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# Exploring the pork production chain in urban Ghana: insights from focus group discussions

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## Abstract

**Introduction** In urban areas of Ghana, key aspects of the pork production chain, such as pig handling, slaughter practices, and transportation, are critical yet often overlooked aspects of public health and food safety. Despite their significance, only a limited number of studies exist on the dynamics and implications of these practices. This study aims to address knowledge gaps regarding pig-keeping and slaughter practices in Ghana, specifically addressing pig-keeping, handling, slaughter practices, and transportation along the pork production chain.

**Methods** This phenomenological qualitative research paradigm utilised eight (8) focus group discussions (FGDs) with pig handlers and slaughterhouse workers in Accra and the Upper East Region of Ghana. Five (5) FGDs were conducted with pig-keepers, and three (3) FGDs were conducted with slaughterhouse workers. Three (3) participatory observations were conducted, probing study participants' views and the information they provided against their actual behaviour. This was to ascertain pig-keeping practices, the slaughter process, means of transport to vending sites, and hygiene and sanitation issues. Four (4) key informant interviews were conducted—two with veterinary officers and two with environmental health officers—to gain insights into their respective supervisory roles.

**Results** The study results indicated that most of the pigs were housed in makeshift structures, and free-ranging was widespread to reduce the cost of feeding. It was observed that the activities of pig farmers and slaughterhouses need to be adequately supervised, leading to widespread poor practices. Little knowledge of zoonotic diseases was present among actors in the pork production chain in Ghana.

**Conclusions** This study underscores the importance of addressing pig handling and slaughter practices as integral components of urban food systems in Ghana. By engaging stakeholders and raising awareness, policymakers can foster sustainable solutions to enhance food safety, protect public health, and promote animal welfare in urban Ghana.

**Keywords** Free-ranging, Keeping animals indoors, Pigs, Pre-slaughter handling, Slaughter

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## Introduction

Agriculture employs about 34% of Ghana's workforce, accounting for 19% of the gross domestic product (GDP) [1]. Pig-keeping is among the most critical livestock sectors worldwide [2]. The pig-keeping industry is the fastest-growing sector in the food industry, with the global increase in pork production reaching 80% [3, 4] and a predicted rise in annual pork demand reaching 7% [5]. Pork remains one of the most consumed meats in the world [6]. Pig-keeping has become the most commercialised form of livestock production after poultry in Ghana [7, 8]. Ghana's pork market has risen rapidly above other livestock products [9]. Pig production globally is growing steadily due to the high prolificacy rate, the comparative ease of management, and shorter generational time [10]. The recent rise in the pork industry has been attributed to the preference for white meat over red meat [11, 12]. Smallholder farmers have done pig-keeping in many rural and peri-urban communities. These usually adopt the extensive or free-ranging system where the pigs can scavenge for their food from unhygienic places like refuse dumps, gutters, and open defecation sites [13]. In some of these extensive or semi-intensive management systems, feeding the pigs is complemented by providing leftover food from hotels and restaurants [14]. Animals kept under the free-ranging system are likelier to die than those kept under the intensive pig management system [15, 16].

The pig/pork industry in Ghana has been confronted with several challenges. First, improper handling of animals before slaughter is very common in Ghana. This reduces pork quality [17, 18]. The second is the religious aversion to pig-keeping. The dominance of Islam and some Christian denominations in Ghana, which do not eat pork, has further stifled the pig/pork industry in those communities where these two denominations dominate [19]. Religious beliefs and native customs also show the type of slaughtering method employed, and the total number of slaughters done and recorded, usually at homes or slabs, exceeds the officially recorded Figs. [13, 20, 21]. Pig handling and pig slaughter have been significant challenges in urban Ghana. Although slaughterhouses exist in urban Ghana, most handle animals like cattle, sheep, and goats. There are few or no dedicated pig slaughterhouses, making slaughter a neglected problem. Most pigs in Ghana are slaughtered either clandestinely at homes or farms or slaughter slabs with or without veterinary supervision [13]. This, therefore, raises questions about the safety and quality of pork consumers' purchases. There is also a lack of information in the scientific literature on the nature of pig-keeping and handling, and the processes leading to

the eventual slaughter of pigs for consumption. There is also a dearth of information on the structure and composition of Ghana's pig/pork sector [22].

This study aims to address knowledge gaps regarding pig-keeping and slaughter practices in Ghana. Specifically, this study intends to 1) explore the pig-keeping and handling practices utilised by pig-keepers, 2) assess slaughtering methods and means of transport to vending sites, 3) identify key challenges encountered by stakeholders along the pork production chain, and 4) evaluate how these practices impact pork quality and public health. The findings from this research will provide invaluable insights for policymaking related to pig production and slaughter practices in Ghana.

## Materials and methods

### Study area

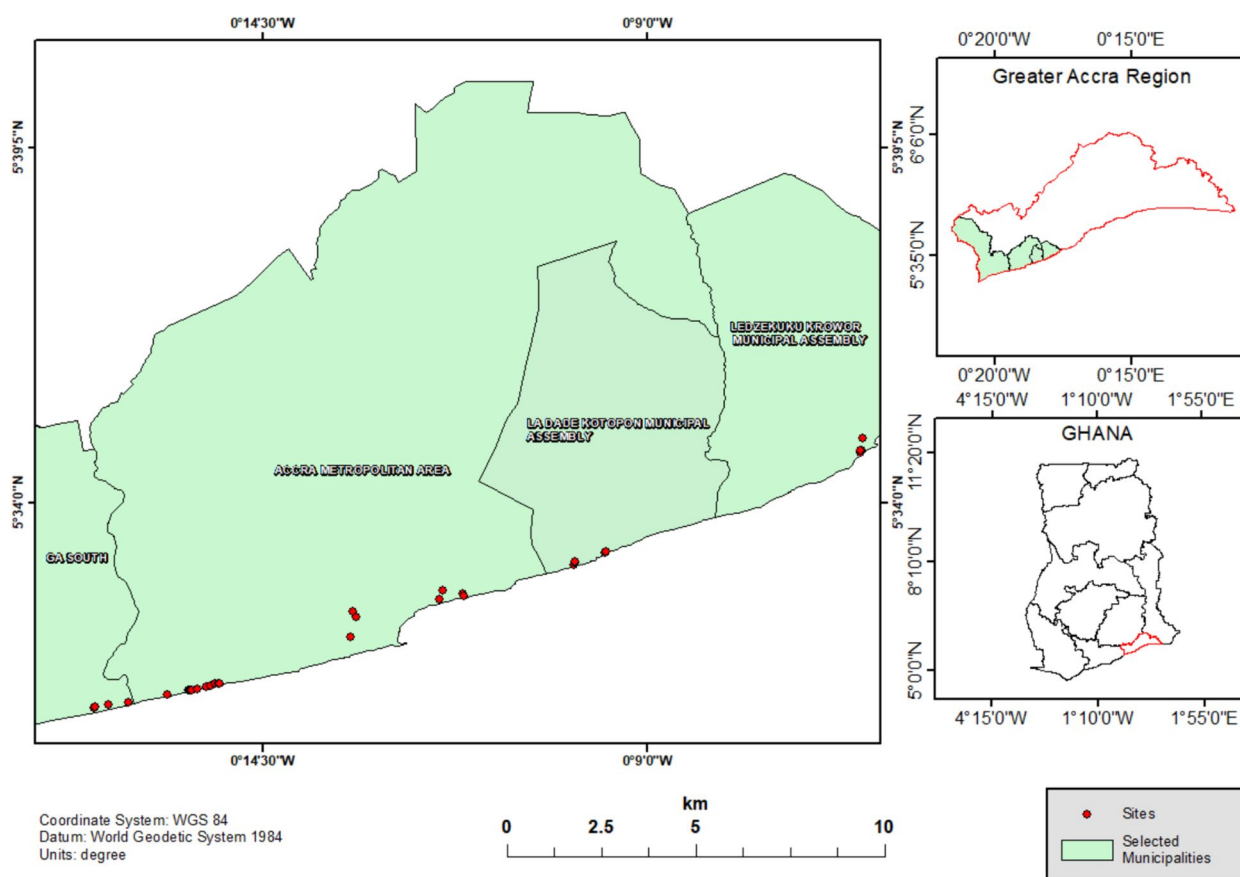
The study sites were purposively selected from pig farms along the coast of Accra because they represent places of intense pig-keeping activities and trade in Accra. The study sites were chosen because they have been identified as sites of pig-keeping and trade, mostly along the Coast of Accra. Although some pig farms may be located inland, these sites were purposively chosen.

Again, there has been little research on pig farming activities along the Coast, so this study was designed to fill that gap, hence the choice of these sites.

Communities selected from Weija-Gbawe Municipality included Pambros, Glefe, and Gbawe (Fig. 1). Gbawe has two slaughterhouses serving pork sellers and other customers from all over Accra.

For the Accra Metropolitan Assembly (AMA), communities were Shiabu, Chemunaa, Korle Gonno, Timber Market, and Bola Beach (Fig. 1). Communities selected from Ladekotopon Municipality included Osu Kaajanor and South La (Fig. 1). Teshie was used as the community from Ledzokuku-Krowor Municipality (Fig. 1). The coast provides a valuable place for keeping pigs due to easy access to water and waste disposal. As a result, more smallholder pig farms are located along the coast and serve as a significant place for trading in pigs; hence, it was included as a study site as it provided access to many pig-keeper associations.

The Upper East Region was also included as a study area because the International Livestock Research Institute has identified it to improve food security through pig production. Bolgatanga (Fig. 2) and Zebilla (Fig. 2) represented the selected communities from the Upper East Region. The Upper East Region is also a significant conduit of live pigs to Accra.



**Fig. 1** Map of selected districts in Accra

### Description of pig farms and slaughterhouse premises

Smallholder pig farms in Ghana generally operate under basic and informal conditions, featuring rudimentary housing structures, limited space, and insufficient waste disposal systems. Most of these pigs are kept on the free-range system, and the few pigs that are housed are kept in makeshift structures. These farms frequently lack adequate drainage, ventilation, and biosecurity measures, which can heighten the risk of disease spread. Similarly, slaughterhouse premises are usually poorly maintained, characterized by inadequate infrastructure, unsanitary conditions, and limited oversight by supervisory bodies.

### Study design and population

The study population comprised two main actors along Ghana's pork production chain: pig farmers and slaughterhouse workers. Supervisory bodies, such as veterinary and environmental health officers, were also recruited for this study. The pig farmers were selected through assistance from pig farmers' associations formed in some of the communities. However, in areas where the pig farmers' association did not exist, the head of the pig farmers

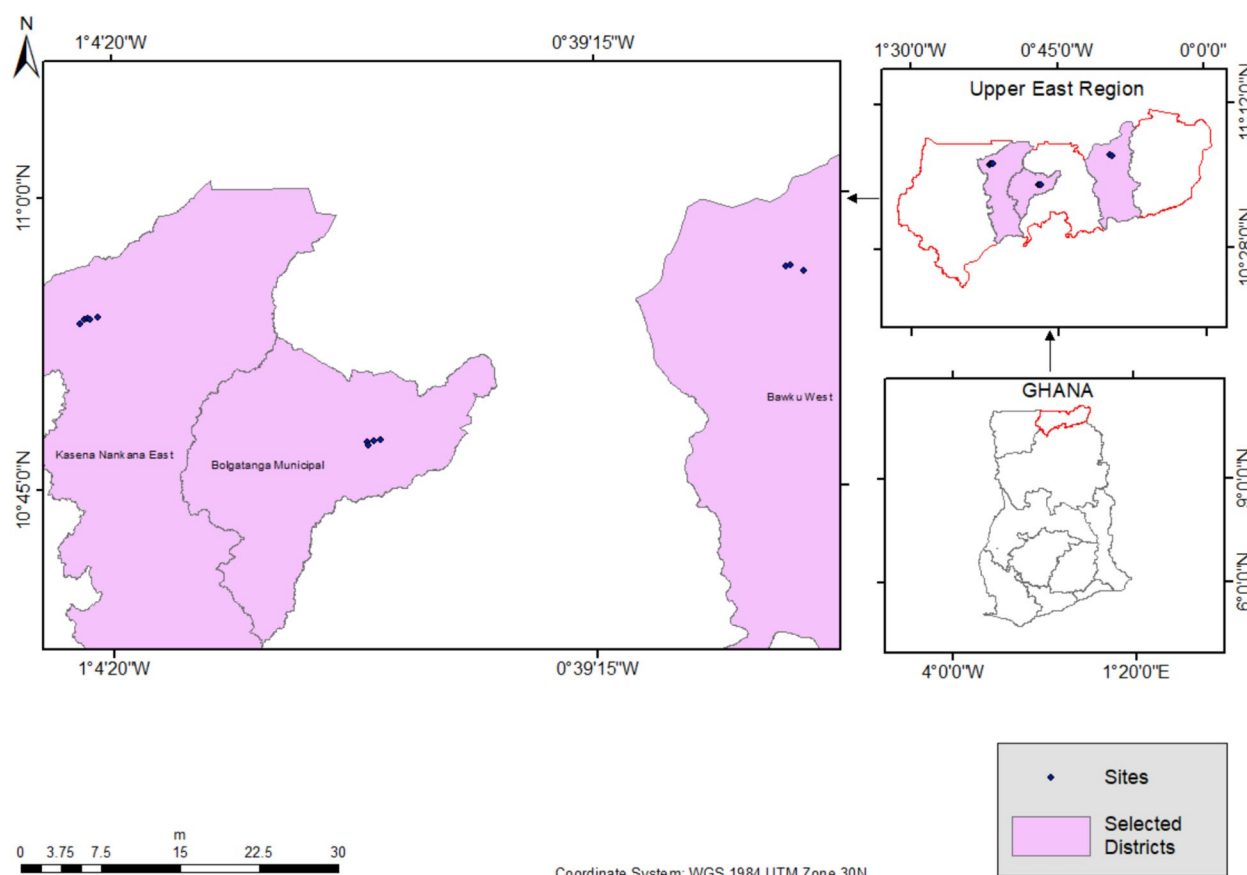
in that community recruited participant pig farmers in that vicinity for the study. Slaughterhouse workers were recruited from the largest slaughterhouse for pigs located in Gbawe. Veterinary and Environmental health officers were recruited from the Weija-Gbawe Municipality and the Bolgatanga Municipality.

This study used the phenomenological qualitative research paradigm to gather information on pig handling and slaughter practices among actors in Ghana's pork production chain.

### Data collection

#### Focus Group Discussions (FGDs)

Focus group discussions were held at Gbawe, Korle Gonno, Chemunaa, Shiabu, Bolgatanga, and Zebilla between June 2019 and October 2019. These groups were purposively selected for their crucial pig-keeping and slaughter roles. Separate focus group discussions were held for the various actors in the pork production chain. Each focus group consisted of 10–12 participants recruited purposively with the help of the association heads. Five [5] separate discussions were held for males, and three [3] FGDs were held with females, which lasted



**Fig. 2** Map of selected districts from the Upper East Region

between 1 h and 30 min and 2 h. A discussion guide focused on pig-keeping practices, slaughter practices, pork business constraints and expansion, and knowledge of pig-related zoonoses. Eight [8] focus group discussions were held for pig farmers and slaughterhouse workers, which were enough to reach data saturation for the concepts needed for this study, the point at which no new themes emerged from the various discussions. Six FGDs were held with pig farmers, and two FGDs were conducted with slaughterhouse workers. All focus group discussions were digitally recorded, and notes were also taken.

#### Key informant interviews

Four [4] key informant interviews were conducted—two with veterinary officers and the other two with environmental health officers—to gain insights into their respective supervisory roles. Veterinary officers in Ghana ensure animal health and welfare throughout the pork production chain, conducting health checks, vaccinations, and disease surveillance. They also play a crucial role in diagnosing and treating illnesses in pigs, thus safeguarding the safety of pork products. Environmental

health officers complement this work by concentrating on food safety regulation, environmental monitoring, public health protection, and training and education. They enforce hygiene standards at slaughterhouses, assess the environmental impact of production activities, and perform periodic inspections to avert contamination. Together, veterinary officers and environmental health officers strive to uphold high standards of animal health, food safety, and overall public health.

#### Participatory observations

Three [3] participatory observations were conducted, probing study participants' views and the information they provided against their actual behaviour. This was to ascertain pig-keeping practices, the slaughter process, means of transport to vending sites, and hygiene and sanitation issues. A one-hour observation study was conducted, especially within the study area. It was performed at pig farms, slaughterhouses, and pork retail centres. The activities observed included trade arrangements with pork retailers regarding hygiene and sanitation issues. The means of transporting pork from the slaughterhouse to the vending points were also observed.

## Data analysis

The qualitative content analysis involved the following procedures:

### 1) Recording of data

The recording was done by audio recording on a digital voice recorder. Notes were also taken to serve as backups to the audio recording.

### 2) Verbatim transcription

All interviews and focus group discussions were translated into English and transcribed verbatim immediately after the focus group discussions. To ensure that the transcribed discussions represented the study participants' views, they were made available to verify and agree to. This was done to ensure the validity and reliability of the data collected.

All data were entered into NVivo software version 12 for analysis. Data analysis included the following: data gathered from the study were read thoroughly, and memos were developed to differentiate core themes. A codebook containing the main themes, sub-themes, files, and references was developed. All data were coded with themes from the codebook, and codes were used to identify themes and sub-themes. All socio-demographic characteristics of respondents have been indicated in Table 1. The themes generated included the pig-rearing process, slaughter practices, and regulatory activities. The themes, sub-themes, and descriptions that emanated from this study have been presented in Table 2.

## Results

Table 1 details the socio-demographic characteristics of 165 individuals participating in the pork production chain in Ghana. The majority of participants were between the ages of 41 and 50 (32.7%) and predominantly male (75.8%). Most participants were pig farmers (81.8%), with fewer slaughterhouse workers, environmental health officers, and veterinary officers. Participants were selected from six locations, with the Accra Metropolitan Assembly (AMA) having the highest representation at 32.1%. This data indicates a predominantly middle-aged, male workforce within the pork production sector.

Table 2 presents the main themes, sub-themes, and descriptions from the pork production chain study. The three key themes are the pig-keeping process, pig slaughter practices, and regulatory activities. Relevant sub-themes include feeding, zoonotic disease awareness, slaughtering methods, and regulatory oversight. These themes outline the main processes and challenges in the

**Table 1** Socio-demographic characteristics of study participants

Characteristics	Number N = 165 (%)
Age (In years)	
< 20	14 (8.5%)
20–30	16 (9.7%)
31–40	37 (22.4%)
41–50	54 (32.7%)
51–60	32 (19.4%)
61 +	12 (7.3%)
Sex	
Male	125 (75.8%)
Female	40 (24.2%)
Category	
Pig farmer	135 (81.8%)
Slaughterhouse worker	26 (15.8%)
Environmental health officers	2 (1.2%)
Veterinary officers	2 (1.2%)
Location	
Weija-Gbawe	26 (15.8%)
AMA	53 (32.1%)
Ladadekotopon	20 (12.1%)
Ledzokuku Krowor	14 (8.5%)
Bolgatanga	25 (15.1%)
Zebilla	27 (16.4%)

pork value chain. The table provides a framework for analysing the study's qualitative data.

## Pig-keeping process

### Housing

Pigs cannot be reared at homes or close to places of residence, as is done for some ruminants like goats and sheep. This is because pig-keeping produces an unbearable stench for those nearby. Pig keepers prefer to keep pigs close to the sea for easy access to water and easy waste disposal, especially for those pig farmers along the coast of Accra. In most communities along the coast of Accra, pigs are kept in close contact with humans. Pig farms along the coast of Accra are found in densely populated communities where pigs and humans live close to each other. The situation differs from many communities in the Upper East Region of Ghana, where pigs share living space with families. Most pig-keeping communities along the coast of Accra have adopted a low-input, free-range system. Other pig-keepers keep the pigs in their pens at night and release them to scavenge for food along the beaches during the day. This practice of rearing pigs, including handling pigs' faeces, wastes, and even feeding, could transmit zoonotic pathogens to the humans who handle them. The main reason for practising the free-range system is to reduce the cost of production,

**Table 2** Themes, sub-themes, and descriptions

Theme	Sub-themes	Description
Pig rearing process	Housing	Process of keeping pigs
	Feeding	
	Challenges	
	Zoonotic diseases awareness	
Pig slaughter practices	Arrival of pigs	Practices involved in the slaughter of pigs
	Handling of pigs before slaughter	
	Slaughtering process	
	Problems with slaughtering	
	Transport of carcass	
Regulatory activities		Supervisory role of regulatory bodies
	Animal and Public health	
	Regulation of slaughtering	

especially in terms of the cost of feeding. This practice exposes the pigs to open defecation sites and refuse dumps where they can contract infections like *Trichinella* and *Taenia solium* taeniasis/cysticercosis. The pen of the pigs must be swept and cleaned every morning and evening, but if that cannot be done, then it should be cleaned once daily to reduce the stench emanating from the pen. On average, they bathed the pigs every three or seven days because regular bathing would destroy the pen floor and incur more costs. However, farmers who reared their pigs along the sea did not see the need to bathe the pigs, as the pigs bathed in the sea when they were released.

*‘..... Here, we do not spend much on feeding as the pigs can get their food along the beach’ (Pig farmer, Teshie).*

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**Feeding**

The farmers stated that pigs should be fed twice daily (morning and evening). The type of feed given included cassava peels, yam peels, corn husks, fish leftovers, wheat bran, rice bran, malt, and restaurant leftovers (swill). During the dry season, pigs are fed in the morning and released to roam until evening, when they return to their pen. However, in the rainy season, they are confined to their pens and fed in the morning and evening.

Farmers were further asked about their monthly production costs and expenses. Generally, almost all farmers spend a monthly amount on feed, medication, water, rent, movement permits, and police checkpoint fees.

Some farmers along the sea indicated they spent money on water because the pigs could not drink the seawater because of its salty content, which caused diarrhoea.

*‘...Usually, depending on the number of pigs, I spend more than GH¢ 50 a day, most of which goes into feeding. The feed includes waste products from pito, dirty flour from grinding mills, husks from rice, and leftover foods. We also spend money on drugs, housing, and rent (Farmer at Zebilla).*

*‘...We pay a range of GH¢ 40–150 monthly for medical costs and GH¢ 50–200 on feeding, depending on the number of pigs...’(Farmer at Teshie).*

*...At the police checkpoint, 100 pigs cost me GH¢600 per trip, and I pay GH¢4 per animal for a movement permit’ (Farmer at Gbawe).*

**Challenges associated with pig-keeping**

The major challenge reported by most farmers is the money that goes into feeding the pigs. Added to this is the cost of water and the distance that must be travelled to get potable water for the pigs. During the dry season, some pigs are lost to road accidents because they are released to roam about. Farmers also lose their pigs to yearly disease outbreaks, especially swine flu. Confinement of pigs might be an ideal way to rear pigs. However, most farmers said keeping these pigs and their daily routines, such as cleaning the pen, was very difficult in the rainy season.

Another challenge most of these farmers face is delays from Police officials, although their documents, such as movement permits, are accurate. This delay leads to starvation, and most pigs, especially the piglets, do not survive.



*'...The main issue is the money that goes into rearing the pigs, especially the feed price, which we buy at GH¢90 per bag. We also have challenges with veterinary officers and the District Assembly. We pay movement permits, which are usually expensive...'*(Farmer at Zebilla).

*'...AMA harasses us and wants to evict us, so we give them money from time to time. We also must travel long distances to get pipe water because we cannot give the pigs sea water to drink...'*(Farmer at Korle-Bank, -Bukom Boxing Arena).

*'...In the dry season, because we open the animals to scavenge around, we lose many of them to road accidents from cars and cycles. Environmental Protection Agency officials often harass us, and most cases end up in the law court because of sanitation issues...'*(Farmer at Bolgatanga).

In terms of business expansion, it was realized that the pig-keeping business had expanded over the past few years due to increased pork consumption. They believe the dry season is the best season for great sales compared to the rainy season. They stated that they can buy and sell many pigs during the dry season, which has helped them a lot as they can fulfil many responsibilities and take good care of their families.

*'...Business has been so good... it has increased, and we have been able to care for our families...'*(Farmer at Bolgatanga).

*'...The business has grown over the years due to increased consumption of pork. We also have foreigners coming to our town to enjoy pork. Consumption has also gone up because people are no longer put off by Muslim prohibition...'*(Farmer at Zebilla).

#### **Awareness and control of zoonotic diseases among pig farmers**

The study sought to determine pig farmers' awareness of zoonotic diseases. Most of the farmers were not aware of zoonotic diseases.

*'...I have not had any disease from pigs since I started pig-keeping 15 years ago, so I do not know of any disease...'*(Farmer at Zebilla).

*'...We are unaware of any disease that can pass from animals to humans or humans to animals...'*(Farmer at Teshie).

*'...Do not know about the diseases that affect pigs...'*

*'(Farmer at Korle-Bank,—Bukom Boxing Arena).*

Generally, the farmers needed to be aware of the pig-keeping practices that could be risk factors for pig-related zoonotic pathogens.

*'...We know the presence of cysts, but do not know where they originated. We also know the presence of the cyst in the pork is not good, so we sometimes burn the carcass...'*(Farmer at Teshie).

*'...Yes, we know cysts. The pigs will have swollen jaws and rashes on the tongue. When we see these things, we reject the pigs and do not buy...'*(Farmer at Zebilla).

*'...Yes, we see cysts after slaughter on the skin (rashes) and in the meat, and we remove them from the meat when they are present. We do not know where cysts come from...'*(Farmer at Korle-Bank,—Bukom Boxing Arena).

Other farmers also dewormed pigs when they experienced disease among pigs, and these farmers could not give the names of the dewormers they used. They acknowledged the role of veterinary officers, and some called on them when they saw any strange disease they could not handle themselves. Most of the farmers relied on their years of experience in pig-keeping to treat and monitor their pigs.

*'...We inject the pigs when we suspect the presence of swine fever, but it does not help in controlling the disease because our pigs continue to die...'*(Farmer at Teshie).

*'...We give them dewormers as well as white'Maggi cube'(monosodium glutamate) to treat them. We used to have a veterinary officer who treated them, but he is late (dead), and the current veterinary officer does not come...'*(Farmer at Bolgatanga).

*'...We give injections (antibiotics and vitamins) to affected animals, but most often die...'*(Farmer at Korle-Bank, -Bukom Boxing Arena).

#### **Pig slaughter practices Gbawe slaughterhouse**

Gbawe has one of the largest pig slaughterhouses in Accra, which serves the Greater Accra Region and other nearby regions. Two slaughterhouses in Gbawe (5.574683, -0.315269) are about 50 m apart. Both slaughterhouses serve pork sellers and other customers from all over Accra. Slaughterhouse 1 has about 12 slaughterhouse workers and slaughters an average of 30 pigs daily.

The pigs here come from all over Accra. The environment is relatively neat, with access to water and waste disposal being the only challenges. Slaughterhouse 2 has about 15 workers and serves customers from all over Accra. There is also a makeshift pig farm here with all the pigs coming from the Northern part of Ghana, specifically from the Upper East Region of Ghana. Customers can select pigs of their choice for slaughter. The categories of people served by the pig slaughter facilities at Gbawe include small-scale pork retailers who buy one pig per week and large-scale pork retailers who purchase between 5 and 10 pigs each week. The Gbawe slaughterhouse also serves customers who purchase pigs/pork for home consumption. Slaughterhouse 2 slaughters an average of 50 pigs daily, which could rise significantly during the dry season. The slaughtering premises at Gbawe lack appropriate infrastructure, and staff work is done without personal protective equipment (PPE). Sanitation standards and hygienic practices are low, and slaughtered pigs are left on concrete floors.

### ***Slaughterhouse workers' practices***

***Arrival of pigs at the slaughterhouse*** This study revealed that pigs came from different parts of Ghana to be slaughtered at the Gbawe slaughterhouse, especially from the Upper East region. The pigs had to travel more than twelve hours before arriving at the slaughterhouse. Most of the pigs come in public transport and are not fit for transporting pigs for slaughter. When the trucks arrive at the slaughterhouse, they are led to specific sites for unloading. The slaughterhouse workers supervise the unloading procedure to guarantee that the pig/pork industry in Ghana faces numerous challenges, including improper handling of animals before slaughter, which affects pork quality.

Additionally, religious aversion to pig-keeping due to the dominance of Islam and certain Christian denominations in certain communities has further limited the growth of the pig/pork industry in those areas. Religious beliefs and native customs also influence the type of slaughtering methods employed. The pigs are offloaded safely and gently. To reduce stress and injury, the animals must be handled carefully. There is no functional lairage, so some pigs are slaughtered immediately upon arrival at the slaughterhouse.

***Handling of pigs before slaughter*** Gbawe is the dedicated place for pig slaughter in Accra, though some customers also request that their pigs be slaughtered at home.

*"We have clients everywhere, and they usually call us to do the home slaughter. We go to places like Kasoa, Cape Coast, Swedru, Winneba, Mankessim, Akuse, Mitchell Camp, Boduase, Prampram, Amasaman, Suhum, Madina, Kwa-benya, Pokuase, Kpando"*(Slaughterhouse worker, Gbawe).

*"Going away to people's homes or farms to slaughter animals is more expensive due to transport costs. Customers ask for this when there are no animals to buy here"*(Slaughterhouse worker, Gbawe).

Most of the workers in the slaughterhouse have worked for years, ranging from 6 months to more than five years. They are involved in this kind of business because, according to them, there is a high demand for pig slaughter due to increased pork consumption. Some also see the slaughtering business as a family business, as their fathers handed it down. Such people receive training from family elders and "seniors" in the slaughtering business. They described the training they received as that of an apprentice, where they were trained on how to restrain the pig, how to slaughter pigs, and how to cut them up. The slaughterhouse workers had varied reasons for choosing Gbawe for the slaughtering activities.

*"Another reason is that some slaughterhouses are expensive, so we decided to establish this one here to make our prices very affordable to our clients"*(Slaughterhouse worker, Gbawe).

*"This is a more informal set-up where customers can select pigs they want and bargain for price reduction"*(Slaughterhouse worker, Gbawe).

***The slaughtering process*** There is a unique division of labour among the workers of the slaughterhouse. It is erroneous to term every worker at the slaughterhouse as a butcher. There are different people at the slaughterhouses, and they all have different job descriptions. However, they all work in unison to finally deliver the pork cut to the specifications of the pork retailers. A usual day starts when a customer buys a pig from the pig seller. The rest of the transaction is between the customer, mostly a pork seller/pork retailer, and the slaughterhouse. Pigs for slaughter are charged based on their size. The slaughterhouse charges twelve Ghana cedis (GH¢12.00). They charged between 20 and 30 Ghana cedis for an average-sized pig. They charged GH¢50.00 for the big pigs. They usually spend about one hour on such big pigs during the slaughtering and cutting up of the carcasses.



A typical day at the pig slaughterhouse starts at 4:30 am with the lighting of the fire and boiling of water. When a customer selects the pig they want from a nearby make-shift structure, the butchery sends a team to pick it up. The method of stunning is very crude. The animal is hit with a specially designed stick, and this renders the pig unconscious. Specially trained people then use a knife to cut through the throat or the heart, after which the animal is hurled into boiling water, a process called scalding. To bleed the pigs for sample collection, the pigs were properly restrained using a snout rope (Fig. 3). The blood was picked from the external jugular vein. The external jugular vein was the preferred site due to its large size, making it easier to access. The site of the sample collection was properly disinfected with an antiseptic to prevent contamination. A 16-gauge needle was inserted into the vein at a shallow angle. The blood collection tube was attached to the syringe, and 10 ml of blood was drawn from the pig. Once the sample was collected, the needle was removed, and pressure was applied gently to the site to minimise bleeding.

They revealed that the time spent in the pot of boiling water depends on the pig's hair type. Extensively reared pigs had stiff hair and, hence, spent a relatively longer time in the pot of boiling water than those reared intensively, with soft hair.

*"Usually, there is one person to bring the animal from the pen after the customer has identified the kind of animal they want. There are two people to kill the pig and another two people to dip the animal in the hot water. The number could be increased*



**Fig. 3** Restraining and bleeding of pigs at Chemunaa

*to 3 depending on the animal's size. Three people are involved in shaving the animal, and mostly two people are involved in the cutting up of the carcass according to the client's specifications..."(Slaughterhouse worker, Gbawe).*

*"...The cutting process involves cutting the head off, opening the abdomen, removing the guts, isolating the spinal cord, and dividing it into four parts. We also cut the joints and then the large bones into small pieces. Two women are here who collect the intestines and dress for clients..."(Slaughterhouse worker, Gbawe).*

**Problems associated with working in the slaughterhouse** The slaughterhouse workers enumerated several challenges they have encountered in their scope of work. They listed such difficulties as lack of potable water, the injuries they sustain from their work, and the fact that there is no insurance for them. Most of the workers were observed to be working without personal protective equipment (PPE) (Fig. 4).

*"This is risky work with no insurance and pension. We mostly get our injuries from waste bones"(Slaughterhouse worker, Gbawe).*

*"We usually start very early in the morning, around 4:30 am, and so it is perilous since we do not have lights here"(Slaughterhouse worker, Gbawe).*

**Transport of carcass** This study observed that public transport is primarily used to deliver pork to vending sites. This has implications for the quality of pork available to consumers. In Ghana, pig carcasses are mainly transported from slaughterhouses to vending sites using public transport such as taxis and buses. These vehicles lack appropriate refrigeration and proper containment,



**Fig. 4** Slaughterhouse workers working without PPEs with slaughtered pigs lying on the concrete floor

likely exposing the meat to dust, flies, and temperature fluctuations. Unpackaged carcasses may come into contact with other cargo or passengers, leading to cross-contamination. This informal transportation practice illustrates insufficient logistics infrastructure and poor regulatory oversight. Consumers purchasing pork under these conditions face an increased risk of foodborne illnesses. Addressing these challenges requires investment in dedicated refrigerated transport and stricter enforcement of meat distribution standards.

### Role of supervisory bodies

#### Animal and public health

The slaughterhouse workers were aware of the impact of their activities on animal and human health. Residents who lived nearby complained of the stench and noise emanating from the slaughtering activities. The worst issue is the waste generated by the pig/pork business. There is no proper waste management mechanism at the slaughterhouse.

*"There is an open dump for hair, blood, dung drying area. We sell dry dung to farmers to use as manure"(Slaughterhouse worker, Gbawe).*

#### Regulation of slaughtering activities

Even though the regulatory authorities do not officially recognise the slaughterhouse at Gbawe, environmental health and veterinary officers supervise some of its activities. However, veterinary officers virtually did not inspect meat.

*'...The slaughterhouse at Gbawe is not certified by the municipality, but we go there to ensure that the meat is wholesome for consumption. However, slaughtering starts early in the morning, making it difficult for me to come early'(Veterinary Officer, Gbawe).*

*'The lighting system is poor, so inspection of the pigs before slaughter is quite impossible' (Veterinary officer, Gbawe).*

The environmental health officers visit regularly and often give training on sanitation.

*We come here regularly to train them on proper waste management. As you can see, this is a residential area, and the stench produced by the slaughtering activities must be controlled'(Environmental Health Officer, Gbawe).*

*The residents of this area have complained several times about the noise and stench from the slaughter-*

*house. The Assembly is working hard to relocate it (Environmental Health Officer, Gbawe).*

The study revealed three types of permits given to the slaughterhouse operatives:

- a) Movement permit: The veterinary officer gives this permit to the person who has purchased the pig and presents it before it is moved from the farm.
- b) Council waybill: This tax is collected by the District or Municipal Assembly from which the animal is taken. The respective Municipal Assemblies collect the waybill for all the pigs transported from the Upper East Region as the animals are transported to Accra.
- c) Slaughter permit: This permit is given by the veterinary officer after the pig is slaughtered. The slaughter permit is provided as evidence of both ante-mortem and post-mortem inspections.

*"So, after slaughtering, if there is a problem with the animal, it is sent to the original place where it was bought for replacement. The Veterinary Officer usually burns the carcass or pours DDT (dichlorodiphenyltrichloroethane) on the carcass to prevent the public from eating it..."(Slaughterhouse worker, Gbawe).*

*"...We reject animals with cysts as customers do not want. The carcasses with cysts are either burnt or buried..."(Slaughterhouse worker, Gbawe).*

### Discussion

Local pig production is economically, nutritionally, and socio-culturally important to the sustenance of most homes in Ghana [14]. However, in many developing countries, the need for appropriate facilities for slaughtering animals and poor practices by slaughterhouse workers greatly affect the products available for consumption.

Animal handling before slaughter is one of the most stressful circumstances for pigs [23]. However, pig handling and slaughter have been significantly neglected challenges in urban Ghana. There are no dedicated slaughter points for pigs in this country, which means that pigs are either clandestinely slaughtered at homes, on farms, or in unapproved slaughter slabs, mostly without veterinary supervision. This raises serious questions about the quality and safety of pork consumers' purchases.

This study focused on pig farms along the coast of Accra and the Upper East Region. Farmers gave reasons for raising pigs along the coast of Accra, such as easy access to water and land, and the means of disposing of

waste. [24] opine that pig pens are located near a water source, such as streams, for easy access to water. Again, [24] also found that in the Lao Republic, approximately 95% of pig farmers kept their pigs in their pens during the wet season to prevent the destruction of crops. This is very similar to what pertains to Ghana's Upper East Region. Farmers keep their pigs in pens during the farming season to prevent crop damage. This thus affects the sale of pigs during the wet season. Hence, pigs are more expensive during the wet season than during the dry season. [25] asserts that the supply of pigs is low between September and December. The main reason for pig farmers to practise the free-range system is to reduce the cost of production, especially in terms of feeding [26]. This practice exposes the pigs to open defecation sites and refuse dumps where they can contract infections like HEV and cysticercosis. In terms of housing, most farmers use sheds or permanent structures for their pigs [14, 27] highlighted the need for improved housing and feed for pigs in their study. This present study reported the high production cost among pig farmers as the primary constraint to their business. This finding agrees with the work of [28], who reported the high cost of inputs as the major constraint. The finding of this present study, however, contradicts the survey of [22], who recorded pig theft as the major constraint. Since the cost of feeding is mainly cited as the major hindrance to pig-keeping activities, most pig farmers are compelled to practice the free-ranging pig production system. Free-ranging of pigs brings about two major issues: deaths of pigs through road accidents and the likelihood of zoonotic disease transmission as these scavenging pigs get access to open defecation sites and refuse dumps.

At all times, before slaughter, pigs may experience stress from various handling practices, such as fasting, transportation, and interaction with humans [29, 30]. From this study, pigs must travel more than twelve hours from the North of Ghana to Accra in the South. This translates to more than twelve hours of travel time for pigs from the farm to the slaughterhouse. The European regulation regarding animal welfare stipulates that no animal should stay more than 8 h in a vehicle without rest [23]. Long travel times for pigs to slaughterhouses have been known to induce animal stress. In their study, [31] asserted that the long journey of animals, especially without rest, affects the welfare of slaughtered animals. Pigs are transported on open trucks for long distances, even during extreme weather conditions. There are growing concerns about livestock welfare during transport and handling [32].

Upon arrival at the Gbawe slaughterhouse, pigs are given a short rest before slaughter. However, there is no functional lairage for pigs before slaughter. Another study

[33] corroborated this, finding no functional lairages in 60% of slaughterhouses evaluated in three northern regions of Ghana.

Proper lairaging is essential as it allows animals ample time to rest before slaughter [30, 33]. This means that pigs are slaughtered immediately after arriving at the Gbawe slaughterhouse. A proper lairage also provides a place and facility for inspecting the animals before slaughter. This happens when the slaughterhouse premises have an appropriate system of lighting. From this study, slaughtering activities started at 4:30 am, meaning a proper lighting system would be very useful for veterinarians to perform ante-mortem inspection of animals before slaughter [34]. Ante-mortem inspection, mainly carried out during lairaging, is very important as it ensures that unhealthy animals are not slaughtered for human consumption.

The method of stunning animals before slaughter is crude [35]. It involves a physical struggle to wrestle the animal, which affects the meat quality [33–35]. Animals ready to be slaughtered must be restrained to control their movement and ensure effective bleeding [34, 36]. However, in most slaughterhouses in Ghana, stunning operations are not performed [34, 36].

This study's pig slaughter process could be described as purely manual. A high human-pig interaction can induce stress in the pig due to the fear of humans. Higher stress levels in pigs before slaughter lead to poor meat quality [37]. All the slaughterhouse workers were observed to be working without personal protective equipment (PPE). Other studies have reported slaughterhouse workers working without PPE [33, 38]. Working without PPEs could serve as a means of introducing pathogens to both the slaughterhouse workers and the meat. The carcass was processed on the bare floor, which was not tiled, which could have served as a means of contamination of the pork.

Transporting pork from the slaughterhouse to the vending sites or the home is vital in transmitting pathogens to people. In this study, most pork retailers used public transport to transport their pork to the vending site. This is similar to the work done by [13] and [38], who reported that using taxis, wheelbarrows, and motorcycles to convey pork to market centres is very common in Ghana [39] also reported that lorries (trucks) were the most typical mode of transporting pigs to the abattoirs [40] in their study also noted that meat was primarily conveyed in pickup trucks and motorbikes. In Ghana, pork is sold in the open market in colanders and on tables, usually under direct exposure to pathogens that might be present [26].

The supervisory role of bodies such as veterinary services and environmental health officials could be



considered inadequate in this study. Post-mortem meat inspection was virtually absent at the slaughterhouse at Gbawe. Slaughtering activities started very early in the morning, mostly without veterinary presence, which could impact the quality of the pork the consumer receives.

### Limitations of the study

This study focused on selected urban areas in Accra and the Upper East Region, which might affect its generalizability to other regions of Ghana. Limited access to certain pig slaughter points also constrained data collection.

### Conclusion

This study exposes critical challenges along the pork production chain in Ghana, from pig keeping and transportation to slaughter and vending sites. These challenges raise many public health and food safety concerns. Its findings highlight the importance of implementing good handling practices and management procedures to ensure animal welfare and minimise the risk of disease transmission during pig transport and slaughter. Pig rearing in Ghana primarily takes place in unofficial locations, including the coastal areas of Accra and various rural homes in the Upper East Region. Pigs are typically housed in makeshift structures, and free-ranging practices are common to lower feeding costs. Slaughter of pigs occurs at unapproved sites. Carcasses are mostly transported to vending sites using the public transport system, which increases the risk of contamination of the meat that consumers purchase. The supervision and regulation of activities along the pork production chain in Ghana are notably inadequate. This study recommends the licensing and regulation of all pig-keeping activities in Ghana to ensure uniformity of practices across all pig farms and regulate their operations. The key actors along the pork production chain should be educated on practices that might lead to the contraction of pig-zoonotic diseases.

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### Clinical trial number

Not applicable.

### Authors' contributions

HOA and AOM conceptualized the overall study with its goals and aims. AJB retrieved the requisite data from databases. FK and LB played a supportive role in data consolidation. AOM and HB wrote the study background and played a supportive role in data analysis. HOA, AOM, AJB and PPAA played a vital role in designing the methodology for the study. HOA and LB played a role in writing the discussion of the study. FK, LB, AOM and HB supported the writing, review, and editing of the manuscript. AJB, HOA, and PPAA did the data analysis for the study. All authors contributed significantly to the critical revision and approved the final version before the onward submission.

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### Data availability

All data generated during this study are included in this article and can be requested from the corresponding author.

### Declarations

#### Ethics approval and consent to participate

The study protocol was approved by the Ethics Committee of the College of Basic and Applied Sciences (ECBAS) of the University of Ghana with approval number (ECBAS 010/17–18). The study protocol was carefully and verbally explained to each participant in a language they understood, and each participant was assured of confidentiality. Informed consent was duly obtained from the farm owners. Each participant also had the chance to ask questions at each study point, to which answers were provided. After voluntarily agreeing to participate, participants were free to withdraw from the study. Literate participants were given written forms to read and sign. Illiterate participants were asked to provide a literate witness who signed on their behalf before they were asked, in the presence of their witness, to thumbprint the consent form in accordance with the Declaration of Helsinki.

#### Competing interest

The authors declare no competing interests.

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