

A review on the state of abattoirs in Nigeria during COVID-19 pandemic era: Potential threats and public health interventions

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ABSTRACT: The Coronavirus Disease-2019 (COVID-19) is an emerging zoonotic disease with global impact. Different intervention measures have been rolled out to flatten the curve, however the unhygienic conditions of abattoirs in Nigeria may be a perfect breeding ground for the novel coronavirus, hence could pose a threat to public health. The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) was first reported among individuals who had either visited or had consumed food sold at the wet animal market in Wuhan, megacity of China in late December, 2019. The outbreak compelled China authority to close down all the wet animal markets in the Hubei province in an attempt to curb zoonotic transmission of the virus. Due to the unhygienic conditions of Nigerian abattoirs, butchers are more likely to come in contact with contaminated objects or surfaces and when they do, they may unknowingly infect themselves by touching their noses, mouth, or eyes with contaminated hands. Consequently, the virus could find its way into the respiratory tract to initiates an infection. Worst still, the lack of social distancing in the abattoirs can promote local transmission amongst butchers if some of them are infected and remain asymptomatic. These asymptomatic individuals can constitute a potential reservoir in the propagation and transmission of the virus within the abattoirs and in the community if they are not identified, isolated and treated. The current pandemic poses a threat of zoonotic transmission, hence, there is need for the Federal Government of Nigeria to make concerted effort in restoring sanitary in the abattoirs in order to forestall an outbreak of a virus that may be more deadly than SARS-CoV-2. This review therefore seeks to evaluate the growing concerns of the unhygienic conditions of abattoirs in Nigeria amidst the COVID-19 pandemic, the threats it poses to public health and the possible way forward.

Keywords: Abattoirs, COVID-19, public health, unhygienic conditions, zoonotic disease.

INTRODUCTION

Abattoirs are well designed structural facilities approved by relevant authority for the purpose of antemortem, hygienic slaughtering, evisceration and postmortem inspection of

livestock (including cattle, goats, sheep, pigs and poultry) for wholesome meat production for public consumption (Alonge, 2005; Stevenson, 2013). The operational proce-

ture in a standard abattoir (Figure 1) includes; the general inspection of animals in a lairage by a veterinarian for signs of diseases, humane slaughtering and evisceration, postmortem examination of carcass, removal of bones, dressing and cutting of carcasses either for storage in a designated refrigerator or immediate transportation using an enclosed motor vehicle for retail purposes (Mamhobu-Amadi et al., 2019). Besides serving as a central location where all the processes involved in the holding, slaughtering and preparation of food animals for public safety are carried out; the abattoirs also provide a veritable platform for animal disease surveillance through the instrumentality of veterinary examination of large and small animals (Food and Agricultural Organization, 2004; Morgan and Pinner, 2009).

As at 2019, the World Bank's estimation of Nigeria population stands at 200,963,599 (World Bank, 2019). Since, important food animals are being slaughtered and processed as meat for human consumption in our abattoirs; attention must be paid to the conditions of our abattoirs in order to ensure national food safety, security and sufficiency for the growing population. Unfortunately, this aspect of food supply chain is threatened by the unhygienic conditions and unsafe practices in our abattoirs. Before the advent of COVID-19 pandemic, the state of abattoirs in Nigeria and the operations thereof are rated to be far below international standards and best practices (Nwanta et al., 2008, Abiola, 1995; Igwe and Yakubu, 2000; Aliyu et al., 2008).

The legal framework for the establishment and operations of abattoirs indicates that abattoirs are social services of appropriate tiers of government. Statutorily, the local government authorities are responsible for the setting up and looking after public facilities like public toilets, motor parks, as well as slaughterhouses (David-West, 2002; Nwanta et al., 2008). They are expected by law to take ownership, as well as regulate and control the operations of slaughterhouses within their domain; whilst maintaining the facility and ensuring strict adherence to standard protocols of operation by the butchers and other stakeholders. However, this is not the case as the local government authorities appear to be more concern about high revenue generation and collection from the abattoirs than servicing the system. This misplaced priority and negligence has resulted in the deplorable conditions of abattoirs across the country, characterized with unhygienic processing of meat and inadequate waste disposal system (David-West, 2002; Nwanta et al., 2008). Quite a few studies have reported the presence of highly pathogenic microorganisms of zoonotic importance in processed meat from abattoirs. This has affected the quality and integrity of meat served to the public (Coker et al., 2000; Hird et al., 2009; Ali et al., 2010; Okike et al., 2011; Delia et al., 2012; Delia 2015; Birhanu et al., 2017).

The present unhygienic and deplorable state of abattoirs across the nation, no doubt, pose a serious threat to public health particularly with the COVID-19 pandemic in which

the causative agent was reported to have emanated from a wet animal market (Figure 2), located few miles away from the P4 Virology Laboratory in Wuhan megacity of China (Lu et al., 2020; Enitan et al., 2020; Ralph et al., 2020). Since it was first reported in late December, 2019, the deadly virus has spread to 220 countries and territories, with more than 36 million total confirmed cases and over 1 million deaths recorded globally as at 09 October, 2020 and still counting (Johns Hopkins University Center for Systems Science and Engineering, 2020). Nigeria like other countries of the world has continued to record a dramatic rise in the number of confirmed cases and fatalities of COVID-19 since the first incidence was reported on the 27th of February, 2020 (NCDC, 2020). As of 09 October, 2020; Nigeria had the largest COVID-19 outbreak in the West-Africa sub-region (59,841), third to South-Africa (686,891) in the continent (WHO-Africa, 2020).

Coronaviruses are zoonotic in nature (*i.e.*, have the ability to jump the animal-human-specie-barrier) and cause a vast array of severe respiratory, enteric and systemic infections in both humans and numerous animal hosts including: cattle, swine, rodents, cats, dogs and avian species (Fehr and Perlman, 2015). Most identified coronaviruses are considered to be of animal origin (Cui et al., 2020). The Bovine coronavirus (BCV) for instance, have been reported to cause respiratory distress and enteric diseases in cattle (Robert, 2009). The highly pathogenic severe acute respiratory syndrome coronavirus (SARS-CoV), Middle East respiratory syndrome coronavirus (MERS-CoV) and the current novel SARS-CoV-2 were believed to have originated from the horseshoe bat (Chan et al., 2015; Cui et al., 2020). Coronaviruses have also been known to exhibit antigenic variability, with potentials for genetic re-assortment (Oma et al., 2016). These viruses have been reported to adapt to specific host because of the high plasticity of their genomic contents (Cui et al., 2020). Seeing the potential role of animals in the current pandemic, the World Health Organization (WHO) in its advice to the public recommended avoidance of unprotected contact with both farm and wild animals (WHO, 2020). The conditions of the live-animal markets in China was thought to have provided the breeding grounds for animal coronaviruses to cross the animal-human-specie-barrier. This compelled the China authority to close down all the wet animal markets in the Hubei province in an attempt to curb zoonotic transmission of the virus (Figure 3).

Furthermore, outbreaks of COVID-19 in slaughterhouses and meat processing plants have been reported in several countries in Europe and around the world. The reason for this development is not unconnected to the poor working conditions in slaughterhouses and meat processing plants, as well as poor adherence to the required COVID-19 safety protocols (EFFAT, 2020).

Considering the unhygienic conditions and unsafe practices in Nigerian abattoirs, the abattoir environment



Figure 1. Picture showing meat workers wearing protective clothing carrying out evisceration on rail in a standard abattoir (Source: <https://www.fginsight.com/news/news/coronavirus-pandemic-could-aid-small-abattoirs-111657>).



Figure 2. Picture showing Huanan animal wet market in Wuhan megacity of China (Source: <https://www.mirror.co.uk/news/world-news/coronavirus-could-started-market-koala-21346952>).

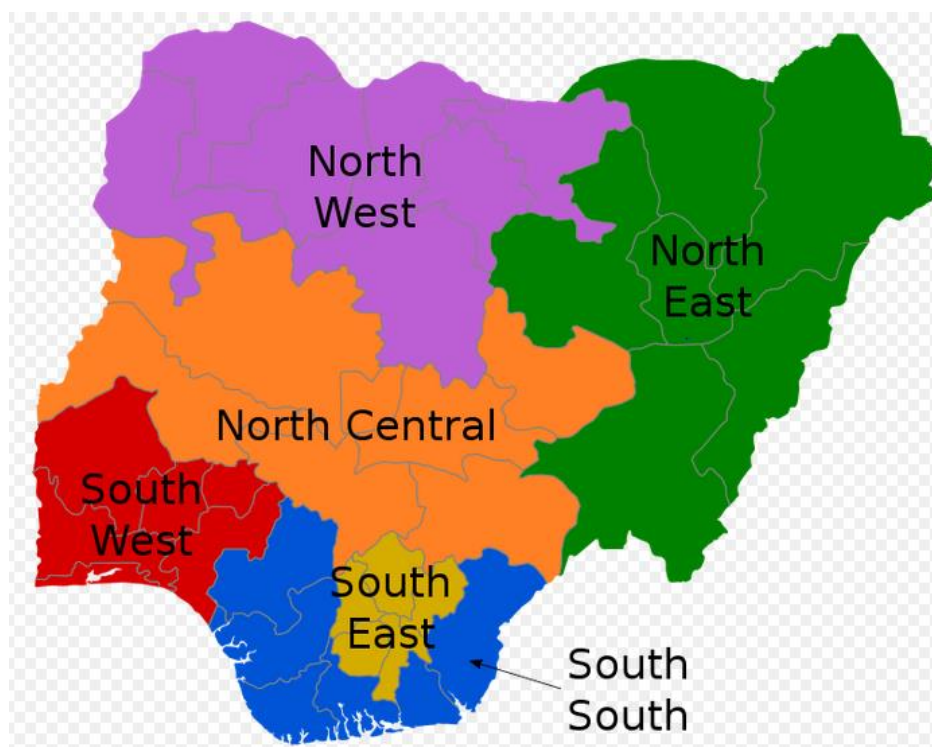


Figure 3. Map of Nigeria showing the six-geographic zones (Source: https://en.wikipedia.org/wiki/Geopolitical_zones_of_Nigeria#/media/File:Geopolitical_Zones_of_Nigeria.svg).

can present a favorable condition for exchange of genetic materials between the animal coronaviruses and the human novel SARS-CoV-2. This would no doubt pose a greater public health challenge and may trigger the next pandemic if urgent interventions are not put in place. This review therefore seeks to evaluate the growing concerns of the unhygienic conditions of abattoirs in Nigeria amidst the COVID-19 pandemic, the attending threats to public health and the possible way forward.

CONDITION OF ABATTOIRS IN NIGERIA AND POTENTIAL THREATS TO PUBLIC HEALTH

The conditions of abattoirs in Nigeria are best imagined than described. The ugly situation is the same across the six (6) geo-political zones of the country (Figure 3) including: North East (Jalingo Metropolitan abattoir, Damaturu abattoir in Yobe), North-West (Malumfashi abattoir in Katsina, Maiyanka abattoir in Kano, Zangon Shanu abattoir in Kaduna and Kara abattoir in Sokoto), North Central (Jos abattoir, Wurukum abattoir in Benue, Lapai slaughter house in Niger, Wurukum abattoir in Benue, Ipata slaughter house in Kwara, Deidei and Karu abattoirs in Abuja), South-East (Afikpo abattoir in Ebonyi, Nsukka abattoir in Enugu, Afor-Ajala Mbaaise abattoir in Imo), South-West (Okole Oba abattoir in Lagos, municipal

abattoir in Bodija, Ibadan) and South-South (Trans-Amadi abattoir in Port-Harcourt, Ikpoba abattoir and Afuze slaughter house in Edo) (Adeyemo, 2002; Nwanta, et al., 2008 and 2010; Lawan et al., 2013; Bwala et al., 2015; Gali et al., 2020).

Aniebo et al. (2009) reported the generation of several thousand tons of gut contents, blood, and waste tissues discharged directly into the environment from a local abattoir in North-East, Nigeria. In another case report by Tekki et al. (2012), a site visit to local abattoir in North-Central Nigeria, reveals the presence of huge heap of wastes consisting of blood, ingesta (from animal intestine) and polythene amongst others within the abattoir premises (Figure 4). The slaughter of animals is carried out on a bare unkempt floor. No any form of inspection is done. Evisceration is done on the ground stained with faeces, blood and other wastes from the stressed animals. Worst still, the abattoir is characterized with poor drainage system (Figure 5).

The sanitary condition at the Bodija Municipal abattoir in Ibadan city, South-Western Nigeria is an eyesore. According to Adeyemo (2002), ante-mortem examination is absent as animals are conveyed straight to the slaughter halls. The slaughtering, eviscerations and dressing are done on the floor. The waste disposal system is grossly inadequate, consequently making the abattoir environment and the premises a source of pollution with



Figure 4. Picture showing heap of refuse within the premises of an abattoir in North Central Nigeria (Source: Tekki et al., 2012).



Figure 5. Picture showing poor drainage system in an abattoir in North-West, Nigeria (Source: Tekki et al., 2012).

oozing stench odour to the immediate host community. This also attract rodents, flies, wild carnivores and disease vectors. This observed unhygienic conditions of Bodija abattoir presents with grievous environmental implications. In his report, Adeyemo alluded to the fact that the untreated waste generated from the abattoir which is being washed into the open drainage introduces pathogenic

microorganisms and excessive harmful materials into surface water including wells which serves as source of drinking and domestic water to the community. These wastes contain biodegradable creates both chemical and biochemical oxygen demand on materials; therefore, when the rain falls it dissolves the ground water as it leaks into it. High level of inorganic solute component of the waste



Figure 6. Picture showing butchers without personnel protective clothing carrying out slaughtering of animals in an unkempt floor in an abattoir in Lagos state, South-West, Nigeria (**Source:** Omotosho et al., 2016).

with natural biochemical chemical substances such as iron, manganese and processes occurring within it. The resultant effluent ammonia is released into water bodies. These cumulatively depletes the oxygen level in the water which impact negatively on aquatic life (Abiola, 1995; Kola-Olusanya, 2012; Fearon et al., 2014).

Furthermore; according to the report of Omotosho et al. (2016), poor hygiene and deficient waste disposal are common problems observed in abattoirs in South-West, Nigeria. Slaughtered animals are left on unkempt floor (Figures 6 and 7) as also seen in Lokoja abattoir, North-Central (Figure 8). The available lairage facilities are grossly inadequate. The slaughter areas are poorly demarcated. Stunning and slaughtering are done in segments which are not clearly demarcated from the rest of the slaughter areas. More worrisome is that butchers work without personnel uniform and protective clothing (Figure 6 and 7).

Also, in a recent study, Buhari et al. (2020) reported the gross infrastructural deficit in the Malumfashi metropolitan abattoir in Katsina State, North-West, Nigeria (Figure 9). The lairage created is non-functional; there is no power supply, no provision of cold room, disinfection and first aid facilities are lacking; while the drainage system is dilapidated. The water supply and meat transportation system are also inadequate. There are no antemortem and

postmortem checks. The butchers adopt a cruel method for animal restriction, thereby sustaining physical injuries in the process of laying down large animals. The waste handling, sewage disposal system and sanitation are poor.

The same was our observation, when members of our team visited the Gwagwalada abattoir in the Federal Capital Territory (FCT), Abuja, North-Central. The facility was completely dilapidated (Figure 10). Previously, Lawan et al. (2013) had evaluated the physical facilities and operations of other abattoirs (Kaduna, Kano, Zamfara and Sokoto) in North-West, Nigeria and reported the use of stream water to wash carcasses and at times re-use the accumulated water from the dilapidated drainage system within the slaughterhouse to wash the carcasses. The lairage and hanging rail systems in these abattoirs were non functional except for Kaduna, where it is sub-optimally utilized. Butchers use stream water to wash animal carcasses and at times re-use the accumulated water from the dilapidated drainage system within the slaughterhouse to wash the carcasses. A site-visit by members of our team to the Lokoja abattoir in North-Central, Nigeria, corroborated the report of Lawan et al. (2013) as butchers were seen washing carcasses of slaughtered animals and even dumping animal wastes into the river, which serve as the main source of water supply for the community (Figure 11).

All the aforementioned exposes the public to the



Figure 7. Picture showing butchers without protective clothing carrying out slaughtering of animals in an unkempt floor in an abattoir in Ogun state, South-West, Nigeria (**Source:** Omotoshoi et al., 2016).



Figure 8. Picture showing slaughtered animals lying on unkempt floor in an abattoir in Lokoja, North-Central, Nigeria (**Source:** Photo Credit to Itodo, G. E.).



Figure 9. Picture showing slaughtered animals lying on unkempt floor in an abattoir in Kastina, North-West, Nigeria (Source: Buhari et al., 2020).



Figure 10. Picture showing a dilapidated unhygienic abattoir in Gwagwalada, North-Central, Nigeria (Source: Photo credit to Alaba, O. E. G.).



Figure 11. Picture showing butchers washing carcasses of slaughtered animals in an abattoir situated close to the river in Lokoja, North-Central, Nigeria (Source: Photo credit to Itodo G. E.).

consumption of noxious meat probably contaminated with infectious agents including viruses, parasites and bacteria (Lewicki, 1993; Food and Agricultural Organization, 2004; Haileselassie et al., 2013). Fonseca (2000) opined that the quality of water used in abattoirs should meet the standard of drinking water. However, this is far-fetched from the practice at the abattoirs in North-West, Nigeria.

Below are some of the common features and general insanitary practices in Nigerian abattoirs. Their public health implications amidst the COVID-19 pandemic are very disturbing and demands urgent intervention:

- Draining blood of slaughtered animals into surrounding areas (Figure 12) and in some cases, such blood is collected for production of blood meal and animal feed; a practice that can potentially serve as a means of vehicle for infection to the handler and the consumer if not done with optimum precautions (Oruonye, 2015).
- Intestinal contents are heaped within premises, composting and washed into surrounding areas. This practice will tamper with the environmental microbiota as pathogenic strains and mutated strain of microbes that may have acquired drug resistant genes through plasmid transfer, transduction or natural selections are released into the environment (Abiola, 1995).
- Bones are burnt or crushed into animal feeds. The burning generates heavy smoke and stench thereby polluting the entire environment (Oruonye, 2015), as observed by members of our team that visited the Lokoja abattoir for site inspection (Figure 13).
- Waste tissues are burned and disposed into depressions within the premises. The inadequate management of waste generated from abattoirs across the country constitutes a huge health risk to human population as this affects the quality of air, portable water and aquatic life (Adeyemi and Adeyemo, 2007). Pathogenic microorganisms have been isolated from both effluents and abattoir solid waste (Elder et al., 2000). This poor hygienic practices at slaughter houses has resulted in meat contamination by several disease etiologies (Haileselassie et al., 2013; Kebede et al., 2016; Thomas et al., 2016).
- Slaughter slabs are not adequately washed and cleaned between slaughter rounds and within each round as there is inadequate supply of water, thus causing contamination of several batches of meat per incidence (Abiade et al., 2006; Oruonye, 2015; Fasanmi et al., 2017).
- With great increase in demand for meat orchestrated by restriction in importation of frozen meat sequel to the COVID-19 pandemic, butchers have an increased target to meet up with without a commensurate increase in abattoir facilities, hence, more butchers work on the same slab per time and at a higher speed. Consequently, social distancing is not observed and no attention is given to hygienic practices. This

situation is further compounded by the poorly designed structure which impedes adequate ventilation as such, at any incident of a COVID-19 infection in the slaughterhouse, there is a great potential for massive spread (Adeyemo, 2002; Nwanta et al., 2008; Lawan et al., 2013).

- In an advent that infected animals are brought into abattoirs, the butchers and visitors are all at risk. Unfortunately, inspections and certification of animals before slaughter are not carried out in most of Nigerian abattoirs (Adesokan and Sulaimon, 2014; Shima et al., 2015).
- The illicit use of unapproved slaughter points is also of great concern as it impedes the regulation of slaughter practices (Lawan et al., 2013; Akpabio et al., 2015).
- The lack of formal education among many of the butchers requires a great deal of work to be done in getting them informed of the bio-safety requirement and hygienic practices needed for their own safety and that of the community in view of COVID-19 and other zoonotic diseases. This situation is further compounded by the apathy and several conspiracies about the existence of the virus in some localities that may not have been hit hard by the pandemic. Butchering jobs are quiet strenuous and wearing of nose mask throughout the day may be very inconvenience for many. This also is a great challenge to bio-safety practices (Oruonye, 2015; Food and Agricultural Organization, 2020; Obidiegwu et al., 2019).

Normally, according to global best practices, activities in slaughterhouses should be well separated such that a designated place is available for holding, antemortem examination, bleeding, evisceration, splitting, meat, processing and packaging (CAC, 2005). In an ideal setting, the pre-handling of animals is important to reduce stress on the animal (Terlouw et al., 2008). This is usually achieved by keeping the animal well aerated without overcrowding. The animal is held off feed for about 24hours while allowing access to water. Shortly before the slaughter, the animal is stunned to ensure humane slaughtering and bleeding. Stunning can be achieved through mechanical means, electrical or use of carbon-dioxide (CO₂) gas.

Unfortunately, this is not the case in most slaughterhouses in Nigeria, as many do not have facility for stunning, no piped borne water or consistent water supply facility; hence, the tradition of hand washing with soap and water by butchers to protect against infectious microbes (especially SARS-CoV-2) cannot be achieved. Due to the unhygienic conditions of Nigerian abattoirs, butchers are more likely to come in contact with contaminated objects or surfaces and when they do, they may unknowingly infect themselves when they touch their nose, mouth, eyes or ears with contaminated hands and from any of this portal of entry, the virus can find its way to predilection sites



Figure 12. Picture showing an unhygienic abattoir in North-East of Nigeria with poor sewage management system (**Source:** Oruonye, 2015).



Figure 13. Picture showing air pollution due to heavy smoke generated from burning of animal bones and carcasses in Lokoja abattoir in North-Central, Nigeria (**Source:** Photo Credit to Itodo, G. E.).

mainly the respiratory tract, as well as the gastrointestinal tract with abundance of angiotensin converting enzyme – type-2 (ACE-2) receptors where it then initiates an infection.

The World Health Organization estimated that about 91 million mortalities in Africa is associated with food-borne diseases and more than 70% of diarrheal cases is linked to the unhygienic ways meat are handled and processed in abattoirs (WHO, 2007). Furthermore, the global upsurge in zoonotic diseases and the recent COVID-19 pandemic calls for serious attention to be paid to the environmental health and hygiene of Nigerian abattoirs, the health of the animals to be slaughtered, as well as the wellbeing of the animal handlers themselves.

In the face of the COVID-19 pandemic; slaughterhouses in many developed countries such as Spain, USA, Germany, France, UK, Norway, Denmark, Austria, and Sweden became hotbeds of COVID-19 infection as slaughterhouses were enlisted as essential service providers. This situation was not unrelated to poor working conditions in slaughterhouses in those countries that have relatively better working conditions than that we have in Nigeria (European Federation of Food Agriculture and Tourism Trade Union report, 2020). Some of the factors that have been recognized to be responsible for these include the poor waste management system, lack of social distancing among workers in slaughterhouses, poor and deteriorating condition of abattoir/slaughterhouse facilities, lack of PPEs, inconsistency in government policies and inspection practices, inadequate water supply, poorly trained personnel, indifference in government's attitude in setting up and looking after slaughterhouses and poor welfare package, lack of insurance scheme for abattoir workers and location of abattoirs in residential areas amongst others (Oruonye, 2015; Food and Agricultural Organization, 2020).

No doubt, SARS-CoV-2 is zoonotic, affecting humans and some animal species (Food and Agricultural Organization, 2020; Konda et al., 2020). Cases of infection of domesticated animals through close interactions or environmental contamination have been reported (OIE, 2020a; OIE, 2020b; OIE, 2020c; Zhang et al., 2020). The unguarded animal-human as well as animal-environment interactions at slaughter points poses a high risk of local transmission of SARS-CoV-2 (DE-Rijksoverheid, 2020).

PUBLIC HEALTH INTERVENTIONS TO PREVENT DISEASE OUTBREAKS IN NIGERIAN ABATTOIRS

The various abattoir facilities in Nigeria should be upgraded to meet recommended standards. The Federal Ministry of Agriculture and Rural Development through the Federal Department of Livestock had issued a prototype design for city abattoirs. There is need to follow this model in the construction of abattoirs both by the local government or private entrepreneurs. This will ensure uniformity as the present abattoir designs in the country

are obsolete (Lawan et al., 2013). A standard abattoir must have adequate facility and spacing relative to the number of animals to be slaughtered per time. The design should include sufficient space for all abattoir operations including lairage, tripe, and hides treatment. Adequate space is also needed for digging pits for the disposal of animal carcasses, compost stacks, lavatories and other forms of solid and liquid wastes (Obidiegwu et al., 2019).

Furthermore, adequate spacing is of great benefit amidst the COVID-19 pandemic as it will go a long way to support proper social distancing and effective hygienic practices. Facilities should be constructed to support segregation of clean and unclean processes without mixing products. Floors are better concrete, smooth, impervious and adequately sloped with gradient towards drains to enhance cleaning with water. Adequate water supply to each slaughter point in the abattoir is very crucial (Obidiegwu et al., 2019; EFFAT, 2020).

Likewise, abattoir operations should be optimized. This include assessment and sorting of carcasses by a veterinary inspector to ensure the safety of meat for public consumption. Carcasses should be cut apart and separated preferably using the line slaughter system. The meat cut should be immediately chilled in order to forestall growth of microbes on the meat and prevent spoilage, while waiting for market demand. Dehairing, scalding, skinning or plucking should always be carried out in separate room/area other than that designated for evisceration. To ensure adequate sanitation and efficient cranes, overhead railings are preferred for skinning/dehairing process. Evisceration must be conducted with optimal hygienic to minimize contamination of meat. Spilling of intestinal content on edible organs and tissue must be intentionally avoided. Also, wastes must quickly be removed from evisceration area and frequent sanitization of cutting instruments must be practiced during slaughter processes (OIE, 2020a).

Also, Government should be more committed to ameliorating the public health concerns of Nigerian abattoirs. Though there are legislatures that regulate the operations and management of abattoirs in Nigeria but the government has not shown adequate commitment to the implementation and enforcement of guidelines regulating the establishment, operations, management, inspections and maintenance of abattoirs. The COVID-19 pandemic has impressed a necessity for the review and commitment to the implementations of these regulations. Mechanisms must also be put in place to pursue and bring to book erring individuals. Over the years, several abattoirs and slaughterhouses have been illegally sited at wrong locations, subjecting the environment and neighborhoods to a lot of hazards. Such illegal facilities should be forced to relocate to suitable abattoir site. It is a reality that the number of abattoirs in the country is grossly inadequate (Oruonye, 2015), thus the need for the establishment of more abattoirs in the country. There is also a need to establish laws regulating the welfare of the butchers and abattoir workers because they are exposed to great risk

and hazards in the cause of service delivery and often not well remunerated. In an attempt to earn more, speed has become an essential component of abattoir operations at the expense of standard practice of hygiene and sanitation (Awosile et al., 2013; Banjo et al., 2013). Therefore, a good package may encourage them to stick to the rules of the game. When these workers get ill, they often fail to seek proper medical attention due to paucity of funds and consequently serve as potential source of infection to others (EFFAT, 2020; Food and Agricultural Organization, 2020).

In addition, abattoir workers are encouraged to be committed to the use of Personal Protective Equipment (PPE) such as wellingtons boots, raincoats, plastic aprons hand gloves, ear muffs/plugs and face mask. This has become critically important in the face of the COVID-19 pandemic. It will be highly encouraging for the abattoir workers if government could assist to provide them with the needed PPEs at a subsidized cost or better still, at no cost at all.

Still, the training and re-training of butchers, meat inspectors, as well as abattoir managers particularly on personal hygiene and use of PPE is pivotal to reducing meat contamination and spread of zoonotic pathogens from abattoirs (Haileselassie et al., 2013; Kebede et al., 2016). This will further ensure a well-informed abattoir work force and further curb the spread of COVID-19. As public health issues relating to zoonosis continue to evolve over time, there is a strong need for everyone, including the abattoir workers to step up their knowledge in this regard. Most abattoir workers do not have the time to search out such information, thus the need for the veterinarians and the public health officers to organize educative seminars and workshops that could help forestall disease outbreaks.

Moreover, there is need to integrate the abattoir waste disposal management into the general municipal waste management system. This will ensure an efficient waste disposal management system. It is also very important for the local authority to plunge back part of the revenue generated from the abattoirs into maintaining the facilities through provision of basic amenities to improve the current state of the abattoirs.

Additionally, individuals and corporate bodies can be encouraged to own private abattoirs or slaughter slabs as obtained in developed countries. However, these privately owned abattoirs must be routinely supervised and regulated by the relevant agencies. There is also need to introduce modern equipment into the abattoir operations in Nigeria to replace the obsolete, non-animal and non-environmental friendly practices. Such state-of-the-art facility will include standard rail for evisceration.

Finally, in view of the current pandemic (COVID-19), an efficient animal disease surveillance system, as well as safety protocol for importation of animals into the country must be put in place in our various ports of entry. Also, the relevant authorities must ensure that social distancing measures are put in place in our abattoirs, including

compulsory wearing of face mask. Physical contacts should be minimized. Very importantly, asymptomatic COVID-19 positive butchers and other abattoir workers must be identified, isolated and treated as they may constitute a silent reservoir in the propagation of the virus within the abattoir and the community.

CONCLUSION

COVID-19 is an emerging zoonotic disease with global impact and the unhygienic conditions of abattoirs in Nigeria may be potential breeding ground for the novel coronavirus. The current pandemic highlight the possible threat of spillover of zoonosis, hence the need for the Federal Government of Nigeria to declare a state of emergency on the unhygienic conditions of abattoirs in order to forestall outbreak of any pathogen that may be more deadly than SARS-CoV-2. Meanwhile, the local government authority should take responsibility for the management of abattoir facilities within their domain. They must ensure that butchers in the abattoirs adhere to the COVID-19 safety guidelines, particularly with respect to wearing of face masks and observation of social distancing among other measures to curtail the spread of the virus. No doubt, this could be very challenging for the butchers and abattoir operators, but it is very achievable with strong resolution, attitudinal changes, government supports, public enlightenment and enforcement.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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