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POOR SLAUGHTERHOUSE WASTE MANAGEMENT: EMPIRICAL EVIDENCES FROM NIGERIA AND IMPLICATIONS ON ACHIEVING MILLENNIUM DEVELOPMENT GOALS

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Abstract

The compounding contribution of slaughterhouse wastes to waste management problems in developing countries is likely to continue into the future considering the growing quest for animal protein.

Adequate knowledge and practice of waste management among slaughterhouse workers can help limit the associated effects of poor disposal on access to safe water, environmental sustainability and quality of life which are core areas of Millennium Development Goals (MDGs). Data on knowledge, attitudes and practices of waste management of 390 randomly selected slaughterhouse workers in Nigeria were collected and analyzed using multiple regression statistics. The results reveal that the majority of the respondents had poor attitudes (75.6%) and practices (97.4%) of proper waste management, though 51.5% demonstrated good knowledge. While 51.3% knew that slaughterhouse wastes are related to diseases, 75.4% were unconcerned that poor management could be major public health and environmental hazards and 74.4% discharged slaughterhouse wastewater into surrounding streams. Gender, education and work experience were significantly associated with good knowledge (p <0.05). These poor attitudes and practices have negative implications on environmental health conditions, access to safe water and quality of life. Therefore, addressing poor slaughterhouse waste management issues in developing countries becomes imperative to making achieving the MDGs a reality.

Key words: Environment, Health, Slaughterhouse waste, Millennium Development Goals, Nigeria

Introduction

Increasing quantities of wastes are generated all over the world and slaughterhouses are one of the industries that contribute to these wastes. Waste generation is one of the major impacts of the increasing slaughter rate of food animals as a result of the growing demand for animal protein. As reported, per capita meat consumption in developing countries has increased threefold with the rising demand leading to increased livestock populations (FAO, 2010) and hence increased wastes generation from their slaughter. Although slaughterhouse wastes could be of potential benefits, they are a major source of public health and environmental hazards if they are not

properly managed. Their adverse impacts on access to safe water, environmental sustainability, sanitation and human health which are focal points of the Millennium Development Goals (MDGs) are issues of concern.

The negative impacts of poor slaughterhouse waste management on surface waters as well as underground waters (Ezeohaa and Ugwuishiwu, 2011) are not far-fetched. Contaminations of water bodies by slaughterhouse wastes have been reported to constitute significant environmental and public health hazards (World Bank, 1998; Coker et al, 2001; Nafarnda et al, 2006; Osibanjo and Adie, 2007). The consequences of infection by pathogens originating from poor slaughterhouse waste management can range from temporary morbidity to mortality, especially in high-risk individuals (Nafarnda et al, 2012). Besides, reduced life expectancy in most developing countries especially in sub-Saharan Africa has been associated with inadequate and hazardous waste management, among other factors (WHO, 2005).

While waste management is a major challenge in urban areas throughout the world (Hwa, 2007), the developing countries are the worst hit given the deficient waste management programmes which characterize the regions (Yáñez et al, 2002). A lack of awareness, technical knowledge, legislation, policies, and strategies are major issues for waste management in most developing countries (Hwa, 2007). Though there are other sources of wastes in Nigeria, the slaughterhouse as an important component of the livestock industry generates enormous and potentially hazardous wastes. Despite this, there is a gap in the critical knowledge and practices of proper waste management among the stakeholders in the livestock processing industry. Besides, there is little history of the implementation of formal and informal community environmental education awareness programmes on waste management (Ehrampoush and Baghianimoghadam, 2005). Worse still, there is no waste management

programme for the wastes generated from slaughterhouses in most developing countries particularly Nigeria.

Adequate knowledge and practice of proper waste management are of tremendous significance considering the aforementioned hazards related to slaughterhouse wastes coupled with other life limiting factors ravaging the developing countries. This paper therefore assessed the knowledge, attitudes and practices of proper waste management among slaughterhouse workers in Nigeria with a view to determining possible implications on achieving the Millennium Development Goals (MDGs).

Materials and methods

Study Location

This study was carried out in selected regions of Nigeria. Nigeria is located between latitude 4^0N and 14^0N of the equator and between 3^0E and 18^0E of the Greenwich meridian. It is the most populous black nation of the world; a country that is typical of most other developing nations particularly in sub-Saharan Africa. The development and growth of livestock production in the country has been on the increase and has guaranteed steady supply of slaughtered animals being processed for human consumption. Waste generation from these slaughterhouse activities is thus a challenge. Six out of the 36 states in the country were chosen, with Yobe, Kwara and Plateau representing the northern part; and Oyo, Lagos and Osun States for the south-western region. These states were chosen in the regions given the higher livestock activities in the states.

Participants and questionnaire administration

We used the major slaughterhouse in each of the selected six states and chose a purposive sample sizes of 50 and 100 each from the varying estimated slaughterhouse workers' population ranges of between 50-100 (northern states) and 100 – 250 (south-western states), respectively. We believe this was sufficient to gain insights

into the knowledge, attitude and practice levels of proper waste management among the slaughterhouse workers. The participants were randomly selected after explaining the purpose of the study to them. Overall, the potential participants were told they could withdraw their consent to participate in the process of the interview if they felt the need to do so, without any attached penalty. Data were collected through a semi-structured questionnaire designed to obtain information on their socio-demographic characteristics, knowledge of slaughterhouse wastes and management, their attitudes toward and practices of waste management. A pre-test of the questionnaire was carried out after which some of the questions were modified in order to improve clarity.

Data Analysis

Data were analyzed using SPSS version 16.0. Knowledge on proper waste management was scored with reference to answers to five questions. Positive responses were scored 1 and negative 0. Scores ranged between 0 and 5 with scores ≥3 taken as good knowledge and scores <3 as poor knowledge. Attitudes toward proper waste management were also scored with reference to nine questions. Positive responses were scored 1 and negative responses 0. Scores ranged between 0 and 9. Scores ≥5 were taken as good attitudes while scores <5 were taken as poor attitudes. Waste management practices of the slaughterhouse workers regarding seven specific slaughterhouse wastes with reference to a list containing correct and wrong methods of waste management were documented. Correct management practice was scored 1 and wrong 0 per a waste. Scores ranged between 0 and 7. Scores ≥4 were taken as good practices while scores <4 were taken as poor practices. Multiple regression statistics was used to determine association between the socio-demographic characteristics of the slaughterhouse workers and their knowledge, attitudes as well as their practices of waste management.

Results

Demographics of the respondents

From the proposed sample size of 450 slaughterhouse workers, only 390 questionnaires were available for analysis giving a response rate of 86.7%. Out of these, 103 and 287 were, respectively, from the northern and south-western regions of the country. Based on age group, those within 21-30 years were the majority (32.1%); 80.0% were males, 77.2% had post-primary education and 43.6% had been working in the slaughterhouses for between 1 and 5 years.

Knowledge of slaughterhouse workers on slaughterhouse wastes and related issues

The results show that 51.5% of the slaughterhouse workers had good knowledge of proper slaughterhouse waste management. While 51.3% knew that slaughterhouse wastes are related to diseases, only 16.4% knew that these wastes could be recycled. In addition, only 9.5% were aware that slaughterhouse wastes could be a source of revenue. Statistically, gender ($p = 0.044$); education ($p = 0.005$) and work experience ($p = 0.003$) were significantly associated with knowledge (Table 1).

Attitudes of slaughterhouse workers toward proper waste management

It was revealed that only 24.4% of the slaughterhouse workers had good attitudes toward proper management of slaughterhouse wastes. While 52.6% indicated that slaughterhouse wastes could constitute a menace to environmental hygiene, 56.7% were of the opinion that poorly disposed condemned carcasses/organs could be health risks to scavenging animals. However, only 30.0% were concerned with disposing wastes around slaughterhouse premises or in the drainages while 75.4% were not concerned that poor management of slaughterhouse wastes could be a major source of public health and environmental hazards. In addition, only 14.6% were of the opinion

that waste management required the concerted efforts of all stakeholders including the Government and the general public. Statistically, age ($p = 0.000$), gender ($p = 0.011$), education ($p = 0.000$) and work experience ($p = 0.017$) were significantly associated with their attitudes toward proper waste management (Table 2).

Practices of waste management among slaughterhouse workers

In all, only 2.6% of the slaughterhouse workers demonstrated good practices of proper waste management. Though 84.4% and 84.9%, respectively, practised recycling the bones and horns generated from the slaughtered animals, 74.4% and 37.4% discharged slaughterhouse wastewater and the blood as run-off into surrounding streams. Besides, almost 10% and 15% disposed off slaughtered animal hoofs and the dung, respectively, by burning and burying. In addition, only 3.6% disposed condemned animal carcasses/organs by incineration while 15.4% threw these condemned animal carcasses/organs to the open field. Statistically, none of the socio-demographic variables was significantly associated with the practice of waste management (Table 3).

Discussion

Inappropriate management of wastes is an increasing problem worldwide (Yáñez et al, 2002). Nonetheless, adequate knowledge and attitudes toward waste management appear to be very crucial in facilitating the development of environmentally friendly community waste behavior (Ehrampoush and Baghianimoghadam, 2005). The results of this formative study show that despite the considerable knowledge level of the slaughterhouse workers regarding proper slaughterhouse waste management, their attitude and practice levels were rather low. These poor attitudes and practices are a matter of public and environmental health concern with attendant implications on achieving the key MDGs. Generally, slaughterhouse operations in most developing countries including Nigeria generate large quantities of wastes, a trend that is likely to continue into the future given the

rising demand per capita meat consumption in developing countries (FAO, 2010). Unfortunately, the awareness of the waste pollution is low; thus pollution of natural and artificial waters and environment by these waste matters has continued to be one of the most important and complex challenges confronting public health authorities (Adelagan, 2002).

As revealed in this study, almost 75% of the slaughterhouse workers discharged slaughterhouse wastewater into surrounding streams. This practice portends negative implications on the availability of safe water to the surrounding communities given the pollution potentials of discharging slaughterhouse wastewater untreated into surrounding streams (Nafarnda et al, 2012). As previously reported, such a practice could contaminate surface and underground waters (Abiade-Paul et al, 2006) with resultant pathogenic organisms in surrounding well water (Awoseyi, 2000; Akinro et al, 2009; Odeyemi et al, 2011). This is similar to the report from Swaziland that the industrial pollution impacts on poor communities with associated severe health risk to communities located near the river that use it for domestic activities, such as cooking, washing and bathing (Tsiho, 2013).

In the same vein, the practice of disposing condemned animal carcasses/organs to the open field also has attendant negative implications. These condemned materials may end up being eaten by animal meat scavengers or even humans leading to their illness or death (Roberts et al, 2009). More so, the current economic conditions in most developing countries make the under-privileged people from poor communities to scavenge in order to source for food. There is thus a potential danger of transmission of diseases to humans through the consumption of such condemned diseased carcasses/organs. In addition, uncontrolled access of vultures to feed on the condemned carcasses/organs disposed on open dump sites could facilitate disease transmission from one region to the other given the migratory nature of these birds. Overall, the environmental conditions of uncontrolled dumping of condemned carcasses/organs on open sites could be

extremely vulnerable, with severe environmental pollution and public health implications.

Similarly, burning of hooves in open air as indicated by some of the respondents could negatively impact the quality of air around the slaughterhouses and hence reducing the quality of health of the people (Bello and Oyedemi, 2009). In contrast, however; recycling of the bones and horns generated from the studied slaughterhouses by the majority of the people is worth-noting. Usually, animal bones and horns constitute major wastes generated in the slaughterhouse. The practice of recycling these wastes does not only constitute a source of revenue, but also prevents unhealthy environment that could have resulted from haphazard disposal as open garbage around the slaughterhouse environment. More so, the search for environmentally safe and socially acceptable sites for waste disposal has become a perennial concern that seems impossible to solve (Koh, 2007).

Again, it is revealed from our findings that despite the good knowledge of proper waste management among the people in higher age groups and those with longer years of work experience, these same groups were the majority with poor attitudes and practices. This portends a continuous decline in their attitudes toward proper waste management with passing years in the establishment and hence the resulting poor practices. Therefore, measures that could enhance a change of attitudes are very key to achieving improved practices. Meanwhile, a cursory look at the results of this study further shows that education was significantly associated with good attitudes toward proper waste management. It therefore suffices to say that education particularly public health education remains a major tool in the quest to improve the knowledge, attitudes as well as practices related to environmental and public health issues (Abdul-Mutalib et al, 2012; Cabezas et al, 2013).

Overall, given the pollution potential of slaughterhouse wastes (Ezeohaa and Ugwuishiwu, 2011); adverse effects on air quality, environment, potable water supplies, and aquatic life negatively

impact health and well-being. A report by the WHO Regional Office for Africa of six African countries (WHO, 2005) concluded that the main environmental health factors causing morbidity and mortality are related to inadequate access to safe water supplies, inadequate sanitation, inadequate solid and hazardous waste management. As reported, more than 44% have no access to safe drinking water, less than 37% have access to safe sanitation; and air pollution remains one of the leading causes of child morbidity (WHO, 2002). Furthermore, some 1.7 million young children die each year from diarrhoeal disease associated with contaminated water, poor sanitation and hygiene and a further 1.4 million child deaths from respiratory infections were attributable to indoor pollution (Cairncross et al, 2003).

Furthermore, reports showed that slaughterhouse wastes piled up within the environment can cause pollution and subsequently produce methane gas that intensifies green house effect (Adeyemo, 2002). While the significance and impact of environmental interventions cannot be underestimated in terms of disease prevention and the subsequent impact on all areas of the MDGs (Morse et al, 2010), the practice of proper management of wastes generated in slaughterhouses in developing countries become imperative.

The above findings notwithstanding, this study had some limitations. One, the sample size used was relatively small. The authors feel confident, however; that information gained from this population could generalize to other slaughterhouse workers in Nigeria. Two, there were more male respondents when compared to the number of females. However, the nature of activities in the slaughterhouse requires energy and physical strength; hence, male workers often dominate such a workplace with only very few females.

Conclusion

The results of this study show that despite the considerable knowledge of the slaughterhouse workers on proper management of slaughterhouse wastes, the majority had poor attitudes and practices.

Since these poor attitudes and practices might not be limited to Nigeria only but also typical of most developing countries particularly in sub-Saharan Africa, they portend threats against achieving the key MDGs given the associated adverse effects on water, air, sanitation and environment. Therefore, addressing the issue of poor waste management practices in developing countries holds the promise of achieving the MDGs and other internationally agreed development goals. This remains one of the most key interventions in the drive for improved health outcomes for the populations in the African Region. The authors anticipate a synergy between the Government and private stakeholders toward providing continuous public health education and training for slaughterhouse workers. Besides, provision of modern waste processing facilities is needed to improve the current waste management situations in the developing countries.

Acknowledgements

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Table 1: Multiple regression analysis of slaughterhouse workers' knowledge level on proper waste management (N = 390) and their socio-demographic characteristics

Variable	Category	Good (%)	Poor (%)	Total	Adjusted knowledge level	*p* value
Age group (years)						
	10-20	49 (50.0)	49 (50.0)	98	0.039	0.143
	21-30	52 (41.6)	73 (58.4)	125		
	31-40	35 (46.7)	40 (53.3)	75		
	41-50	20 (55.6)	16 (44.4)	36		
	51-60	29 (80.6)	7 (19.4)	36		
	≥61	16 (80.0)	4 (20.0)	20		
Gender						
	Male	179 (57.4)	133 (42.6)	312	0.064	0.044*
	Female	22 (28.2)	56 (71.8)	78		
Education						
	No formal education	12 (54.5)	10 (45.5)	22	0.097	0.005*
	Primary	37 (55.2)	30 (44.8)	67		
	Post-primary	143 (47.5)	158 (52.5)	301		
Work Experience (years)						
	1-5	68 (40.0)	102 (60.0)	170		
	6-10	22 (46.8)	25 (53.2)	47	0.114	0.003*
	11-15	36 (62.1)	22 (37.9)	58		
	16-20	11 (33.3)	22 (66.7)	33		
	21-25	65 (79.3)	17 (20.7)	82		

*Variable significant at 0.05 level

Table 2: Multiple regression analysis of slaughterhouse workers' attitude level toward proper waste management (N = 390) and their socio-demographic characteristics

Variable	Category	Good (%)	Poor (%)	Total	Adjusted Attitude level	p value
Age group (years)						
	10-20	50 (51.0)	48 (49.0)	98	0.118	0.000*
	21-30	36 (28.8)	89 (71.2)	125		
	31-40	3 (4.0)	72 (96.0)	75		
	41-50	2 (5.6)	34 (94.4)	36		
	51-60	0 (0.0)	36 (100.0)	36		
	≥61	4 (20.0)	16 (80.0)	20		
Gender						
	Male	60 (19.2)	252 (80.8)	312	0.133	0.011*
	Female	36 (46.2)	42 (53.8)	78		
Education						
	No formal education	2 (9.1)	20 (90.9)	22	0.194	0.000*
	Primary	5 (7.5)	62 (92.5)	67		
	Post-primary	88 (29.2)	213 (70.8)	301		
Work Experience (years)						
	1-5	68 (40.0)	102 (60.0)	170	0.205	0.017*
	6-10	9 (19.1)	38 (80.9)	47		
	11-15	11 (19.0)	47 (81.0)	58		
	16-20	1 (3.0)	32 (97.0)	33		
	21-25	5 (6.1)	77 (93.9)	82		

* Variable significant at 0.05 level

Table 3: Multiple regression analysis of slaughterhouse workers' practice level of proper waste management (N = 390) and their socio-demographic characteristics

Variable	Category	Good (%)	Poor (%)	Total	Adjusted practice level	*p* value
Age group (years)						
	10-20	3 (3.1)	95 (96.9)	98	0.008	0.476
	21-30	7 (5.6)	118 (94.4)	125		
	31-40	0 (0.0)	75 (100.0)	75		
	41-50	0 (0.0)	36 (100.0)	36		
	51-60	0 (0.0)	36 (100.0)	36		
	≥61	0 (0.0)	20 (100.0)	20		
Gender						
	Male	6 (1.9)	306 (98.1)	312	0.008	0.064
	Female	4 (5.1)	74 (94.9)	78		
Education						
	No formal education	0 (0.0)	22 (100.0)	22	0.032	0.707
	Primary	2 (3.0)	65 (97.0)	67		
	Post-primary	8 (2.7)	293 (97.3)	301		
Work Experience (years)						
	1-5	10 (5.9)	160 (94.1)	170	0.032	0.358
	6-10	0 (0.0)	47 (100.0)	47		
	11-15	0 (0.0)	58 (100.0)	58		
	16-20	0 (0.0)	33 (100.0)	33		
	21-25	0 (0.0)	82 (100.0)	82		