daily	210	67.0
B	Twice in a Week	103	33.0
	Total	313	100 (%)

Table 6 reveals the frequency of the disposal of solid waste from the slaughter slabs as put by the operators revealed that 67.0% evacuate their solid waste from the slaughter slabs

daily while 33.0% clear their solid waste from the slaughter slabs twice in a week.

**Table 7.** Liquid Waste Disposal.

S/n	Method of Liquid Waste Disposal	Frequency	Percentage (%)
A	Channel to Nearby Stream	200	63.9
B	Channel to Nearby Drainage	113	36.1
	Total	313	100.0 (%)

The study reveals 2 methods of wastewater management in

the study area as shown in Table 7. It was observed that 63.9%

of the slaughterhouse operators discharge their liquid waste into the nearby water bodies while 36.1% discharge their liquid waste into nearby drains in their neighbourhood. This indiscriminate discharge of wastewater is bound to

contaminate the nearby water bodies and also cause drains around the slaughterhouses to be filled with sludge wastewater and slaughterhouse effluents [21, 22, 23].

**Table 8.** Frequency of Cleaning of Wastewater Channel.

S/n	Frequency of Cleaning of Wastewater Channel	Frequency	Percentage (%)
A	Daily	40	12.8
B	Weekly	60	19.1
C	Monthly	100	32.0
D	Every 3 months	113	36.1
	Totals	313	100 (%)

On the frequency of the cleaning of the slaughter slabs, the study revealed that all the operators wash the slabs of the slaughter houses daily. However, findings on the cleaning of drains conveying wastewater and its effluents (dissolved solid, blood gut contents, urine and water etc.) from the study showed that 12.8% clean their wastewater channel daily,

19.1% of the respondents clean their wastewater channel weekly, 32.0% clean their wastewater channel monthly while the remaining 36.1% clean their wastewater channel every three months.

Section D: Effect of Waste generated at Maiduguri Abattoir

**Table 9.** Distribution of the effects of waste generated in Maiduguri main abattoir.

S/n	Effect of the Waste generated	Frequency	Percentage (%)
A	Surface and Groundwater contamination	80	25
B	Air pollution and Insect generation	108	35
C	Reduced quality of health	44	14
D	Land degradation	9	3
E	Generation of wastewater containing blood and paunch	72	23
	Total	313	100 (%)

Table 9 indicates the effects that the waste generated from the abattoir pose on the people and environment in general. This study found that majority of the respondents 35% are being affected by the polluted air emitted from the abattoir. 25% stated that the waste generated from the abattoir contaminates the surface and ground water resulting into water pollution. Some of the respondents 14% said that the activities of abattoir results into reduced quality of health among the workers and neighbouring residents. According to Adegbol & Adewoye [2] diseases like pneumonia, diarrhea, typhoid fever, asthma, wool

sorter diseases, respiratory and chest diseases are associated with abattoir activities. Few of the respondent 3% agreed that the waste generated from the Maiduguri main abattoir results into land degradation. This could be confirmed when related to a study conducted by Abiade *et al.* [1] to analysis the Microbial content of wastewater in two abattoirs, the wastewater contaminated the soil in Agege and Ojo Local Government Areas in Lagos State.

Section E: Possible suggestions for improvement of Maiduguri Abattoir

**Table 10.** Respondents' suggestions for improvement.

Suggestion for improvement	Frequency	Percentage (%)
The abattoir should be relocated outside the city	Yes	184
	No	129
	Total	313
The abattoir is not modernized and adequately equipped	Yes	64
	No	249
	Total	313
Is the meat in the abattoir hygienic and safe for human consumption?	Yes	146
	No	167
	Total	313
Is the disposal method and equipment of the abattoir are appropriately adequate?	Yes	54
	No	259
	Total	313

Table 10 shows respondents' suggestions for possible improvement on the waste generated in the abattoir. Out of 313 respondent's majority (59%) agreed that the abattoir should be relocated outside the city and 41% do not agree. Majority 80% agreed and stated that the abattoir is not adequately equipped and therefore needs modernization.

Based on the meat produced in the abattoir, 53% out of the respondent are not contented about the meat hygiene in the abattoir. This is consistent with the findings of Mohammed a& Musa [15]; Nandita *et al.* [16] and Williams a& Dimbu [23]. Therefore, there is need for awareness about effects of producing unhygienic meat and also need of adjustment in

the abattoir activities. Also 83% revealed that the disposal method of the abattoir is improper and inadequate. There is need for better equipment and positive improvement in the method of disposing the abattoir effluent.

## 4. Conclusion

In conclusion, generally in Nigeria, the establishment and management of abattoirs and waste is one of the numerous social services shouldered by various tiers of government especially because of its health implication to the general public. Unfortunately, the abattoir is one sector that have not attracted the attention of the government over the years probably as a result of the perceived low revenue generation in the sector. The findings from this study shows that despite the inherent dangers associated with abattoir waste in the study area, the increasing volume of such waste in recent times present numerous economic opportunities for providing employment opportunity, increasing agricultural production and reduction of harmful wastes discharged into the environment. There is therefore the need to improve the present local uses of the abattoir waste through empowerment of the local people and enlightenment campaign.

## 5. Recommendations

From the findings of this study, we recommend the following:

- 1) There is need for relocation and reconstruction of a modern abattoir, away from residential area which will further help in solving the present challenges of abattoir waste in the study area.
- 2) There is need to enforce the design criteria and siting restriction which include setbacks from neighbours and buffers to protect against encroachment by property developers.
- 3) Enacted environmental regulations and guidelines should be enforced in the study area.
- 4) The National Environmental Standards and Regulations Enforcement Agency (NESREA) should enforce strict compliance to relevant guidelines, policies and regulations through the agency's routine compliance visit to the abattoir.
- 5) There is need for the introduction of an alternative waste disposal method other than dumping, and incineration which will be properly enforced.
- 6) NESREA should embark on public awareness and enlightenment campaign on possible impact of pollution from abattoir wastes.

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