



# Research



# Insights into animal welfare at slaughter: perceptions, knowledge and practices among slaughterhouse workers in Ghana

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# Abstract

Introduction: animal welfare at slaughter, particularly the practice of pre-slaughter stunning, is essential for minimizing animal suffering and improving meat quality. While international standards promote humane slaughter, the implementation of these practices in developing countries including Ghana remains inconsistent. This study aimed to assess the knowledge, perceptions and practices related to animal welfare among slaughterhouse workers in Ghana. **Methods:** a cross-sectional mixed-methods study was conducted in Ghana between August and September 2024. A structured questionnaire was administered to 45 slaughterhouse workers and semi-structured interviews were conducted with an additional 10 participants, totaling 55 respondents. Quantitative data were analyzed using descriptive statistics and chi-square tests, while qualitative data underwent thematic analysis to explore in-depth perspectives. Results: the majority of respondents (88.8%) demonstrated awareness of the concept of animal welfare, but only 44.4% had received formal training. Although understood pre-slaughter 71.1% stunning, practical application was limited, with 55.6% never verifying if animals were properly stunned. Regional differences were evident, with the Forest/Middle Belt showing higher perceptions towards animal welfare standards and preslaughter stunning (p<0.05). Key barriers included religiocultural issues, inadequate equipment (53.3%) and lack of training (35.6%). Conclusion: despite theoretical support for humane slaughter, significant gaps in training, equipment and enforcement hinder effective implementation in Ghanaian slaughterhouses. Addressing these challenges through improved infrastructure, training and regulatory oversight is critical to aligning Ghana's practices with international standards and enhancing animal welfare at slaughter.

# Introduction

Animal welfare at slaughter is an increasingly critical concern in livestock management and food production worldwide [1-3]. As global awareness of animal rights grows, so does the emphasis on humane slaughter practices, which are seen not only as ethical imperatives but also as contributors to meat quality and food safety [4,5]. Central to humane slaughter is the practice of pre-slaughter stunning, which renders animals insensitive to before slaughter, thereby pain reducing suffering [6,7]. International guidelines, such as those provided by the World Organisation for Animal Health (WOAH), advocate for adopting preslaughter stunning as a standard practice to ensure the humane treatment of animals and improve the quality of meat produced [8,9]. However, the implementation of such practices in developing countries, including Ghana, remains inconsistent [10], and the extent to which these welfare standards are understood and applied is poorly documented.

In Ghana, as in many other developing countries, slaughterhouse practices vary significantly due to differences in regional infrastructure, levels of worker training, and access to modern slaughter technologies [11,12]. While global attention is increasingly focused on improving animal welfare, evidence suggests that many slaughterhouses in low- and middle-income countries do not adhere to international welfare standards, resulting in greater animal suffering and a decline in meat quality [13,14]. The diversity of practices in Ghana's slaughterhouses is influenced by a complex interplay of cultural norms, economic limitations and regional disparities in infrastructure [15-18], all of which affect the implementation of humane slaughter techniques such as pre-slaughter stunning.

Although several studies have addressed animal welfare in other African contexts such as in Nigeria [19], Kenya [20,21], South Sudan [22], Ethiopia [23], the situation in Ghana remains





under-researched. Acknowledging the study by Adzitey et al. [24] which focused on pre- and postslaughter animal handling by butchers in the Upper East region of Ghana and Badu et al. [25] also focused on meat consumers and Islamic scholars understanding of humane slaughter and how pre-slaughter stunning affects purchasing decisions, little empirical data is available on the knowledge, attitudes and practices of those directly involved in slaughter operations. This gap in the literature underscores the need for comprehensive research to assess the current state of animal welfare practices in Ghanaian slaughterhouses. Understanding the factors that influence slaughterhouse workers' perceptions and practices particularly in terms of how they relate to animal welfare and pre-slaughter is crucial for informing policy stunning interventions aimed at improving slaughter global markets practices. Furthermore, as increasingly demand ethically sourced meat, aligning Ghanaian practices with international animal welfare standards becomes imperative, not only to enhance ethical compliance but to improve meat quality and ensure market competitiveness.

# **Methods**

### Study design

This cross-sectional study was designed to assess the perceptions, knowledge and practices related to animal welfare and pre-slaughter stunning across various regions of Ghana. Data were collected using a structured questionnaire and semi-structured interviews, combining quantitative and qualitative approaches. The study aimed to capture both statistical trends and indepth insights into the challenges and potential improvements in slaughterhouse practices. The study was conducted from August to September 2024 and respondents were drawn from 12 regions with operational slaughter facilities.

### Study area

This study was conducted across slaughterhouse workers from 12 regions of Ghana based on the presence of operational slaughter facilities. These regions were grouped into three geographic belts: the Forest/Middle Belt (including Ashanti, Eastern and Bono regions), the Savannah/Northern Belt (including Northern, Upper East and North East regions), and the Coastal/Southern Belt (including Greater Accra, Central, and Volta regions). These geographic divisions allowed for a diverse sample of respondents, representing a variety of socioeconomic and infrastructural conditions within Ghana's meat processing industry. The selected regions also encompass areas with varied levels of access to modern slaughter technologies, which provided a comprehensive overview of regional differences in slaughter practices and animal welfare perceptions.

### Study population and sampling

A total of 55 participants were included in the study. The main sample consisted of 45 respondents who completed the structured questionnaire, while an additional 10 participants were selected for in-depth semi-structured interviews to gain deeper qualitative insights. Purposive sampling was used to ensure representation from different regions, including the Forest/Middle Belt, Savannah/Northern Belt and Coastal/Southern Belt. Participants were selected based on their direct involvement in animal slaughter or supervision of the slaughtering process, with at least one year of experience in the industry.

### **Data collection instruments**

In this study, data collection comprised the use of a structured questionnaire and interviews. The questionnaire used in this study comprised 34 items divided into five sections to capture a comprehensive understanding of the respondents' demographics, awareness, perceptions and practices regarding animal welfare and pre-





slaughter stunning. The demographics section collected information on participants' age, gender, education level and years of experience in the slaughterhouse industry. The awareness and knowledge section focused on respondents' familiarity with animal welfare principles and stunning methods, including whether they had received formal training and their understanding of pre-slaughter stunning techniques. In the perceptions and attitudes section, respondents were asked about their beliefs regarding the importance of pre-slaughter stunning, how well their facility adhered to animal welfare standards, and their views on the occurrence of animal suffering during slaughter.

#### Questionnaires

The practices and experiences section gathered data on the frequency with which respondents performed or oversaw stunning, whether they had witnessed improper stunning, and the actions taken when stunning failures occurred. Finally, the perceived barriers and improvements section explored the challenges respondents faced in ensuring effective stunning practices, their suggestions for improvement, and their support for advanced technology and additional training in humane slaughter practices. Sample questions included: "How familiar are you with the term 'animal welfare'?" (Section 2) and "How often do you verify that an animal is properly stunned before slaughter?" (Section 4). Responses were measured using Likert scales, multiple-choice and open-ended questions.

#### Interview guide

For qualitative data collection, an interview guide was developed to explore more nuanced perspectives on animal welfare practices. Questions focused on respondents' personal experiences with stunning procedures, perceived barriers to humane slaughter and recommendations for improving practices in their facilities.

#### **Reliability and validity**

The internal consistency of the questionnaire was assessed using Cronbach's alpha, which yielded a reliability coefficient of 0.78. This indicates acceptable reliability, demonstrating that the survey instrument was consistent in measuring the intended constructs, such as knowledge. perceptions, and practices related to animal welfare and stunning. To ensure validity, the questionnaire was pre-tested with a sample of five respondents, and adjustments were made to improve clarity and comprehension. Content validity was ensured through a review by experts welfare and slaughterhouse in animal management, who verified the relevance of the items to the study's objectives.

### **Data collection procedure**

Data collection was conducted between August and September 2024. Structured questionnaires were administered in-person by trained research assistants. Each interview lasted approximately 15-25 minutes. Participants who consented to indepth interviews were interviewed separately and these interviews were conducted face-to-face to capture more detailed qualitative data. All participants were informed of the voluntary nature of their participation and confidentiality was guaranteed.

### **Ethical considerations**

In this study both oral and written informed consent was obtained from all participants and they were assured that their responses would remain confidential. Participants were also informed that they could withdraw from the study at any time without any penalty. All data were stored securely and were only accessible to the research team.

#### **Data analysis**

Survey data collected using questionnaire were entered into Microsoft Excel version 19 for





assessment and cleaning. This was then coded and exported into Statistical Package for Social Science (SPSS) Version 27 for analysis. Descriptive statistics such as frequencies, percentages and means were used to summarize the results obtained demographic characteristics, levels of knowledge, perceptions and practices. Chi-square test was conducted to examine associations between demographic factors and perceptions of preslaughter stunning, with a significance level set at p < 0.05. Thematic analysis was employed to analyze qualitative data from interviews. The transcripts were coded for recurring themes related to challenges, facility conditions and recommendations for improvement. This process allowed for an in-depth understanding of the contextual factors influencing perceptions and practices related to animal welfare.

### Results

### **Demographic characteristics**

In this study, a total of 45 respondents participated with the majority being male (77.8%, n = 35) and the remainder female (22.2%, n = 10). The distribution revealed that age most respondents were between 35 and 45 years (42.2%, n = 19), followed by those aged 25-35 (33.3%, n = 15), 45-55 (20%, n = 9) and over 55 years (4.4%, n = 2) (Table 1). In terms of educational attainment, 77.8% (n = 35) held a university degree, while 13.3% (n = 6) had veterinary college education and 8.9% (n = 4) had received vocational training. Respondents' years of working experience varied, with 35.6% (n = 16) having more than 10 years of experience, and 33.3% (n = 15) reporting between 1-5 years of experience (Table 1). The regional distribution of respondents showed that the majority were located in the Ashanti region (22.2%, n = 10), followed by the Northern region (17.8%, n = 8). Smaller proportions were from the Eastern (11.1%, n = 5), Greater Accra (11.1%, n = 5) and Upper East (8.9%, n = 4) regions. Other regions, including Ahafo, Bono, Bono East, Central, North East, Volta

and Western, each represented 4.4% (n = 2) of the respondents. The broader regional distribution indicated that the majority of respondents were from the Forest/Middle Belt region (44.4%, n = 20), followed by the Savannah/Northern Belt (31.1%, n = 14) and the Coastal/Southern Belt (24.4%, n = 11) (Table 1).

### **Knowledge and awareness**

In terms of familiarity with the concept of animal welfare, 44.4% (n = 20) of respondents indicated they were familiar with the term, and an equal percentage (44.4%, n = 20) reported being very familiar. A small proportion (6.7%, n = 3) were extremely familiar, while 4.4% (n = 2) were somewhat familiar. More than half of the respondents (55.6%, n = 25) reported not having received any formal training on animal welfare, while 44.4% (n = 20) had received such training (Table 2). When asked about their understanding of pre-slaughter stunning, the majority (71.1%, n = 32) stated that they understood both the concept and the process. A smaller percentage (13.3%, n = 6) understood the idea but not the process, while 4.4% (n = 2) had heard of it but did not understand it. Only 11.1% (n = 5) of respondents had practical experience performing pre-slaughter stunning (Table 2). Regarding the reasons for supporting pre-slaughter stunning, the most common rationale was to reduce animal suffering (68.9%, n = 31), followed by improving meat quality (17.8%), n = 8). Other reasons cited included making the slaughter process easier (6.7%, n = 3) and complying with regulations (6.7%, n = 3) (Table 2). Respondents were asked about their knowledge of various pre-slaughter stunning procedures. As shown in Table 2, knowledge of electrical stunning was reported by 51% of respondents, while 49% indicated that they were unfamiliar with this method. Gas stunning was less known, with only 33% of respondents reporting familiarity, and 67% indicating a lack of knowledge. Manual percussive stunning was the least understood procedure, with 77% of respondents reporting no knowledge of this technique and only 23% indicating familiarity. In contrast, 48% of respondents were



familiar with captive bolt stunning, while 52% were unfamiliar with this method (Table 2).

### Perceptions/attitudes

The study assessed respondents' perceptions towards pre-slaughter stunning and related practices. The majority of respondents (51.1%, n = 23) strongly agreed that pre-slaughter stunning improves animal welfare, while 33.3% (n = 15) agreed. A smaller proportion were neutral (13.3%, n = 6) and only 2.2% (n = 1) disagreed with this statement (Table 3, Table 4). The importance of ensuring that animals do not suffer during slaughter was considered very important by 57.8% (n = 26) of respondents, while 24.4% (n = 11) rated it as important. Only 17.8% (n = 8) viewed this aspect as extremely important (Table 3, Table 4). Regarding facility adherence to animal welfare standards, 33.3% (n = 15) of respondents rated their facility as average, while 26.7% (n = 12) rated it below average, and 22.2% (n = 10) believed their facility adhered poorly to these standards. Only 15.6% (n = 7) rated their facility as above average, and 2.2% (n = 1) reported excellent adherence to animal welfare standards (Table 3, Table 4). In terms of the adequacy of worker training in humane slaughter practices, 31.1% (n = 14) of respondents agreed that workers in their facility were adequately trained, while 22.2% (n = 10) strongly disagreed with this statement. An equal proportion of respondents disagreed (20%, n = 9) and remained neutral (20%, n = 9). Only 6.7% (n = 3) strongly agreed that workers were adequately trained (Table 3, Table 4). The frequency of animals experiencing pain during slaughter varied, with 42.2% (n = 19) reporting that animals always experienced pain during the process. A further 33.3% (n = 15) indicated that this occurred sometimes, while 22.2% (n = 10) reported that it often happened. Only 2.2% (n = 1) believed that animals never experienced pain during slaughter (Table 3, Table 4). Support for stricter regulations on pre-slaughter stunning was high, with 55.6% (n = 25) of respondents strongly supporting more regulations and 42.2% (n = 19) expressing support. Only 2.2% (n = 1) remained

neutral on the matter (Table 3, Table 4). The majority of respondents (62.2%, n = 28) had a positive or "good" perception of pre-slaughter stunning, while 37.8% (n = 17) held a more moderate view (Table 3, Table 4).

# Association between demographic factors and perception of pre-slaughter stunning

The study examined the association between respondents' demographic characteristics and their level of perception of pre-slaughter stunning. The association between age and perception was not statistically significant (p = 0.621), with respondents aged 25-35 years showing moderate (11.1%, n = 5) and good perceptions (22.2%, n = 10), while those aged 35-45 years also reported moderate (13.3%, n = 6) and good (28.9%, n = 13) perceptions. Perceptions among older age groups (45-55 and above 55) were similarly distributed, without significant variation (Table 5). There was no significant difference in perceptions based on gender, with males more likely to report both moderate (31.1%, n = 14) and good perceptions (46.7%, n = 21), and females similarly showing moderate (6.7%, n = 3) and good perceptions (15.6%, n = 7) (p = 0.565) (Table 5). Educational attainment was not significantly associated with perception (p = 0.856). Respondents with a university degree exhibited moderate (28.9%, n = 13) and good (48.9%, n = 22) perceptions, while those with vocational training and veterinary college education displayed similar patterns (Table 5). Years of working experience showed a marginal association with perception, nearing statistical significance (p = 0.066). Respondents with more than 10 years of experience were equally distributed between moderate (17.8%, n = 8) and good (17.8%, n = 8) perceptions, while those with 1-5 years of experience reported predominantly good perceptions (28.9%, n = 13) (Table 5). Regional distribution was significantly associated with the perception of pre-slaughter stunning (p = 0.050). Respondents from the Savannah/Northern Belt exhibited moderate (13.3%, n = 6) and good perceptions (17.8%, n = 8), while those from the Forest/Middle Belt



predominantly reported good perceptions (35.6%, n = 16). In contrast, respondents from the Coastal/Southern Belt were more likely to report moderate (15.6%, n = 7) perceptions than good (8.9%, n = 4) (Table 5).

### **Practices and experiences**

The study evaluated respondents' practices and experiences related to pre-slaughter stunning. The majority of respondents (55.6%, n = 25) reported that they never verified whether an animal was properly stunned before proceeding with slaughter, while 24.4% (n = 11) indicated that they sometimes performed this verification. A smaller proportion rarely (11.1%, n = 5), often (4.4%, n = 2), or always (4.4%, n = 2) checked that animals were properly stunned (Table 6). Nearly half of the respondents (48.9%, n = 22) stated that they had witnessed never an animal regaining consciousness during slaughter. However, 28.9% (n = 13) reported sometimes observing this occurrence, while 11.1% (n = 5) rarely witnessed it. A smaller percentage (6.7%, n = 3) often saw animals regain consciousness, and 4.4% (n = 2) stated it always occurred (Table 6). Regarding their feelings about performing the stunning process, 35.6% (n = 16) of respondents felt neutral, while 26.7% (n = 12) reported feeling comfortable with the task. A further 20% (n = 9) indicated discomfort, and 15.6% (n = 7) reported feeling very comfortable. Only 2.2% (n = 1) of respondents felt distressed when performing stunning (Table 6). The condition of stunning equipment in facilities was rated as poor by 62.2% (n = 28) of respondents, while 17.8% (n = 8) rated it as good. A smaller proportion rated the equipment as fair (15.6%, n = 7) or very good (4.4%, n = 2) (Table 6). Respondents were asked whether they had taken part in or supervised the stunning process. As shown in Table 6, the majority of respondents (77.8%, n=35) had not participated in or supervised the stunning process, with only 22.2% indicated that they had done so (Table 6). Respondents were asked about the actions they would take if an animal was not properly stunned. As illustrated in Table 6, 64% of respondents

indicated that they would not re-stun the animal, while 35.6% reported that they would take this action. When asked if they would proceed with slaughter despite improper stunning, 62% indicated they would not, while 37.8% admitted they would proceed regardless. A significant majority of respondents (82.2%) reported that they would not escalate the situation to a supervisor, while only 17.8% stated they would report it. Similarly, 84.4% of respondents indicated that they would not stop the process and reassess the situation, with only 15.6% willing to do so (Table 6).

# Challenges, improvements and recommendations for pre-slaughter stunning

In this study, respondents identified several challenges related to the pre-slaughtering process as shown in Table 7, inadequate equipment was a major challenge with 53.3% of respondents indicating that. Lack of training was reported by 35.6% of the respondents while challenges with management priority and time pressure were reported by 6.7% and 4.4% respectively (Table 7). Respondents provided insights into potential improvements and recommendations for preslaughter stunning practices. When asked whether facility management prioritized animal welfare, 28.9% (n = 13) of respondents opposed the statement, while 24.4% (n = 11) strongly opposed it. A smaller proportion supported (20%, n = 9) or strongly supported (11.1%, n = 5) the prioritization of animal welfare by management, with 15.6% (n = 7) remaining neutral (Table 7). In terms of specific improvements needed in stunning processes, 26.7% (n = 12) of respondents recommended the provision of more equipment, while 13.3% (n = 6) suggested additional staff training. A small proportion (11.1%, n = 5) highlighted the need for education of staff, but nearly half (48.9%, n = 22) provided no response (Table 7). Regarding the introduction of advanced stunning technology, 42.2% (n = 19) of respondents supported the idea, while 37.8% (n = 17) strongly supported it. A small proportion were neutral (11.1%, n = 5), and 8.9% (n = 4) strongly





opposed the introduction of advanced technology (Table 7). When asked about their willingness to participate in additional training on humane slaughter practices, 40% (n = 18) of respondents stated they were very likely to participate, while 26.7% (n = 12) indicated they were likely. A further 24.4% (n = 11) were extremely likely to participate, and 8.9% (n = 4) were only slightly likely to engage in such training (Table 7). Respondents were asked about their support for a program aimed at regularly assessing and improving animal welfare practices in their facilities. It was observed that 60.0% (n = 27) of respondents strongly supported such a program, while 37.8% (n = 17) expressed support while only 2.2% (n = 1) remained neutral (Table 7).

# Response to animal slaughtering and food hygiene practices by regional belt

As shown in Figure 1, there was strong agreement across all regions that improper bleeding of an animal leads to contaminated meat. Respondents from the Coastal/Southern Belt reported the highest mean response (4.45), followed closely by those from the Forest/Middle Belt (4.36) and the Savannah/Northern Belt (3.86) (Figure 1). Similarly, stressing animals before slaughter was viewed as having a significant impact on meat quality, with mean responses of 4.6 from the Savannah/Northern Belt, 4.45 from the Coastal/Southern Belt, and 4.36 from the Forest/Middle Belt. In contrast, the belief that a dirty animal should be passed for slaughter was largely disagreed upon, with respondents from the Forest/Middle Belt expressing the strongest disagreement (mean of 1.95), followed by the Coastal/Southern Belt (2.27)and the Savannah/Northern Belt (2.29) (Figure 1). Regarding the fitness of meat with bruises or blood marks for consumption, respondents from the Forest/Middle Belt disagreed most strongly (1.8), while the Savannah/Northern and Coastal/Southern Belts had mean responses of 2.14 and 2.18, respectively (Figure 1). The opinion that meat from unstunned animals is fit for human consumption accepted was more in the

Coastal/Southern Belt (3.45), while respondents from the Savannah/Northern Belt and Forest/Middle Belt reported lower agreement, with mean responses of 3.14 and 2.85, respectively. Finally, when asked whether meat from an injured part of an animal is fit for consumption, responses were relatively consistent, with means 2.5 from the of Savannah/Northern Belt, 2.45 from the Coastal/Southern 1.9 from the Belt, and Forest/Middle Belt (Figure 1).

### Thematic analysis results

The analysis of interviews with slaughterhouse workers in Ghana revealed several critical themes regarding their awareness and practices of animal welfare and pre-slaughter stunning. Below are the key themes that emerged from the interviews, with selected responses to illustrate participants' views and experiences.

# Awareness and understanding of animal welfare and pre-slaughter stunning

Participants demonstrated a basic awareness of animal welfare and the importance of preslaughter stunning, but challenges in equipment availability and usage often hindered their ability to implement these practices effectively. One worker acknowledged the importance of animal welfare but highlighted the practical barriers they face:

"I think animal welfare is about how we treat animals, like making sure they don't suffer too much. I've read some things about it, and people talk about it in meetings sometimes. Stunning, I've heard, is supposed to help with that, but honestly, we don't use it very often here. The equipment is either not available, or it's too old to work properly."(Respondent 1).

This sentiment was echoed by another respondent, who stated,

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"From what I understand, animal welfare is mostly about preventing the animals from feeling unnecessary pain, right? So stunning is something that should make that easier by knocking them out first. The problem is, in our facility, we don't have the right machines to do it properly, so we just proceed without stunning most of the time"(Respondent 4).

Others pointed out that while they had received some training, their ability to apply stunning was limited.

One respondent noted, "Animal welfare is a concept I'm somewhat familiar with, like making sure animals aren't mistreated, but to be honest, I didn't know stunning was such an important part of it until a few months ago when we had a small training session. It opened my eyes a bit, but since we don't have the equipment, it hasn't changed much in practice."(Respondent 3). Even when equipment is available, proper operation remains an issue. As one worker explained, "Yes, most of us know that stunning is important because it reduces the animal's suffering. But honestly, only a few people here really know how to operate the equipment correctly, and that's a big issue. Even when we have the machine, it's not always used right."(Respondent 6). A common theme among respondents was the struggle to balance animal welfare with practical constraints, as one participant shared: "The concept of animal welfare has been mentioned here and there, and I know stunning is supposed to be part of that, to prevent the animal from suffering too much. But the reality is, we don't always have the time or the tools to make it happen, so sometimes we just skip it."(Respondent 8).

### Perceived importance of humane slaughter

Participants generally agreed that humane slaughter is critical for reducing animal suffering and improving meat quality. Many connected humane practices to their sense of professionalism, while others highlighted operational challenges that sometimes prevent them from carrying out these practices consistently.

One worker emphasized the ethical importance of humane slaughter, stating, "To me, humane slaughter is really important because it's only fair that the animals don't suffer unnecessarily. Even though they are being slaughtered, I believe it's our responsibility to make sure it's done in a way reduces their pain that as much as possible."(Respondent 1). Another participant added, "One thing I've noticed is that when we treat the animals well, especially by making sure they're calm and using stunning, the meat ends up better. It's not just about the welfare of the animal-it's also good for business because customers want high-quality meat."(Respondent 2).

Respect for the animals was a recurring theme, as one respondent shared, "I've always believed that even though we're slaughtering the animals, it doesn't mean we shouldn't respect them. Making sure they don't suffer during the process is part of showing that respect. It's something I take seriously in my work."(Respondent 3). Participants also recognized the practical benefits of humane slaughter.

One respondent noted, "I've seen it first handwhen the animals are stressed or suffer too much before they're slaughtered, the meat isn't the same. It gets tougher, and it affects the taste. That's why I think humane slaughter is important, not just for the animal, but for the quality of the meat we produce." (Respondent 4). Some workers highlighted the growing consumer demand for humane practices, as one participant explained, "These days, more and more people are concerned about where their meat comes from and whether the animals were treated well. So humane slaughter isn't just about the animals; it's also important for us because it affects our reputation and sales." (Respondent 5).



# Barriers to implementing humane slaughter practices

Despite their awareness of humane slaughter practices, workers cited several significant barriers to implementing these consistently. A lack of equipment, training, and time pressure were commonly mentioned obstacles.

A slaughter house worker shared his view by stating that; "One of the main issues we face is the lack of proper stunning equipment. We know what we should be doing, but we don't have the tools to carry it out properly. Sometimes the machines are broken, or we don't have them at all, so it's hard to follow the guidelines."(Respondent 8).

Another respondent shared the same view and added that: "We've had some equipment for stunning, but it's outdated and doesn't function properly most of the time. When that happens, we're forced to do things manually, which takes more time and makes the process less humane for the animals."(Respondent 2).

The frequent breakdown of stunning machines was a recurring issue. As one worker explained, "There's a stunning machine in the facility, but it breaks down so often that we usually don't even bother using it. It's unfortunate because I know it's meant to help reduce the animal's suffering, but we just can't rely on it."(Respondent 3). Training gaps also played a role in the inconsistent use of stunning. One participant noted, "I feel like if we had more regular training on how to use the stunning machines, it would make a difference. We don't get much instruction, and a lot of people don't know how to use the equipment correctly, which is why it sometimes doesn't get used at all."(Respondent 4).

Time pressure was another significant barrier. Some respondents commented, "One of the biggest challenges is the constant pressure to work fast. We're always trying to keep up with the numbers, and because of that, we don't always take the time to make sure the animals are *stunned properly before slaughter.*"(Respondent 5).

### Regional disparities in practice and perception

Workers from different regions reported significant disparities in access to equipment and the adoption of modern slaughter practices, with rural regions facing more severe challenges than urban centres.

Some participants from a rural area shared these views by saying that; "Here in the rural areas, we don't have the same access to the modern equipment they use in the bigger cities. They have better tools for stunning and other processes, but out here, we make do with what we have, which isn't always enough."(Respondent 1).

Another worker added, "I've heard about stunning and how it helps with animal welfare, but in this region, we still stick to more traditional methods. It's partly because that's how things have always been done, and also because we don't have the equipment to make changes."(Respondent 2).

Workers from more developed regions highlighted the differences between their facilities and those in less developed areas. One respondent noted; "I've seen the facilities in the southern regions, and they're much more modern compared to what we have here up north. They have better equipment, better training programs-it's a big difference. Up here, we just work with what's available, which isn't much."(Respondent 3).

Cultural factors also played a role in regional disparities. Some of the participants explained these in varied ways: "Where I'm from in Upper East, we still follow a lot of traditional slaughter practices. Stunning isn't something that's widely accepted here, and some people don't believe in using the machines. It's a cultural thing, and it's hard to change people's minds." (Respondent 4).

"The cultural practices in the Northern region where I come from are sometimes at odds with



what's considered modern animal welfare. There's a lot of resistance to change because people are used to doing things the way they've always been done, and it's hard to get them to accept new methods like stunning."(Respondent 6).

"There are many reasons why stunning is hard here. Stunning is difficult to implement here for a lot of reasons. Sometimes it's because people are attached to traditional practices, but more often, it's just because we don't have the tools. Without the equipment, we can't follow the modern methods, even if we wanted to"(Respondent 10). Workers from rural regions noted the impact of these challenges on their ability to meet welfare standards.

One respondent remarked, "In the capital city Accra, they have better equipment and facilities, but out here in Bono, it's a different story. We don't have the same resources, and so we just have to work with whatever tools we can find. Sometimes that means doing things manually."(Respondent 5).

### Suggested improvements and recommendations

Participants provided several recommendations for improving humane slaughter practices, focusing on better equipment, increased training, and stronger management support.

One participant emphasized the need for reliable equipment: "One of the main improvements we need is better equipment. If the stunning machines were more reliable and easier to use, it would make it so much easier to follow the animal welfare standards we're supposed to meet. Right now, it's a struggle because the tools aren't always there."(Respondent 1).

Another participant highlighted the importance of training: "Training is something I feel we need more of. If we had regular sessions that showed us the best techniques for handling animals without causing them unnecessary suffering, I think it

would make a big difference in how we do our jobs."(Respondent 3).

The need for greater management support was also emphasized. One respondent shared, "I think things would improve a lot if management made animal welfare a bigger priority. Right now, it feels like they talk about it but don't take enough action. If they were more serious about it, we'd probably get better equipment and training."(Respondent 8).

Staffing was another concern, with one participant noting: "One of the things we struggle with is having enough trained staff. We need more people who know how to operate the stunning machines properly. Sometimes there's just one person who knows how to use it, and if they're not available, no one else can do it."(Respondent 6). Finally, participants called for regular maintenance of equipment prevent breakdowns. One to respondent suggested: "I think one simple would improvement be to have regular maintenance for the stunning machines. Right now, we wait until something breaks before it gets fixed, and by then it's too late. Regular checkups would prevent a lot of the problems we have."(Respondent 5).

### Discussion

This current study offered critical insights into abattoir workers' perceptions, knowledge, and practices surrounding animal welfare at slaughter in Ghana. The respondents' familiarity with animal welfare principles was relatively high, with 44.4% reporting familiarity and 44.4% reporting a high level of awareness. However, the finding that more than half (55.6%) had not received any formal training on animal welfare indicates a significant gap in the dissemination of best practices. The lack of practical knowledge on specific stunning techniques, particularly manual percussive stunning (77% unfamiliar), further emphasizes this gap. This finding mirrors challenges identified in other regions of Africa,

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where a lack of equipment and training severely limits the adoption of humane slaughter methods, as noted by Njoga *et al.* [19] in Southeast Nigeria, where 77% of animals were slaughtered without stunning due to inadequate equipment and training. These deficits in practical knowledge raise profound ethical concerns, particularly in relation to animal suffering during slaughter, as the ability to apply humane stunning techniques is a prerequisite for reducing pain and distress in livestock [23].

While the majority of respondents understood the concept of pre-slaughter stunning (71.1%) and supported its role in reducing animal suffering (68.9%), this theoretical understanding did not necessarily translate into practice. A mere 11.1% reported having direct experience with performing stunning, suggesting disconnect between knowledge and execution. This is significantly lower than 66.7% of butchers in the abattoir being involved in the pre-slaughter animal stunning in South Sudan as reported by Lado et al. [22]. This disconnect is particularly concerning when viewed through the lens of ethical slaughter standards outlined by the World Organisation for Animal (WOAH), which mandate both Health an understanding and a practical application of procedures to ensure stunning animal welfare [26]. The fact that nearly half of the respondents (49%) were unfamiliar with electrical stunning, a commonly recommended practice, underscores the infrastructural and educational deficiencies that hinder the adoption of humane slaughter methods in Ghana. Asiam [17] similarly found that although meat handlers in Accra had some knowledge of food safety, the lack of practical implementation due to limited training and resources was a major issue, which parallels the disconnect found in this study regarding humane slaughter practices.

The high level of theoretical support for preslaughter stunning, with 51.1% strongly agreeing improves animal welfare. This reflects a broad consensus on the ethical importance of reducing animal suffering. However, this consensus

contrasts sharply with the reported conditions in slaughter facilities, where adherence to animal welfare standards was deemed poor or below average by nearly half of the respondents (48.9%). This discrepancy suggests that despite an intellectual understanding of animal welfare principles, practical limitations such as inadequate equipment and a lack of regulatory enforcement prevent the realization of humane slaughter practices in many facilities in Ghana as previously indicated by Ofosu-Kwarteng [16]. This finding is consistent with other investigations in low- and middle-income countries, where infrastructural deficits and limited regulatory oversight have been identified as key barriers to the implementation of humane slaughter practices [27, 28].

study's demographic profile reveals a The predominantly male respondent base (77.8%), with most participants in the 35-45 age range (42.2%) and holding university degrees (77.8%). While the high level of formal education among respondents may indicate an awareness of animal welfare concepts, the lack of formal training in animal welfare (55.6%) highlights a concerning disjunction between theoretical knowledge and practical competence. Such discrepancies have been noted in similar studies across the developing world, where formal education does not necessarily translate into humane slaughter practices due to infrastructural deficits and the absence of policy enforcement [29]. Lado et al. [22], in a study on slaughter slabs in South Sudan, found that poor infrastructure and training significantly impacted slaughter hygiene and welfare practices, similar to the findings in Ghana.

One of the most striking findings is that demographic factors such as age, gender, and education were not significantly associated with perceptions of pre-slaughter stunning. This suggests that perceptions of animal welfare may transcend individual characteristics and reflect broader institutional or cultural factors. This is consistent with the work of Grandin [30], who argues that humane slaughter practices are more





likely to be influenced by institutional culture and leadership than by individual-level demographics. In Ghana's context, these findings may be attributed to a lack of structured training programs and insufficient policy oversight that transcends individual competencies. This underlines the urgent need for targeted interventions to ensure that formal education is complemented by on-the-ground practical training in humane slaughter techniques. Similarly, Adzitey et al. [24] found in Northern Ghana that traditional methods and poor handling practices were common due to the lack of practical training offered by management, despite the presence of basic animal welfare knowledge among workers.

The study revealed significant regional differences in perceptions of pre-slaughter stunning, with respondents from the Forest/Middle Belt exhibiting a more positive perception than those from the Coastal/Southern Belt (p = 0.050). This regional variation may be explained by differences in infrastructure, access to training, and cultural animal welfare. The attitudes toward Forest/Middle Belt, which is more economically developed than the Savannah/Northern Belt, may have better access to equipment and training, which in turn influences workers' perceptions of the feasibility and importance of humane slaughter. Similar regional disparities have been documented in other developing countries, where economic and infrastructural differences between regions often result in varying levels of compliance with animal welfare standards [23.29]. Lado et al. [22] found that rural areas in South Sudan lacked the infrastructure to support modern animal welfare practices, a challenge also seen in Ghana's Savannah/Northern Belt.

These findings suggest that cultural and institutional factors play a critical role in shaping attitudes toward animal welfare. In this study, respondents from the Savannah/Northern Belt were less likely to have participated in or supervised stunning procedures, with 85% reporting no involvement. This could be attributed to the region's cultural and religious practices, where traditional methods of slaughter may be more prevalent, and the adoption of modern stunning techniques may face resistance. This notion aligns with research by Farouk [31], who found that religious beliefs and cultural practices significantly influence the acceptance of preslaughter stunning in many parts of the world, especially in regions where traditional slaughter methods such as the *"Halal"* and the *"Kosher"* are deeply rooted in; which is equally practised among Muslims in Ghana of which majority originate from the Northern belt of Ghana [32].

The practical challenges associated with preslaughter stunning are vividly illustrated by the finding that 55.6% of respondents never verify whether an animal is properly stunned before proceeding with slaughter. This finding raises significant ethical and practical concerns, as improper stunning can lead to prolonged animal suffering, in violation of both international welfare standards and Ghana's own regulations on humane slaughter [26]. Additionally, the fact that nearly half of the respondents (48.9%) reported witnessing animal never an regaining consciousness during slaughter may indicate a lack of awareness regarding the risks of improper stunning techniques. This is troubling, as research has consistently shown that improperly stunned animals are likely to experience extreme pain and distress during slaughter, which not only raises ethical concerns but also has potential public health implications, as stressed animals produce lower-quality meat [29].

The poor condition of stunning equipment reported by 62.2% of respondents further exacerbates these concerns, highlighting the infrastructural deficiencies that are endemic in many of Ghana's slaughterhouses. Inadequate equipment was the most frequently cited challenge (53.3%), followed by a lack of training (35.6%). These findings are consistent with the work of Farouk [31], who argues that in many developing countries, the absence of appropriate technology and the lack of regulatory enforcement are the primary barriers to the adoption of





humane slaughter techniques. Addressing these infrastructural deficits must be a priority if Ghana is to meet international standards for animal welfare and ensure that slaughter practices are both humane and ethically defensible.

The study's findings have profound implications for policy and practice in Ghana. The widespread support for pre-slaughter stunning and humane slaughter practices indicates that there is a strong foundation upon which to build more effective regulatory frameworks. However, the gaps in knowledge, training, and equipment must be addressed if Ghana is to align its slaughter practices with international standards. Specifically, the provision of formal training programs, the upgrading of slaughterhouse equipment and the enforcement of stricter regulations are necessary to ensure that theoretical support for animal welfare is translated into practical, on-the-ground improvements. Additionally, the regional disparities identified in the study suggest that a one-size-fits-all approach to animal welfare may be insufficient. Instead, localized or region-specific interventions that take into account the specific cultural, infrastructural, and economic contexts of each region are likely to be more effective. Targeted training programs in the Savannah/Northern Belt, where participation in stunning procedures is low, could help to increase awareness and acceptance of humane slaughter techniques. This aligns with the suggestions of Adzitey et al. [23] who in previous studies reported that poor handling and traditional practices were common the Bawku in Municipality, where lack of awareness and training contributed to these issues, highlighting the need for localized, context-sensitive interventions.

Despite the significant findings from this study, the study is limited by the relatively smaller sample size of 45, which may not fully represent all slaughterhouse workers across Ghana. In addition, the cross-sectional design limits insights into changes over time.

### Conclusion

This study highlights both the potential and the challenges of improving animal welfare practices in Ghana. While there is broad support for humane slaughter techniques such as preslaughter stunning, significant gaps in knowledge, equipment, and training exist as well as cultural and institutional factors that influence animal welfare practices in different parts of the country. This study recommends the implementation of comprehensive training programs for slaughterhouse workers, emphasizing both theoretical knowledge and practical application of humane slaughter techniques. Investment in modern and well-maintained stunning equipment essential, particularly in regions facing is infrastructural challenges. Strengthening regulatory frameworks with stricter enforcement and regular audits is critical to ensuring compliance with animal welfare standards. Region-specific interventions are needed to address cultural and infrastructural variability, particularly in areas where traditional practices hinder the adoption of stunning techniques. Facility management must prioritize animal welfare through accountability measures and fostering a welfare-oriented culture. Additionally, public and industry awareness should be heightened to promote demand for ethically sourced meat, driving improvements in slaughterhouse practices.

### What is known about this topic

- Pre-slaughter stunning is widely endorsed by international guidelines as a key practice to reduce animal suffering and enhance meat quality, but its adoption remains uneven in many developing countries;
- In developing countries found in Africa, the implementation of humane slaughter practices is hampered by a range of challenges, including limited infrastructure, cultural norms, and the lack of regulatory enforcement;





• Previous studies have identified gaps in training, equipment availability, and awareness as major obstacles to the consistent application of animal welfare standards in slaughterhouses across Africa.

### What this study adds

- This study provides new evidence on the significant disconnect between theoretical knowledge of animal welfare and its practical implementation in Ghanaian slaughterhouses, with over half of the workers lacking formal training in humane slaughter practices;
- This research highlights stark regional disparities in both perceptions and the application of pre-slaughter stunning, with workers in more developed regions better equipped and trained, while those in rural areas face severe infrastructural and cultural barriers;
- The study underscores the need for targeted interventions, such as regionspecific training programs, improved access to modern equipment, and stronger enforcement of animal welfare regulations, to bridge the gap between awareness and action in Ghanaian slaughterhouses.

### **Competing interests**

The authors declare no competing interests.

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## **Authors' contributions**

All authors made significant contributions to this work. Emmanuel Awuni conceptualised the project, and secured funding for the project. Benjamin Obukowho Emikpe, Daniel Baba Abiliba were responsible for the conceptualization, resource acquisition, supervision, project administration and methodology design. Prince Nana Takyi, Suraj Mohammed Kasim contributed to the investigation, data collection, data analysis and drafting of the manuscript. All authors reviewed and provided critical feedback on the manuscript and approved the final version of this manuscript.

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Table 1: demographic cl	naracteristics of responde	nts	
Variable	Categories	Frequency (n)	Percentage (%)
Age	25-35	15	33.3
	35-45	19	42.2
	45-55	9	20
	Above 55	2	4.4
Gender	Male	35	77.8
	Female	10	22.2
Education level	Veterinary College	6	13.3
	Vocational Training	4	8.9
	University Degree	35	77.8
Years of working	Less than 1 years	4	8.9
	1-5 years	15	33.3
	6-10 years	10	22.2
	More than 10 years	16	35.6
Region	Ahafo	2	4.4
	Ashanti	10	22.2
	Bono	2	4.4
	Bono East	1	2.2
	Central	2	4.4
	Eastern	5	11.1
	Greater Accra	5	11.1
	North East	2	4.4
	Northern	8	17.8
	Upper East	4	8.9
	Volta	2	4.4
	Western	2	4.4
Country Regional Belt	Savannah/ Northern	14	31.1
	Forest/ Middle	20	44.4
	Coastal/ Southern	11	24.4





Table 2: respondents' familiarity an	d knowledge of animal welfare	and preslaught	er stunning
Query	Response	Frequency (n)	Percentage (%)
Level of familiarity with animal	Somewhat familiar	2	4.4
welfare term	Familiar	20	44.4
	Very familiar	20	44.4
	Extremely familiar	3	6.7
Received formal training on animal	No	25	55.6
welfare	Yes	20	44.4
Understanding of pre-slaughter stunning	Heard of it but don't understand	2	4.4
	Understand the idea but not the process	6	13.3
	Understand both the idea and the process	32	71.1
	Experienced in performing it	5	11.1
Reasons for pre-slaughter stunning	To improve meat quality	8	17.8
	To make slaughter easier	3	6.7
	To reduce animal suffering	31	68.9
	To comply with regulations	3	6.7
Stunning Procedures known	Response	Frequency (n)	Percentage (%)
Electrical stunning	Yes	23	51.1
	No	22	48.9
Gas stunning	Yes	15	33.3
	No	30	66.7
Manual Percussive Stunning	Yes	10	22.2
	No	35	77.8
Captive bolt stunning	Yes	22	48.9
	No	23	51.1





Table 3: response to queries on perceptions t	owards pre-slaughter	<sup>-</sup> stunning	-
Query on perceptions	Response	Frequency (n)	Percentage (%)
Believe pre-slaughter stunning can improves	Disagree	1	2.2
animal welfare	Neutral	6	13.3
	Agree	15	33.3
	Strongly agree	23	51.1
Importance of ensuring animals do not suffer	Important	11	24.4
during slaughter	Very important	26	57.8
	Extremely	8	17.8
How well does your facility adhere to animal	Poorly	10	22.2
welfare standards	Below average	12	26.7
	Average	15	33.3
	Above average	7	15.6
	Excellent	1	2.2
Frequency of workers in your facility	Strongly disagree	10	22.2
adequately trained in humane slaughter	Disagree	9	20
practices	Neutral	9	20
	Agree	14	31.1
	Strongly agree	3	6.7
Frequency of animals experiencing pain	Never	1	2.2
during slaughter in your facility	Sometimes	15	33.3
	Often	10	22.2
	Always	19	42.2
Support for more strict regulations on pre-	Neutral	1	2.2
slaughter stunning	Support	19	42.2
	Strongly support	25	55.6

Table 4: level of perceptions towards pre-slaughter stunning			
Level of perception	Frequency (n)	Percentage (%)	
Moderate	17	37.8	
Good	28	62.2	



Table 5: assoc	iation between dem	nography of	respondents a	and level of pe	rception of
pre-slaughter	stunning				
Variable	riable Categories Level of Perception		Chi-square	P-value	
		Moderate	Good	value	
Age (years)	25-35	5(11.1%)	10(22.2%)	1.774	0.621
	35-45	6(13.3%)	13(28.9%)		
	45-55	5(11.1%)	4(8.9%)		
	Above 55	1(2.2%)	1(2.2%)		
Gender	Male	14(31.1%)	21(46.7%)	0.331	0.565
	Female	3(6.7%)	7(15.6%)		
Education	Veterinary College	2(4.4%)	4(8.9%)	0.311	0.856
	Vocational	2(4.4%)	2(4.4%)		
	Training				
	University Degree	13(28.9%)	22(48.9%)		
Years of	Less than 1 years	3(6.7%)	1(2.2%)	7.209	0.066
working	1-5 years	2(4.4%)	13(28.9%)		
	6-10 years	4(8.9%)	6(13.3%)		
	More than 10	8(17.8%)	8(17.8%)		
	years				
Regional Belt	Savannah/	6(13.3%)	8(17.8%)	5.972	0.050
	Northern				
	Forest/ Middle	4(8.9%)	16(35.6%)		
	Coastal/ Southern	7(15.6%)	4(8.9%)		





Table 6: practices and experiences with pre-slaughter stunning					
Practice	Categories	Frequency (n)	Percentage (%)		
Frequency of verification that an animal is properly	Never	25	55.6		
stunned before proceeding with slaughter	Rarely	5	11.1		
	Sometimes	11	24.4		
	Often	2	4.4		
	Always	2	4.4		
Witnessed an animal regaining consciousness	Never	22	48.9		
during the slaughter	Rarely	5	11.1		
	Sometimes	13	28.9		
	Often	3	6.7		
	Always	2	4.4		
Level of feel about performing the stunning process	Distressed	1	2.2		
	Uncomfortable	9	20.0		
	Neutral	16	35.6		
	Comfortable	12	26.7		
	Very	7	15.6		
	comfortable				
Rating of the condition of the stunning equipment	Poor	28	62.2		
in your facility	Fair	7	15.6		
	Good	8	17.8		
	Very good	2	4.4		
Supervised or taken part in the pre-slaughter	Yes	10	22.2		
stunning process	No	35	77.8		
Actions taken when an animal is not properly stunned	Categories	Frequency (n)	Percentage (%)		
Re-stunning	Yes	16	35.6		
	No	29	64.4		
Proceed with slaughter	Yes	17	37.8		
	No	28	62.2		
Report to supervisor	Yes	8	17.8		
	No	37	82.2		
Stop the process and reassess the situation	Yes	7	15.6		
	No	38	84.4		



Table 7: challenges, sugge	ested improvements and r	<u>ecommendatio</u>	ns for pre-slaughter stunning
Variable	Categories	Frequency (n)	Percentage (%)
Challenges associated with the preslaughter stunning process	Inadequate equipment	24	53.3
	Lack of training	16	35.6
	Management priority	3	6.7
	Time pressure	2	4.4
Suggested Improvements	and Recommendations		
Improvement needed for	Education of staff	5	11.1%
the stunning process at	No response	22	48.9%
your facility	Provision of equipment	12	26.7%
	Training of staff	6	13.3%
Introducing more	Strongly oppose	4	8.9%
advanced stunning	Neutral	5	11.1%
technology would improve animal welfare in your facility	Support	19	42.2%
	Strongly support	17	37.8%
Willingness to participate	Slightly likely	4	8.9%
in additional training on humane slaughter practices if offered	Likely	12	26.7%
	Very likely	18	40.0%
	Extremely likely	11	24.4%
Level of support for a program to regularly	Neutral	1	2.2%
	Support	17	37.8%
assess and improve animal welfare practices	Strongly support	27	60.0%





Statements on Animal slaughtering and Food Hygiene Scale:1.00 -1.80 = Strongly disagree, 1.81-2.60= Disagree, 2.61 - 3.40=Neutral, 3.41 - 4.20= Agree, 4.21 - 5.00= Strongly agree

Figure 1: mean response to animal slaughtering and food hygiene practices by regional belt