Living with a Fatal Choice: Effects of Slaughterhouse Activities on Residents' Health in Osogbo, Nigeria

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Abstract

Background. This study assessed the effects of slaughterhouse activities on the health of surrounding residents in Osogbo Nigeria. This was with a view to suggesting policy response capable of enhancing healthy environment in the city and others with similar background.

Materials and Methods. A total of thirty three slaughterhouses identified in the study area out of which fifteen (45 %) were randomly selected for questionnaire administration. This is followed by stratification of 500metre radial distance from the respective residences surrounding them into 1-250 metres and 251-500 metres. In the strata, questionnaires were administered on 98 residents comprising 44 and 54 in the first and second strata respectively. Data analysis was done using cross tabulation and Chi-square tests.

Results. Findings revealed that slaughterhouse activities pollute the environment and this inevitably had negative impacts on the health of the surrounding residents. From the findings, 80 % of the slaughterhouses were located near water bodies. The study also found that most of the surrounding residences were infested by flies and mosquitoes with varying degrees as distance increases from the slaughterhouses. This study established that the quality of the environment varied with distance from the slaughterhouses. Similarly, the proportion of residents that treated malaria and diarrhoea continually in the study areas was 69.4 % and 70.4 % respectively.

Conclusion: These findings have implications for policy making towards planning effective and sustainable intervention strategies for slaughterhouse activities in Osogbo and other cities with similar background.

Keywords: Slaughterhouse, Solid waste, Effluents, Pathogens, Carcass, Osogbo, Nigeria.

1. Introduction

Slaughterhouses are known all over the world to pollute the environment either directly or indirectly from their various processes. They are frequently located near urban centres and enormous amount of waste are produced (Adeyemo, 2002). The location of facilities and services such as slaughterhouses in the neighbourhood is very important. This is because it provides residents with easy access to purchase of meats for household consumption. However, its activities pose danger on the immediate environment and health of surrounding residents (Bello, Oyedemi, 2009) due to the negation of the principle of separation of incompatible land uses upheld by physical planning. This is no doubt prevalent in developing countries where enforcement of

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development control is at its lowest ebb (Kawu et al., 2012). The dilution of residential neighbourhoods with slaughterhouses has left residents with no choice than to live with the fatal hazards associated with the slaughterhouse activities in their vicinity.

Pollution emanating from slaughterhouse operations in Nigeria has become a source of concern because conventional methods for disposal of waste are inadequate (Adeyemo, 2002; Kawu et al., 2012; Olowoporoku, 2013). Nwanta et al (Daramola, 2006) also noted that the numerous wastes produced by slaughterhouse operation not only pose a significant challenge to effective environmental management, they are also associated with decrease in air quality of the environment and transferable of several infectious diseases. The major concern is the risks to health of residents living with these fatal choices in their neighbourhoods.

Slaughterhouses generate significant quantities of secondary wastes which are not environmentally friendly. For instance, Aniebo, Wekhe and Okoli (Nwanta et al., 2008) noted that the blood from a single cow carcass if discharge directly into a sewer line, the effluent load would be equivalent to the total sewage produced by 50 people on average day. These wastes are highly organic with relatively high levels of suspended solid, liquid and fat. The solid wastes include condemn meat, undigested ingesta, bones, horns, hairs, aborted foetuses and grit while the liquid wastes usually compose dissolved solid, blood gut contents, undigested feed, urine and wastewater (Aniebo et al., 2009). In Nigeria, these wastes are indiscriminately and improperly discharged. This makes the environment unsightly, occupy useful space and odorous which in turn attracts flies, mosquitoes, rodents and other disease vectors thus causing nuisance in the neighbourhood.

Another peculiar issue in Nigerian cities is the location of slaughterhouses. Due to their required large quantity of water (Adeyemo et al., 2002), slaughterhouses are usually located near water bodies or places with high water table in order to gain unhampered access to water for processing of their activities (Kuyeli, 2007). Effluents from these slaughterhouses are directly discharged into streams and rivers without any form of treatment and the slaughtered meat is washed with the contaminated water (Kosamu et al., 2011). This could lead to transmission of pathogens to humans causing infections such as Coli, Bacillus, Salmonella infections, Brucellosis, methemoglobinemia and Helminthic diseases (Adelagan, 2002). This is aside the heat, smoke and noise which emanates from slaughterhouse.

These fatal issues related to slaughterhouse activities have aroused the interest of researchers in Nigeria (Daramola, 2006; Aniebo et al., 2009; Esona, 2004). However, they have only focused on the impact of slaughterhouse activities on nearby water bodies and the health effect of the water pollution. Other studies in this regard include Omole and Ogbiye (Omole, Longe, 2008), Afon and Fadare (Omole, Ogbiye, 2013) and Bello and Oyedemi (Bello, Oyedemi, 2009). These past studies did not extensively discuss the pollution and health effects with due consideration for the surrounding residents. Also, effects of distance on pollution and health effects were not extensively considered. The intent of this study is therefore to establish the variation in polluting and health effects based on distances from slaughterhouses and residences surrounding them in Osogbo Nigeria. Also, the study discussed the socio-economic attributes of the surrounding residents. This type of study is imperative as it will elucidate the fatal choices confronting residents living with slaughterhouses in their neighbourhoods.

2. Materials and Methods

The study area is Osogbo, the capital of Osun State, located in south-western part of Nigeria. Following the creation of Osun State in 1991, Osogbo assumed the status of a state capital. It has two local government areas (LGAs) which are Osogbo and Olorunda. Over the years, Osogbo has witnessed tremendous growth both spatially and demographically. Its nature as a nodal settlement and initial establishment of a railway station are factors in the growth of Osogbo. According to the 2006 population census, Osogbo had 287,156 inhabitants (Federal Government of Nigeria, 2007).

This research was carried out on slaughterhouses in Osogbo and their vicinities. As common to most Nigerian cities, slaughterhouses are located in different areas of Osogbo township. They are characterized with locations among residences with no regards for their compatibility. This is against the existence of legislations governing the location and operations of slaughterhouses both at the state and federal level. For instance the federal level, the government promulgated the National Environmental Standard and Regulation Enforcement act on sanitation and waste control. Notwithstanding the existence of these legislation, the yearnings of the growing population

for meat coupled with the laxity on the part of the government have made the location and operations of slaughterhouses unfriendly.

A total of thirty-three slaughterhouses were identified in Osogbo, Nigeria. For this study fifteen slaughterhouses were randomly selected for questionnaire administration and field observation. Simple random technique was adopted in sourcing information from an operator in each of the slaughterhouses selected. Thus, fifteen operators were sampled on which questionnaire were administered. Data collected through the survey include number of cow's slaughtered daily, purpose of location of slaughterhouses, waste handling practices in the slaughterhouses and complaints by surrounding slaughterhouse operators.

Residential buildings within 500metre radius around the slaughterhouses were selected for questionnaire administration. The residential buildings were further stratified into 1-250metres and 251-500metres radius from the selected slaughterhouses. In the stratified distance from the slaughterhouses, every 5th residential building was sampled sequel to enumeration of buildings based on street numbering system and counting of buildings where houses were not numbered. Questionnaire was administered on an adult in each of the each of the selected residential buildings. A total of 98 residents were selected from the 98 selected buildings on which questionnaires were administered. The sample comprises 44 respondents within 1-250metres radius from the slaughterhouse and 54 respondents within 251-500metres radius from the slaughterhouses. Data collected through the questionnaire survey are socio-economic attributes of the residents, level of prevalence of infestation of disease vectors, and health conditions. Analysis of the data was done using cross tabulation and Chi-square Test.

3. Results and Discussions

This section discusses the profile of slaughterhouses and their activities, profile of the respondents, effects of slaughterhouse activities on residents and residents' reported health condition in the study area.

Profile of Slaughterhouses

Findings made on the number of cows slaughtered in the slaughterhouses daily and the purpose of location of the slaughterhouses. Findings revealed that 60.0 % of the slaughterhouses slaughtered between 1-3 cows daily, 26.6 % slaughtered 4-7 cows daily and the remaining 13.4 % slaughtered more than seven cows daily. Further findings revealed that majority of the slaughterhouses slaughter between 1-3 cows daily. The average number of cows slaughtered daily in the study area is two.

Investigations were made on the rationale behind the location of slaughterhouses in the respective neighbourhood within the city. Respondents were allowed to tick multiple responses as a combination of factors could be responsible for locating a slaughterhouse in a particular area. Findings revealed that 36.4 % of the slaughterhouses were located due to proximity to a river/stream, 27.3 % were sited because the area is with a high water table, 12.1 % were located because of closeness to the market and availability of land was responsible for the location of 15.2 % of the slaughterhouses. Further investigations revealed 80 % of the slaughterhouses were sited in their location because of the presence of a nearby water body while 60% of the slaughterhouses were located in places with high water table. These findings confirmed the studies of (Kuyeli, 2007) and (Adeyemo et al., 2002) that slaughterhouses in the developing world are usually located near water bodies because of huge volume of water used for their activities. Physical observation revealed that majority of the slaughterhouses contravened the physical planning laws. This is because they were located within lands allocated as setbacks along river courses.

Table 1. Waste Disposal Practices in Slaughterhouses

Practices	Frequency (%)
Solid Waste Disposal	
Burning	3 (10.0%)
Dump on Vacant Land (Beside Slaughterhouse)	15 (50.0%)
Dump in Nearby Bush	2 (6.7%)

Dump along Drainage	3 (10.0%)
Collected on Request	7 (23.3%)
Total	****30 (100.0%)**
Liquid Waste Disposal	
Channel to Nearby Stream	11(55.0%)
Channel to Nearby Drainage	9 (45.0%)
Total	****17 (100.0%)**
Complaint By Surrounding Residents	
Foul Odour	15 (78.9%)
Foul Odour and Air Pollution	4 (21.1%)
Total	**** 19 (100.0%)**

*These were more than the number of questionnaires administered because respondents were allowed to choose multiple options

Findings on waste disposal methods in the slaughterhouse are contained in Table 1. Slaughterhouse operators were allowed to select the various solid waste disposal methods they employed. Findings revealed that 10.0 % of the operators burned their waste, 50.0 % dumped their waste on vacant land in the premises of the slaughterhouses, 6.7 % dumped their waste in the bush, 10.0 % dumped in the drainage while 23.3 % gave their waste out on request. Further findings revealed that all the slaughterhouses dumped their solid waste on the vacant land in the premises of the slaughterhouses. Physical observation revealed that undigested ingesta, dungs, aborted foetus, bones and horns are the major solid wastes generated in Nigerian slaughterhouses. All the waste disposal methods employed by the operators fall short of the waste disposal standard enacted by the Federal Government of Nigeria. The dump of this waste around the slaughterhouses could be responsible for the highly pungent odour, infestation of flies and diseases vectors in the neighbourhoods where these slaughterhouses are located.

Investigations were made into the management of wastewater in the slaughterhouses. Two methods of waste water management were identified in the study area. Findings revealed that 55.0 % of the slaughterhouses discharged their liquid waste into the nearby water bodies while 45.0 % discharged their liquid waste into nearby drains in their neighbourhood. The indiscriminate discharge of waste water could contaminate the nearby water bodies and also cause drains around the slaughterhouses to be filled with slaughterhouse effluents. This could be responsible for the highly unpleasant odour emanating several metres away from the premise of the slaughterhouses.

Findings from slaughterhouses on complaints about their activities by surrounding residents revealed that 78.9 % of the neighbouring residents have complained about the foul odour emanating from the slaughterhouses while 21.1 % of the operators claimed residents have complained about foul odour and air pollution emanating from the slaughterhouses. These odourous emissions from slaughterhouses could cause eye, nose and throat irritation, headache, nausea, diarrhoea, cough, chest tightness shortness of breath, stress, drowsiness and alterations of mood (Afon, Fadare, 2011). All these health symptoms can occur at the time of exposure and may persist for longer periods of time as well as aggravate existing medical conditions in sensitive individuals such as asthmatic patients.

Profile of the Surrounding Residents
The profile of the respondents discussed consists of gender, age, educational attainment, income status and type of building. Investigation into gender distribution of respondents across the two residential strata around the slaughterhouses revealed that the percentage of male and female living within 1-250 metres radius from the slaughterhouses were 38.6 % and 61.4 % respectively while the percentage of male and female respondents who live within 251-500 metrs radius from the slaughterhouses stood at 39.8 % and 60.2 % respectively. Closely associated with gender is age. The age of the respondents was grouped into four: teenagers (those with less than 20 years); young adults (21 to 39 years); elderly adults (40 to 59 years) and old people 60 years and above). Across

the two strata, majority of the residents (80.6 %) were adults (21 to 59 years), 8.2 % were teenagers and 10.1 % were old people (60 years and above). The overall mean age was 40years. This indicates that respondents were of age that could make them environmentally-conscious of what happens in their neighbourhood.

According to Theodori and Luloff (Schiffman, 2006) and Fransson and Gärling (Theodori, Luloff, 2002), the level of education people raises their consciousness about what operates in their surroundings. Findings on educational attainment revealed that all the respondents sampled acquired a form of formal education. In the first stratum, respondents with primary, secondary and tertiary education stood at 25.0 %, 56.8 % and 18.2 % respectively while the percentage of residents with primary, secondary and tertiary education living within 251-500 metres, from the slaughterhouses were 11.1 %, 38.9 % and 50.0 % respectively. This findings was further established by Chi-square result ($\chi 2$ =14.011; p=0.003) which indicated that a significant association exists between educational level of the people and the distance of their residence to the slaughterhouses. This means that educational level of people influence their residential decision to live around slaughterhouses in the study area.

For easy understanding, residents' monthly income was classified into three. Income below ₦20,000 categorised as low income. The reason is that the minimum wage at the federal level in Nigeria is ₦18,000 while it ranges from ₦15,000 to ₦20,000 in the states of the federation. The medium monthly income was categorised from ₦21,000 to ₦60,000 while residents earning ₦61,000 and above were categorised as high income earners. In the first stratum (1-250 metres), 81.8 % of the residents were low income earners. Those within the medium and high income group were 13.6 % and 4.5 % respectively. In the second (251-500 metres), residents in the low, medium and high income groups were 87.0 %, 7.4% and 5.6 % respectively. The overall mean monthly income was ₦30,627.

Investigations were made into the household sizes of neighbours of slaughterhouses in the study area. A household was defined as a person or group of people with shared cooking, sanitary and living arrangements. Based on this, the household size of the residents was categorised into three. The household sizes of one to five members were categorised as small, those with six to ten members as medium while those with more than ten members was categorised as large. In the first stratum (1-250metres), respondents with small, medium and large households stood at 43.2 %, 44.5 % and 2.3 % respectively while in the second stratum (251-500metres) respondents having small and medium households were 61.1 % and 38.9 % respectively. The mean household sizes for the first and second strata were six and five persons respectively.

Type of houses around the slaughterhouses was categorised into five: face-face (bungalow), face-face (storey), Flat (bungalow), flat (storey) and duplex. Findings revealed that majority (61.3 %) of the residents sampled lived in multi-habitation buildings (face-face) while the remaining 39.6 % lived in single-family apartments. One important fact to note is that multi-habitation buildings may have to do with is presence of many families living within the building.

Table 2. Profile of Respondents

Attribute	1-250 (m)	251-500 (m)	Total
	Frequency (%)	Frequency (%)	Frequency (%)
Gender			
Male	17 (38.6)	22 (40.7)	39 (39.8)
Female	27 (61.4)	32 (59.3)	59 (60.2)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**
Age (years)			
≤ 20	3 (6.8)	6 (11.1)	9 (8.2)
21-39	20 (45.5)	20 (37.0)	40 (40.8)
40-59	15 (34.1)	24 (44.4)	39 (39.8)
60 ≥	6 (13.6)	4 (7.4)	10 (10.2)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**

Educational Level			
Primary	11 (25.0)	6 (11.1)	17 (17.3)
Secondary	25 (56.8)	21 (38.9)	46 (46.9)
Tertiary	8 (18.2)	27 (50.0)	35 (35.8
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**
Average Monthly Income			
≤₦20,000	36 (81.8)	47 (87.0)	83 (84.7)
₦21,000- ₦60,000	6 (13.6)	4 (7.4)	10 (10.2)
≥₦61,000	2 (4.5)	3 (5.6)	5 (5.1)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**
Household Size			
1-5	19 (43.2)	33 (61.1)	52 (53.1)
6-10	24 (54.5)	21 (38.9)	45 (45.9)
Above 10	1 (2.3)	0 (0.0)	1 (1.0)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**
Type of Building			
Face to face (Bungalow)	19 (43.2)	8 (14.8)	27 (27.6)
Face to face (Storey Building)	16 (13.4)	17 (31.5)	33 (33.7)
Flat (Bungalow)	9 (20.5)	12 (22.2)	21 (21.4)
Flat (Storey Building)	0 (0.0)	15 (27.2)	15 (15.3)
Duplex	0 (0.0)	2 (3.7)	2 (2.0)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**

Prevalence of Infestation of Disease Vectors in Respondents Homes

Table 3 contained information on prevalence of disease vectors in respondents' homes in the stratified areas. It is imperative to consider the disease vectors the respondents are vulnerable to. This is necessary because disease vectors may determine the infections respondents' experience.

Table 3. Prevalence of Disease Vectors from Slaughterhouse Activities

Prevalence	1-250 (m)	251-500 (m)	Total
	Frequency (%)	Frequency (%)	Frequency (%)
Level of Prevalence of Flies			
Always	41 (93.2)	34 (63.0)	75 (76.5)
Sometimes	3 (6.8)	20 (37.0)	23 (23.5)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**
Level of Prevalence of Rodents			
Always	12 (27.3)	8 (14.8)	20 (20.4)
Sometimes	29 (65.9)	42 (77.8)	71 (72.4)
Rarely	3 (6.8)	4 (7.4)	7 (7.1)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**
Level of Prevalence of Mosquitoes			
Always	37 (84.1)	32 (59.3)	69 (70.4)
Sometimes	7 (15.9)	22 (40.7)	29 (29.6)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**

Investigation into level of prevalence of flies in residents' homes revealed that 76.5 % of the residents living around slaughterhouses were always infested by flies in their homes while 23.5 %

were sometimes infested by flies in their homes. This overall percentage of residents always infested by flies is less than the percentage of residents always infested by flies in the first stratum (1-250 metres) (93.2 %) but greater than those always infested by flies in second stratum (63.10 %). This was further established by Chi-square value ($\chi2$ =14.3; p=0.001) which indicated a significant association between the level of prevalence of flies and the distance of respondents residence to the slaughterhouses.

On the findings on infestation of rodents in respondents homes, 27.3 %, 65.9 % and 6.8 % of the respondents living within 1-250 metres from the slaughterhouses were always, sometimes and rarely infested by rodents while respondents living within 251-500 metres from the slaughterhouses who were always, sometimes and rarely infested by rodents were 14.8 %, 77.8 % and 7.4 % respectively. Findings on the level of prevalence of mosquitoes in respondents' homes revealed that 84.1 % and 15.9 % of the residents living within 1-250metres were always and sometimes infested by mosquitoes in their homes while in the second stratum (251-500 metres) 59.3 % of the residents were always infested by mosquitoes while the remain 40.7 % were sometimes infested by mosquitoes. These findings were further established by Chi-square results ($\chi2$ =12.17; p=0.007) which indicates that a significant association exist between level of prevalence of mosquitoes and the distance of their residence to the slaughterhouse.

Evaluation of Residents' Reported Health Condition

Sequel to the investigation on level of prevalence of disease vectors in respondents' houses, Table 4 contains findings on slaughterhouse activities and respondent's reported ill-health condition across the two strata as at the time of the study.

Table 4. Reported Health Effects of Slaughterhouse Activities

Period of Infection	1-250 (m)	251-500 (m)	Total
	Frequency (%)	Frequency (%)	Frequency (%)
Last Time Member of Household was Infected by Malaria			
3 months	34 (77.3)	34 (63.0)	68 (69.4)
6 months	9 (20.4)	19 (35.2)	28 (28.6)
Over 6 months	1 (2.3)	1 (1.8)	2 (2.0)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**
Last Time Member of Household was Infected by Typhoid			
3 months	17 (38.6)	8 (14.8)	25 (25.5)
6 months	21 (47.8)	34 (63.0)	55 (56.1)
Over 6 months	6 (13.6)	12 (22.2)	18 (18.4)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**
Last Time Member of Household was Infected by Cholera			
3 months	5 (11.4)	1 (1.9)	6 (6.1)
6 months	13 (29.5)	13 (24.1)	26 (26.5)
Over 6 months	26 (59.1)	40 (74.0)	66 (67.4)
Total	**44 (100.0)**	**54 (100.0)**	**98 (100.0)**
Last Time Member of Household was Infected by Diarrhea			
3 months	32 (72.8)	39 (72.2)	71 (72.4)
6 months	12 (27.2)	15 (27.8)	27 (27.6)
Total	**44 (100.0)**	**54 (100.00**	**98 (100.0)**

Findings were made on the last time household members were infected with diseases. Findings from residents living within 1-250 metres from the slaughterhouses revealed that 77.3%, 20.5% and 2.3% of the residents treated malaria in their household in the last three months, six months and above six months respectively. In the second stratum (251-500metres), 63.0% of the respondents treated malaria 3months ago, 35.2% were infected with malaria six months ago while

1.9% of the respondents were infected with malaria more than six months ago. Investigations were made into the interval of infection of typhoid within the two residential strata. In the first stratum, the percentage of respondents who were infected with typhoid three months ago, six months ago and more than six months stood at 38.6%, 47.8% and 13.6% respectively while respondents within 251-500metre radius who contracted typhoid three months ago, six months ago and more than six months ago stood at 14.8%, 63.0% and 22.2% respectively. This findings was further established by Chi-square results ($\chi2$ =9.14; p= 0.027) which indicated that there is a significant association between the last time the people were infected with typhoid and the distance of their residence to the slaughterhouse.

Residents also expressed the last time were infected by cholera and diarrhoea in their households. In the first stratum 11.4% of the households were infected with cholera in the last three months, 29.5% were infected by cholera in the last six months, and 51.9% of the respondents did not experience cholera in over six months. Respondents within 251-500metre radius whose household were infected with cholera three months ago stood at 1.9%, 24.1% was infected six months ago and 74.0% were infected in their households with cholera more than six months ago. This findings was further established as Chi-square analysis (χ^2 =8.03; p= 0.045) indicate a significant association between the time the people were infected with cholera and the distance of their residence to the slaughterhouses. Findings on last time a member of respondents household were infected with diarrhoea. In the first 1-250metre radius around the slaughterhouse 78.2% of the residents' households were infected with diarrhoea in the last three months while the remaining 27.2 % claimed they were infected by diarrhoea in the last six months. In the second stratum, 72.2 % and 27.8 % of the respondents were infected with diarrhoea in the last three months and six months respectively.

The average per household vulnerability to diseases (malaria, typhoid, diarrhoea and cholera) was determined using the average household sizes in each residential zone. It was revealed that the average per household susceptibility to diseases in the first stratum (1-250metre radius) was 264 persons while in the second stratum (251-500 metres) the average per household susceptibility to disease was 270 persons. These findings are consistent with the results of some earlier studies (Bello, Oyedemi, 2009; Olowoporoku, 2013) which have indicated that there is a significant statistical association between meat industry activities and health quality of residents around it.

In order to examine the relationship between residents' profile on prevalence of infestation of flies and mosquitoes in respondents' homes, cross tabulation was conducted on the variables. Two socioeconomic characteristics (income and level of education) found in literature (Olowoporoku, 2013) to be factors influencing the habitation of residences close to slaughterhouses and its consequential health effects were examined. The analysis revealed that across the two strata, 84.6 % of low income earners were constantly infested by flies in their homes and 83.6 % were constantly infested by mosquitoes in their homes. This is in contrast to the proportion of residents belonging to medium (10.2 %) and high income (5.1 %) categories. This could be attributed to possible unavailability of insect resisting facilities in their homes due to their low income. Also, findings revealed that across the two residential strata, residents with minimum of secondary education were the most concerned about the presence of flies and mosquitoes in their homes (82.6 %). This could be based on their better knowledge of the harm posed by these disease vectors in their homes.

The relationship between residents' income and their health status was also determined. This was measured in terms of the last time the respondents were treated for malaria, typhoid, diarrhoea and cholera. Findings across the two strata revealed that 84.6 % of low income groups treated malaria, 83.6 % treated typhoid and 84.6 % treated diarrhoea frequently in a period of six months to the time of the study. This finding is in tandem with reports of United States Embassy Nigeria (2011) that the most inflicted income group by malaria in Nigeria is the low income group. They account for 65 % of the population and are slaves to infectious diseases such as malaria, typhoid, diarrhoea, cholera etc.

4. Conclusion and Recommendations

This study assessed the relationship between the locations of slaughterhouses and the quality of health of residents living around slaughterhouses in Osogbo. Also, the study examined the socio-economic characteristics of residents as a determinant of their level of vulnerability to health hazards emanating from slaughterhouses in their neighbourhood. This study revealed that slaughterhouse activities pollute the environment and consequently have negative impact on the health of its surrounding residents based on the distance of their residences to the slaughterhouses. The study found out that the level of prevalence of infestation of mosquitoes and flies is more predominant on residents whose homes are closer to the slaughterhouses.

Findings established that residents within the low income group felt the impact of the prevalence of disease vectors. The study established that increase in the distance between residents' homes and slaughterhouses is directly proportional to the level of infestation of residents' homes by flies and mosquitoes. This implies that there is variation in environmental deterioration as distance increases from the slaughterhouses. This may account for the incessant infection of residents with typhoid, malaria and diarrhoea in the first stratum. It can therefore be concluded that the farther the location of the residences to the slaughterhouses, the lesser the degree of the respective polluting and health effects of the slaughterhouse activities on the environment and residents in the study area.

These results on the assessment of the polluting and health effects of slaughterhouse have policy implications for sustainable development both in Nigeria and countries of similar urban settings. For instance, failure to manage the activities of these fatal choices in neighbouhoods could lead to epidemics. Other associated implications of poor management of the fatal choices include high financial and economic cost, direct medical cost associated with curbing epidemics and loss of productivity. Therefore appropriate measures should be taken to reduce its impact on the health of those who live with this conflicting necessity of life. The government should enforce existing laws related to meat industry activities and promulgation of new ones. Also, due the nature and quantity of waste generated from slaughterhouses, they should be considered as industrial waste and not mixed with municipal waste.

Waste management facilities and services should be provided at slaughterhouses and operators should be levied on waste generated based on the number of cows slaughtered. This will be a good source of revenue for the government. Also, design standards and siting restriction such as setbacks and buffers from residences and also from water bodies should be ensured. Residents' education on possible impacts of pollution from slaughterhouse waste should be embarked upon by both governmental and non-governmental organizations with interest in environmental and public health.

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