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Animal Waste Generation and the Impacts on Market Environment in Ibadan Region, Oyo State, Nigeria

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Abstract

The processing of animals such as cows, goats, sheep and pigs for human consumption generate wastes which constitute health risks to the operators of the slaughter slabs in the market within which the processes took place. The wastes generated in form of solid, liquid and gaseous types have impact on the market environment most times negatively. This study analyzed the effects of the wastes generated in two slaughter centers in Ibadan region markets on the operators of the slaughter centers and the immediate neighbourhood environment. The survey method, questionnaire and interview were used to capture data on the types of wastes, nature of work in the slaughtering process, frequency of waste collection, length of time in the business and the diseases suffered in the process of working in the slaughter houses. Interview was conducted on the government official in charge of the management, butchers, cow merchants, slaughter house cleaners and skin removers. A total of 58 respondents were administered questionnaires and interviewed in the two markets. The data were analyzed using Chi-square to test the relationship between the type of diseases and nature of work done in the abattoir. It was found out that the exposure of the operators to the animal wastes made them vulnerable to metaemoglobinae diseases and microbial pathogens. The result showed a significant association between the nature of work and fever ($X=26.31$; $P<.01$); gastrol intestinal disorder ($X=28.04$; $P< 0.01$); fatigue ($X=15.48$; $P<0.05$) and diarrhea ($X=17.60$; $P< .05$). These meant that these diseases were frequent in the midst of the operators of the slaughter houses due to inadequate protection and poor hygiene. It was suggested that the users of the slaughter houses be encouraged to observe good hygiene practice, use protective gears in the process of work, and government officials be more active in education and public monitoring of waste disposal in the markets.

Keywords: Animal Waste, Environmental Health, Slaughter House, Markets Centers, Ibadan Region.

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1.0. Introduction

Domesticated animals such as Goats, Cows and Pigs are slaughtered for human consumption principally in recognized slaughter houses or abattoirs often located in market centers. The slaughtering of these animals often generates wastes in form of solid, liquid and gaseous types which impact on the market environment most times negatively. The solid wastes from the slaughtered animals include condemned meat, undigested ingesta, ligaments, tendon bones, horns, hairs and aborted festuses (Frank-Whittle and Insam, 2013). Liquid wastes comprised of blood, gut and dissolved solid. These wastes contaminate ground and surface waters and contribute to foodborne diseases (Elimule, Raphael, Oloruntoba, etal, 2019). This paper examined the various types of wastes generated from the slaughtered animals and their impacts on the environmental health of inhabitants; the types of diseases suffered by the users of the slaughter houses as a result of the nature of work; and the precautionary measures and policies of the government to reduce environmental risks of the slaughter house users in Ibadan region, Nigeria. The market centers selected for the study were Akinyele Slaughter's house in Akinyele Local Government, and Alesinloye slaughter's slab in Ibadan South West Local Government of Oyo State, Nigeria.

2.0. Waste Generated from Slaughtered Animals in the Slaughters Houses

Animals such as Cattles, Goats, Sheep and Pigs are slaughtered for human consumption at the designated slaughter houses by the butchers. These slaughter houses are also known as Abattoirs which are designed for livestock meat production for human consumption. The wastes generated from the slaughter houses are skin, bones, horns, hooves, blood, fat and offal (EFSA, 2021). According to EFSA, the animal wastes or by-products are not useful for consumption of human beings. These may include dead pets, waste milk, and meats that are of animal origin but unsuitable for human consumption. It was estimated that about 20 million tonnes of animal wastes are produced every year from slaughter houses in European Union (EFSA, 2021). The animal wastes are generated in slaughter houses which are facilities or premises approved and registered by the government authorities for hygienic slaughtering and processing of meat products for consumption (Morck Veterinary Manual, 1998).

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A further review of animal wastes in the slaughter houses or abattoir showed that wastes generated are in various shades such as faeces, clotted blood, fat, animal trimmings, paunch and urine. These waste materials have great effect on the environmental health of the inhabitants of the market centers. The wastes from the slaughter houses can also be categorized into solid, liquid and gas. The solid wastes consist of bones, undigested ingest, aborted fetuses; while the liquid wastes comprise of blood, urine, water and guts (Fearon, Mensah and Boateng, 2014; Oronye, 2015).

Plate 1. Bones waste from slaughtered animals

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Plate 2. Butcher, and Bone collector doing business, 2024.

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3.0 Environmental Health Implication of Animal Waste on Patrons of the Market Centers in Ibadan Region

Environmental health is the assessment of the impacts of the human activities carried out in the environment on the health of all living beings inhabiting the environment. Human health has been observed to be dependent on the health of the environment (Alausa, 2023). It has been noted that 25-33% of diseases in industrialized nations are caused by environmental factors such as manufacturing, construction, trading, transportation and agriculture. The amount of impact of these activities is controlled by the planning process and policies put in place by the stakeholders and the affected people. (United State Department of Health Education and Welfare, 2021).

The wastes from slaughtered animals formed parts of the wastes that pollute the environment. These wastes consist of the bones, undigested ingest, blood, urine, faeces, water and gut contents. The disposal of these wastes if not properly done has implications on the environmental health of the people in the market and its environ. The skinning of hair from the body of the slaughtered animals constitutes health hazards to the operators of the abattoir and the buyers who patronize the slaughter's market. The bunning of the skin to turn to edible meat or the thick skin called "Ponmo" (which is a local meat skin delicacy) produce carbon nitrate which is a source of air pollution in the market environment. The liquid waste if it found way into the water source of the community can pose health risks and cause methaemoglobinae-mia (ScienceDirect, 2024). The slaughtering process which may start from husbandry of the animal before it is ready for slaughtering is capable of generating microbial pathogens, gaseous emissions such as ammonia and offensive odors. These pathogens and offensive gases produced during slaughtering and meat production process may also contribute to decreased quality of life among the animals and human beings working within the slaughter house facilities (Kaltingo, 2023).

The continuous drive to increase meat production for the protein needs of the increasing population has some pollution problems attached as a result of failure to adhere to Good Manufacturing Hygiene Practices. Consideration is hardly given to safety practices during animal transport to the abattoir, during slaughter and dressing to reduce environmental contamination and related diseases, especially zoonotic diseases. Failure to adhere to Good Manufacturing Practices

and Good Hygiene Practices often leads to contamination from hides, hooves and contents of the alimentary tract during evisceration and negatively impacts the environment, including microbes in the soil and surfaces and groundwater (ScienceDirect, 2024).

For example, the butchers who carry out illegal slaughtering of animals generally throw visceral material at the community bins and wash the small intestines at their shops and thus creating a pollution problem. During dressing, the oesophagus of cattle and sheep were not sealed to prevent leakage of animal contents. The authority did not take care that intestines are not punctured during evisceration to avoid contamination of carcasses.

During the operations in the abattoir, the waste generated is of a liquid and solid nature. The liquid waste when washed away often found its way into safe potable and fresh water sources. Drainage lines of abattoirs were not well constructed and strategically located to be able to properly drain liquid wastes and prevent stagnation that emits a foul odour. Wastewater or effluent generated from the abattoir is characterized by the presence of a high concentration of whole blood of slaughtered food animals and suspended particles of semi-digested and undigested feeds within the stomach and intestine of slaughtered and dressed food animals. The waste water from slaughter house is heavy in pollution, therefore, it should not be allowed to mix with the municipal drain system without treatments like anaerobic treatment which means the effluent is digested in the absence of oxygen in an enclosed digester; aerobic treatment in which oxygen assists bacterial action to reduce biochemical oxygen demand level and filter press for dewatering of the sludge.

Uncollected blood in slaughterhouse becomes a serious sanitary problem. It quickly clots, choking drains, septic tanks, etc. and rapidly decomposes serving as an ideal medium for bacterial growth. The sources of solid waste in abattoirs include animal holding areas, slaughterhouse and processing areas, waste treatment plant, unwanted hide or skin pieces and unwanted carcasses and carcass parts. This decreases the volumetric and organic load on the waste water treatment stream.

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Plate 3. Animal waste Blood Collector, Meat buyers at the butchers table, 2024.

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Plate 4. The animal waste dung near the market at Alesinloye market, Ibadan, 2024

As a result of these un-hygienic practices and poor meat preparation handling process by the butchers, there is production of human pathogens which may include viruses which are present in animal faeces. These viruses appear in various forms such as Hepatitis E virus, Caliciviruses, Reoviruses and Parvoviruses. These viruses can affect the respiratory system of the users of the abattoir operators, market customers and houses located around the surroundings of the particular market. This disease can be easily spread by physical contact with infected animals and by the

bites of flies. Bacteria is another human pathogens from animal wastes in slaughter houses. These are of various varieties such as Aeromonas hydrophila, Arcobacter, Bacillus Anthracis (Anthrax), Chlamydia, Coxiella burnetiid. Infections by these bacteria may cause pneumonia, fever, gastrointestinal form or spores, respiratory disorder, and other virulence infections (Gray and Stickler, 1989). There is also the generation of parasites such as Protozoans and Helminths. Protozoa significantly affect human health by causing diseases such as malaria, giardiasis, toxoplasmosis which can lead to diarrhea, abdominal pain, fatigue, organ damage and even death (Seed, 1996). It was noted that increases in animal population, increase in atmospheric temperature and other environmental conditions suitable for transmission will contribute to the spread of protozoan diseases (Fletcher, etal, 2012). On the environment, houses surrounding the market which are within 100-250 meter radius are usually infested by flies and mSosquitoes which may aid the spread of malaria and diarrhea. Water sources especially streams, rivers and shallow wells are prone to pollution as a result of waste water entering the water sources. This can cause epidemics if the water bodies are for drinking by the surrounding residents. The burning of bones and animal skin during preparation pollutes the air and affect air quality. These can lead to respiratory diseases such as Asthma and vision blurring.

4.0 Data Collection and Analysis in the Two Sampled Slaughter Houses in Ibadan Region, Oyo State.

The methodology employed for the study was the case study research approach. According to Yin (2003), case study approach is sacrosanct when issues of What? and How? are to be addressed. Here, the issues of what are the effects of the animal wastes on the environmental health of the market community and how can the effects be eliminated or reduced to insignificant level on the health of the community and the surrounding houses. The survey method, questionnaire and interview were used to capture the types of waste generated in the selected slaughter houses in Ibadan region and the environmental effects on the health of the users. The two slaughter houses were selected based on location in two big market centers in the region. The market centers were Akinyele Slaughter House/Abattoir which is the largest cattle market in Ibadan region, Oyo State; and Alesinloye market which ranked second among the four major market complexes in Ibadan.

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The data variables are the types of people in contact with animal wastes, the frequency of contacts and the diseases suffered by the users of the slaughter houses over the years. The sample population was not so definite since there was no accurate register of workers involved in animal processing in the two slaughter houses. The sample population was purposively determined for the two markets while a systematic approach was used to select the respondents based on the type of job being done in the slaughter houses. The two slaughter houses (abattoir) selected and surveyed in Ibadan region were Akinyele slaughter slab in Akinyele Local Government cattle market; and Alesinloye slaughter slab in Alesinloye market, Ibadan Southwest Local Government, Oyo State, Nigeria with a population of 800 and 200 workers (an estimate) respectively. Forty-four (38) respondents were selected in Akinyele slaughter house and Twenty (20) respondents were selected in Alesinloye slaughter house. The selections were made as in Table 1. A total of 58 respondents were administered questionnaire and interviewed to extract information such as type of work done in the animal slaughter process, the length of time working in the slaughter slab, the nature and frequency of diseases experienced, the frequency of waste collection, and the source of water used in the slaughter houses. All the questionnaire administered were retrieved, and interview was used to collect other needed information that will assist in the data analysis. The number of questionnaires distributed and the type of respondents was shown in Table 1.

Table 1. Distribution of respondents of the two selected market studied.

Market	Butcher/ selling of raw meet	Live cow merchant	Processing of waste	Slaughter slab cleaner	Bone parker	Govt Meat Inspector	Total
Akinyele slab	14	6	6	6	4	2	38
Alesinloye Slab	4	4	4	4	2	2	20
Total	18	10	10	10	6	4	58

4.1 Demographic information of respondents

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This section presents results on the demographic distribution of respondents. Results are presented in charts and tables.

Table 4. 2 Age distribution

Table 2: Age distribution

Age	**Frequency**	**Percentage (%)**
21-40 years	30	51.7
41-60 years	26	44.8
61 years and above	2	3.4
Total	**58**	**100**

Table 2 presents results on the age distribution of respondents. It is shown that 30 (51.7%) indicate to be between 21 and 40 years old, 26 (44.8%) were between 41 and 60 years old, while the remaining 2 (3.4%) indicated to be 61 years old and above. It could be deduced that more of the respondents were between 21 and 40 years old.

Table 3 Distribution by type of work done in abattoir

Table 3: Type of work done in abattoir

Type of work	**Frequency**	**Percentage (%)**
Slaughtering	4	6.9
Selling of raw meat	16	27.6
Processing of waste	12	20.7
Cleaning of waste	17	29.3
Bone parker	9	15.5
Total	**58**	**100**

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Table 3 presents results on frequency distribution according to the type of work done in the abattoir. It is shown that 4 (6.9%) indicated to work as a slaughter, 16 (27.6%) sells raw meat, 12 (20.7%) processes the wastes generated in the abattoir, 17 (29.3%) cleans the wastes generated, while the remaining 9 (15.5%) parks bones at the abattoir. From the distribution, it is deduced that more of the respondents works as cleaners at the abattoir.

Fig 1 Years of working at the abattoir

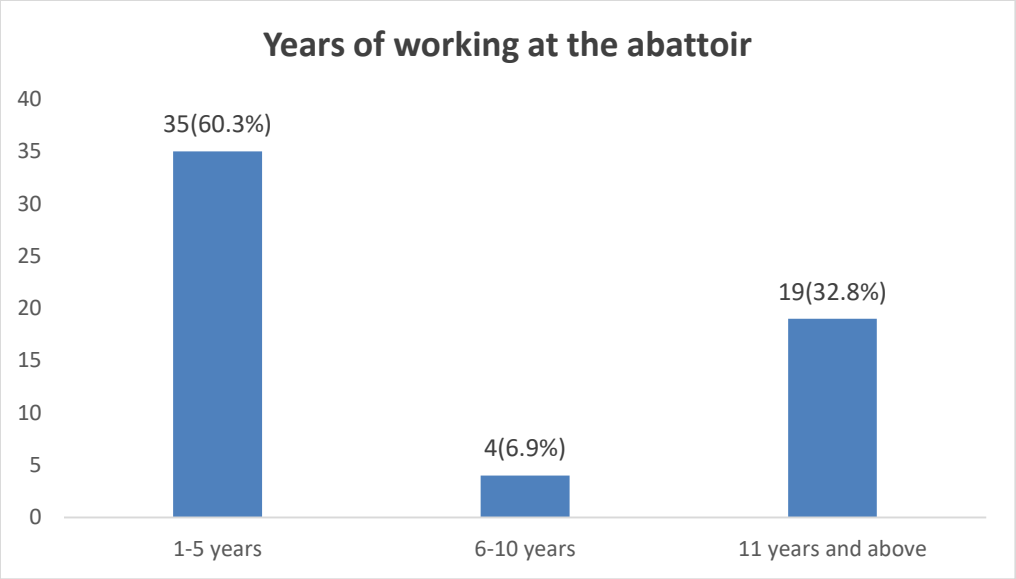

Figure 1: Bar charts on years of working at the abattoir

Figure 1 presents results on the frequency distribution according to the years of working at the abattoir. It is shown that 35 (60.3%) indicated to have been working at the abattoir for between 1 and 5 years, 4 (6.9%) have been working at the abattoir for between 6 and 10 years, while the remaining 19 (32.8%) have been working at the abattoir for 11 years and above. From the distribution, it could be deduced that more of the respondents have been working at the abattoir for 5 years or less.

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Plate 5. Outer skin preparation and boiling of bones, 2024.

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Plate 6. Different animal bone wastes packed for further transportation to different use points, 2024.

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Plate 7. Customers buying meat parts for consumption at Akinyele market, 2024.

The data collected from the people working in the two slabs were analyzed by testing the relationship between nature of work carried out in the abattoir and nature of diseases suffered by the workers. The Hypothesis was stated as there will be significant association between nature of work done at the abattoir and types of diseases suffered. This was tested using Chi-square analysis and the result is presented on Table 4;

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Table 4: Chi-square summary table on nature of work * type of disease suffered

	Nature of work						
Type of disease	**Slaughtering**	**Selling raw meat**	**Waste processing**	**Cleaning of waste**	**Bone parker**	***X***	**Sig.**
Respiratory							
No response	3	15	12	14	9	5.22	.266
More than twice	1	1	-	3	-		
Pneumonia							
No response	4	16	12	17	9	-	-
Fever							
No response	-	1	-	-	-	26.31	.010
Once	-	4	8	12	8		
Twice	-	-	-	2	-		
More than twice	4	11	4	3	1		
Gastro intestinal disorder							
No response	2	4	12	14	8	28.04	.000
Twice	2	12	-	2	1		
More than twice	-	-	-	1	-		
Fatigue							
No response	-	-	2	1	-	15.48	.050
Twice	2	16	8	14	9		
More than twice	2	-	2	2	-		
Abdominal pain							
No response	3	12	4	1	1	25.85	.001
Twice	1	4	8	14	8		
More than twice	-	-	-	2	-		
Diarrhea							
No response	2	15	10	16	9	17.60	.024
Twice	1	-	-	-	-		
More than twice	1	1	2	1	-		
Organ damage							
sNo response	4	16	12	17	9	-	-

Table 4. presents results on the association between type of disease and nature of work. It is shown that respiratory disease, had no significant association with the nature of work ($X = 5.22$; $p > .05$). However, fever ($X = 26.31$; $p < .01$), gastro intestinal disorder ($X = 28.04$; $p < .01$), fatigue ($X =$

15.48; p < .05), abdominal pain (X = 25.85; p < .01) and diarrhea (X = 17.60; p < .05) had significant relationship with the nature of work. This confirmed the stated hypothesis.

Conclusion

The operation of slaughter houses poses some environmental and health risks to the users and the immediate neighbourhood. It was found out that the exposure of the operators to the waste made them vulnerable to metaemoglobinae diseases and microbial pathogens which caused ammonia in the body of the slaughter house users and affect their respiratory system. Also, fever and gastrol intestinal disorder and diarrhear were frequent in the midst of the operators of the slaughter houses due to inadequate protection and poor hygiene. It was suggested that the users of the slaughter houses be encouraged to observe good hygiene practice, use protective gears in the process of work, and government officials be more active in education and public monitoring of waste disposal in the markets.

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