

Utilization of Standard Procedures of Hygiene Practices Associated with Quality Meat Hygiene Handling Practices in Bugesera District, Rwanda

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ABSTRACT

Meat hygiene encompasses all measures and conditions required to guarantee the safety and suitability of meat throughout the food chain. Despite existing meat hygiene regulations in Rwanda, gaps in compliance, training, infrastructure, and enforcement may increase food-safety risks. This study assessed Utilization of Standard Procedures of Hygiene Practices associated with the quality utilization of meat hygiene handling practices among meat handlers and consumers in Bugesera District, Rwanda. A descriptive cross-sectional study using a mixed-methods approach was conducted. Quantitative data were collected from meat handlers and consumers using structured questionnaires, while qualitative data were obtained through four focus group discussions and eight key informant interviews. A total of 422 questionnaires were distributed, of which 402 were completed, giving a 95.3% response rate. Quantitative data were analyzed using SPSS version 25, employing descriptive statistics and inferential analysis, while qualitative data provided contextual interpretation of the quantitative findings. Ethical approval was obtained from Mount Kigali University, and permission was obtained from Bugesera District authorities. Results of the study opined that most of the gender handling and consumers in butcher shop and abattoirs were mainly Males, (259), 64.43%, while female participation was only (143), 35.7%. Results opined that the Utilization of Standard Procedures of Hygiene was being implemented mainly by Meat consumers, who were the majority (263) 65.4%, and meat handlers were (139) 34.6%, with significant protective association of hygiene meat handling practices of RR (0.7, 0.35). The study found that most respondents showed good knowledge of meat hygiene: (394) 98% knew that dirty equipment can cause contamination and (396), 98.5% knew contaminated meat can cause illness, while 270 (92.3%) knew that healthy-looking people can carry foodborne pathogens. On the hygiene regulations are too strict and difficult to follow, indicating a perceived challenges to compliance despite a significant protective association on of RR (0.50, 0.49) with P value of 0.023 attitudes on personal hygiene to prevent communicable diseases. Study concluded that utilization of recommended meat hygiene procedures in Bugesera District remains inadequate despite generally good knowledge and attitudes. Strengthening continuous training, routine inspection and enforcement, improving access to licensed abattoirs and hygienic infrastructure, and increasing public awareness are recommended to improve meat safety and protect population health.

Keywords: Meat hygiene; Meat handlers; Hygiene practices; Food safety.

1. INTRODUCTION

Meat hygiene encompasses all measures and conditions required to guarantee the safety and suitability of meat throughout the food chain (RSB 2023). Meat is an essential source of high-quality protein, vitamins, and minerals that support optimal human health (Rwanda Inspectorate, Competition and Consumer Protection Authority, 2022 & Ahmed, 2018). However, its intrinsic characteristics, including high moisture content, near-neutral pH, and rich nutrient composition, make it highly susceptible to microbial contamination when handled improperly (Chen et al., 2022). Failure to maintain appropriate hygiene and temperature control throughout slaughter, transport, storage, and retailing facilitates the proliferation of pathogens such as *Salmonella* spp., *E. coli*, *Campylobacter*, and *Listeria monocytogenes*, posing significant public health risks (Grace, 2023).

Foodborne diseases remain a major global public-health problem. The World Health Organization (WHO) estimates that, in 2021, foodborne transmission of 42 infectious and chemical hazards caused approximately 866 million cases of foodborne illness, 1.52 million deaths, and 57.1 million disability-adjusted life years (DALYs) globally, with the greatest burden occurring in the African and South-East Asia regions (WHO, 2026). Although the global estimates encompass hazards transmitted through different foods, empirical evidence demonstrates that meat and meat products are important vehicles of foodborne disease. A systematic review of microbial foodborne outbreaks in Africa, covering 31 studies and 42 outbreaks, documented 877,067 infections and intoxications, 2,064 hospitalizations, and 2,061 deaths. Raw and processed meat products were among the most frequently implicated food categories, accounting for 38.1% of the reported outbreaks, while poor hygiene, inadequate food storage, and limited compliance with food-safety practices were identified as important contributing factors (Sosah & Donkor, 2025). To mitigate these risks, international standards such as the Codex Alimentarius provide hygienic requirements across slaughtering and processing stages, while risk-based systems such as Hazard Analysis and Critical Control Points (HACCP) provide a systematic approach to controlling food-safety hazards (Codex Alimentarius, 2020). However, implementation of HACCP-based systems can be challenging for small-scale operators in resource-limited settings because of infrastructure, financial, technical, and capacity constraints (Ahmed, 2023).

In Sub-Saharan Africa, challenges are compounded by structural and infrastructural limitations, including inadequate sanitation facilities, limited access to cold-chain infrastructure, insufficient inspection services, and weak enforcement of hygiene standards, which have been associated with an increased risk of meat contamination. In Uganda, only 3% of butcheries were found to have functional cold-chain facilities, while in South Africa, 65% lacked refrigeration and 42% had inadequate drainage systems, creating conditions conducive to cross-contamination (Siluma et al., 2023; Lamunu et al., 2022). Further studies in Kenya have revealed that inadequate sanitation, poor waste disposal, and limited access to clean water have been associated with higher bacterial contamination levels in slaughterhouses and retail environments across East Africa (Omulo et al., 2021).

In Rwanda, the Rwanda Standards Board (RSB) introduced the DRS 185:2023 Code of Hygienic Practice for Meat, complemented by RICA regulations that require medical certification of handlers, use of protective clothing, equipment sanitation, and proper facility maintenance (RSB, 2023; RICA, 2022). Despite these regulations, compliance gaps persist. Early studies in Kigali reported that 62% of meat handlers used wooden cutting boards, 69.3% store meat at ambient temperature, and fewer than 20% consistently use protective gloves or masks practices associated with increase contamination risks (Niyonzima et al., 2017). More recent evidence on meat-safety practices and their determinants is therefore

needed to assess whether regulatory requirements and recommended hygiene practices are being consistently implemented.

Bugesera District, located in Rwanda's Eastern Province, provides an important setting for assessing these challenges at the district level. Previous evidence from the district has documented carcass rejection due to fasciolosis (9.2%) and poor bleeding (3.2%), indicating the presence of animal-health and slaughter-related challenges (Dukundane et al., 2022). In addition, recent evidence indicates gaps in access to meat- and milk-safety training among livestock farmers (Munyampuhwe et al., 2025). However, district-level empirical evidence on factors associated with the quality utilization of meat hygiene handling practices among meat handlers and consumers in Bugesera District remains limited. This study therefore sought to determine Utilization of Standard Procedures of Hygiene Practices associated with the quality utilization of meat hygiene handling practices to promote population safety among meat handlers and consumers in Bugesera District, Rwanda.

2. Material and Methods

2.1.0 Material

2.1.1 Standard Procedure utilization Associated with Quality Meat Hygiene Handling

Personal hygiene remains the foundation of safe meat handling, and lapses in this area are repeatedly identified as major contributors to contamination. Several African studies show comparable trends. In Uganda, Lamunu et al. (2022) revealed that 65.7% of handlers did not meet minimum hygiene requirements, largely due to irregular handwashing, limited access to PPE, and low compliance with standard operating procedures. In South Africa, Siluma et al. (2023) observed inadequate personal hygiene, improper waste handling, and poor cross-contamination control during meat cutting.

Rwandan evidence is aligned with these findings. Niyonzima et al. (2017), showed that while most Kigali handlers wore coats, only 18% wore gloves and 10% wore masks, and many used wooden cutting boards, which are difficult to sanitize and harbor pathogens. Sanitary conditions of equipment and physical facilities are central to implementing standard hygiene protocols. A substantial body of empirical research highlights persistent sanitation gaps in abattoirs, butcheries, and meat retail points in low-income settings. According to Koech et al. (2024), 72% of beef samples in Nairobi contained *E. coli* and 84% contained coliform bacteria, attributed largely to unclean cutting surfaces, unsanitized knives, and handling money during meat preparation. Similar conditions within Rwanda. Studies by Niyonzima et al. (2017) reported unsanitary environments, wooden cutting boards, absence of proper waste disposal, and limited refrigeration in Kigali butcheries. These deficiencies increase bacterial load and compromise meat safety. Bugesera-specific evidence Dukundane et al. (2022) identified high condemnation rates, including 9.2% for fasciolosis and 3.2% for insufficient bleeding, pointing to facility-level inadequacies, poor sanitation routines, and possible contamination during slaughter.

Meat inspection—conducted both ante-mortem and post-mortem—forms a core component of hygiene protocols intended to ensure only safe meat reaches consumers. However, empirical evidence suggests that inspection effectiveness is often compromised by weak enforcement, inadequate staffing, and inconsistent implementation. A multi-country study by Waldman et al. (2020) in Tanzania showed that inspection often focused only on visible lesions, with limited attention to invisible microbial hazards, resulting in undetected contamination entering the food chain. This aligns with findings from Ethiopia and Kenya where informal slaughter practices bypass official inspection systems altogether.

In Rwanda, national regulatory frameworks such as RSB's Meat Handling Standards (2023) and RICA's inspection guidelines (2022) mandate PPE use, facility certification, traceability, and routine inspections. However, there is persistent gaps, particularly in rural areas: limited inspector numbers, irregular inspections, weak enforcement, and inadequate documentation of slaughter records. Empirical evidence from Dukundane et al. (2022) identifying significant condemnation rates demonstrates ongoing burden of diseases detectable through inspection but reveals the need to strengthen inspection capacity to take corrective action.

2.1.2 Knowledge, Attitude, and Practices (KAP) of Meat Handlers and Consumers associated with Utilization of Quality Meat Hygiene Handling.

Multiple studies highlight a persistent gap between meat handlers' knowledge and attitudes toward hygiene and their actual practices. In Nairobi, Koech et al. (2024) reported that 85% of attendants did not wash their hands before or after handling meat, 91% handled money while serving customers, and 99% did not use gloves; microbial analysis revealed *E. coli* contamination in 72% and total coliforms in 84% of meat samples exceeding regulatory limits. Similar discrepancies have been reported elsewhere. Fekadu et al. (2023) found that although 65.5% of food handlers possessed good knowledge and 65.3% had positive attitudes, only 38.5% practiced proper hygiene.

In Ethiopia, Tolera et al. (2022) observed that three-quarters of abattoir workers had inadequate knowledge of safe waste handling, only one-quarter expressed positive attitudes, and fewer demonstrated proper waste-management behavior. Similarly, Gil et al. (2024) found that trained meat handlers were 5.2 times more likely to comply with hygiene standards than untrained peers. South Asian evidence echoes these trends: in Nepal, Bhandari et al. (2022) noted that although 68% of handlers possessed good theoretical knowledge, only 43.3% demonstrated satisfactory hygiene practices; in Bangladesh, Sarma et al. (2022) reported that while 64.7% had adequate knowledge, only 12% adhered fully to hygiene protocols.

Rwanda shows similar KAP gaps. Niyonzima et al. (2017) found that although most handlers wore protective coats, glove and mask usage remained below 20%, highlighting inconsistent adherence to recommended practices. Overall, the literature clearly indicates that knowledge and positive attitudes alone do not guarantee safe meat handling. Sustainable improvements require continuous training, proper infrastructure, and mechanisms that reinforce consistent hygienic behavior—critical issues for Bugesera District.

2.1.3 Conceptual framework

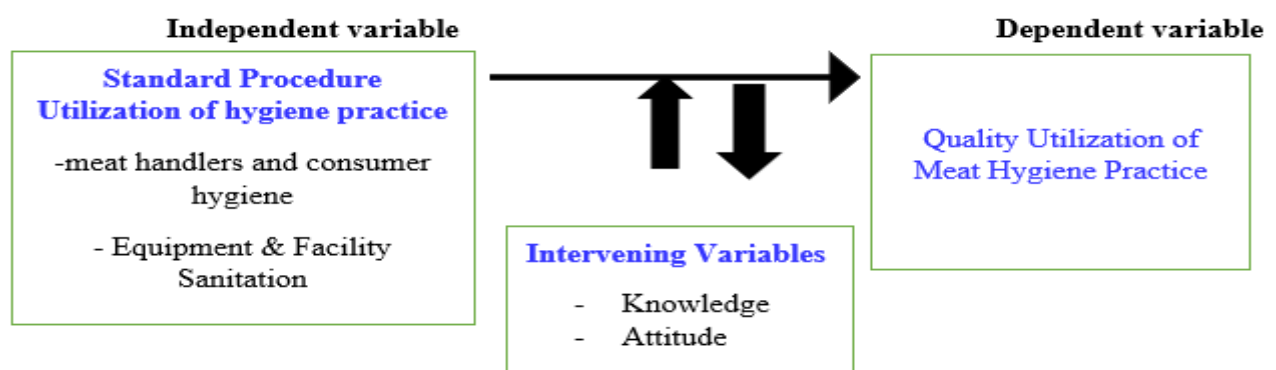


Figure 2.1: Conceptual framework, Source (45)

3. Study Design

This study employs a descriptive cross-sectional design with a triangulation mixed methods integrate both qualitative and quantitative approaches.

3.1 Study Area

This study will be conducted in the Bugesera District, Eastern Province of Rwanda. Covering an area of approximately 1,228 square kilometers, the district is administratively divided into 15 sectors, 72 cells, and 580 villages. According to the 2022 census, the district has a population of 551,103, with a population density of 450 people per square kilometer (with a male-to-female ratio of 49.3% to 50.7%). Bugesera is a predominantly rural area where agriculture and livestock farming are vital to the local economy. National Institute of Statistics of Rwanda (NISR) data from 2023 indicates that approximately 59.4% of households are engaged in crop farming, and 42.8% are involved in animal farming, including cows, goats, and pigs. The district's meat production and retail landscape include three formal abattoirs located in Nyamata, Mayange, and Ruhuha sectors, as well as 67 butcher shop located in Nyamata, Mayange, Ntatarama, Gashora, Lirima, Rweru, Juru and Ruhuha sectors that often operate under sub-optimal sanitary conditions. The diverse social and cultural environment, along with potential variations in infrastructure and resource allocation between more urbanized sectors and remote rural areas, makes Bugesera a suitable setting for a comprehensive assessment of meat hygiene practices. However, quality meat hygiene handling practice may vary across different parts of the district, with remote rural areas often facing challenges related to infrastructure and resource allocation.

3.2 Target Population

The target population was meat handlers involved in slaughter and post-slaughter activities, adult meat consumers aged 18 years and above, and institutional stakeholders in Bugesera District, Rwanda. Meat handlers and consumers provided information on meat hygiene practices and related factors, while abattoir managers, veterinary and public health officers served as key informants on hygiene regulations, enforcement, and facility management.

3.3 Sampling techniques and sample size

3.4 Sample Size Determination

For the quantitative components, the sample size for this study was determined using the Fischer's et al.

(1998) formula for cross-sectional studies:
$$n = \frac{Z^2 pq}{d^2}$$

$Z = 1.96$ (95% confidence level)

$p = 0.50$ (proportion of individuals with good meat hygiene handling practices from previous or pilot studies)

$q = 1 - p$ (0.50)

$d = 0.05$ (5% margin of error)

Therefore,

$$n = \frac{0.50 * 0.50 * (1.96)^2}{(0.05)^2} = 384$$

To account for non-response or incomplete data, an additional 10% was added to the sample calculated.

$$n = 384 + \frac{10 * 384}{100}$$
$$n = 423$$

For the qualitative component, the number of participants depended on data saturation, defined the point at which no new information or themes emerge from the data (Guest, Bunce & Johnson, 2006). 4 focus

group discussions (6 participants each) and 8 key informant interviews were conducted, giving a total of 32 qualitative participants. This combined strategy ensured that both quantitative and qualitative data are adequate, reliable, and representative of the diversity within the study population.

3.5 Sampling Techniques

This study used a mix of purposive, quota, and census sampling techniques to capture the views of different groups involved in meat handling and consumption in Bugesera District. Purposive sampling helped identify people who have specific knowledge or responsibilities related to meat hygiene, such as abattoir managers, veterinary officers, and public health inspectors. Quota sampling ensured that consumers are fairly represented across different market types and community settings. Where meat handlers all of them were included through a census approach. Using these combined methods ensured that voices from every relevant group are heard and that the study reflects the real diversity of experiences influencing meat hygiene handling practices in the district.

3.6 Research Tools and Instruments

This study employed four main data collection instruments designed to capture both quantitative and qualitative information related to meat hygiene handling practices in Bugesera District. A structured questionnaire was administered to meat handlers and consumers to collect quantitative data on socio-demographic characteristics, knowledge, attitudes, and hygiene-related behaviors to allow systemic and measurable assessment of variables for statistical analysis. For the qualitative component, a focus group discussion (FGD) guide was used to gather insights from groups of meat handlers and consumers regarding perceptions, barriers, and attitudes influencing hygienic meat handling. Additionally, a key informant interview (KII) guide was administered to institutional stakeholders such as abattoir managers, veterinary officers, and public health inspectors to collect information on existing hygiene protocols, inspection procedures, and enforcement challenges. All instruments were designed in English, translated into Kinyarwanda for field use, and pre-tested to ensure clarity, consistency, and cultural appropriateness.

3.5 Piloting of Research Instruments

To assess the research tools and methodology before the main investigation in Bugesera District, A pilot study was conducted in Ngoma District, which is neighbors Bugesera and have similar settings, The pilot evaluated the research methodology and tools prior to the main data collection. this small-scale trial involved 39 meat handlers from Ngoma abattoirs and butcher shop, approximately 10% of the intended sample size. Feedback helped to identify potential issues and refine the study protocol (van Teijlingen & Hundley, 2002). to avoid contamination of the actual research population.

8 Testing for Reliability, Validity and establishment of trustworthiness

Reliability

The pilot study was served several purposes, including assessing the clarity and comprehensibility of the structured questionnaires, testing the reliability and consistency of the data collection procedures, and evaluating the feasibility of participant recruitment (Teijlingen & Hundley, 2002). Feedback from the pilot participants was used to refine the study instruments, address any ambiguities, and improve internal consistency of questionnaire items. Additionally, the pilot study provided practical estimates of the time and resources required for the main study in Bugesera District (Malmqvist et al., 2019). Findings from the pilot also guided reliability testing using measures such as Cronbach's alpha for multi-item scales.

Validity

To ensure the validity of the research instruments, a rigorous assessment was undertaken. Content validity was established through a review by experts and consultation with meat handlers to ensure the questionnaires adequately covered all relevant aspects of meat hygiene handling practices (Almanasreh, Moles, & Chen, 2019). This process ensured the questions will be relevant to the target population of meat handlers in Bugesera District.

Criterion validity was assessed by comparing survey responses with objective indicators of meat hygiene handling practices among meat handlers and consumer, such as established regulations or hygiene standards, to determine the instruments' accuracy (Wancata, Alexandrowicz, Marquart, Weiss, & Friedrich, 2006).

Finally, construct validity was confirmed using factor analysis to ensure the survey items accurately measured the underlying theoretical constructs of knowledge, attitudes, and practices related to meat safety. This process ensured that the instrument was a true measure of these key dimensions among the meat handlers in Bugesera District (Colliver, Conlee, & Verhulst, 2012).

3.6 Ethical Consideration

Ethical approval for the study was granted by the Mount Kenya University Ethical Review Board and permission for data collection was obtained from Bugesera District leadership. Respondents were informed about the purpose of the study, how their responses would be used, and their right to withdraw at any time. Informed consent was obtained through signed consent forms from those who agreed to participate.

3.7. Data management and statistical analysis

The Data collected through the questionnaires were initially recorded using toolbox and exported to Statistical Package for the Social Sciences (SPSS) version 25 (IBM, 2017).

4. RESULTS and findings

4.1 Socio-Demographic Profile

Out of the 422 structured questionnaires distributed to meat handlers and consumers, 402 (95.3%) were the. a response rate. The study opined that most of the gender handling and consuming meats in butcher shop and abattoirs were mainly Males, (259), 64.43%, while female participation was only (143), 35.7%

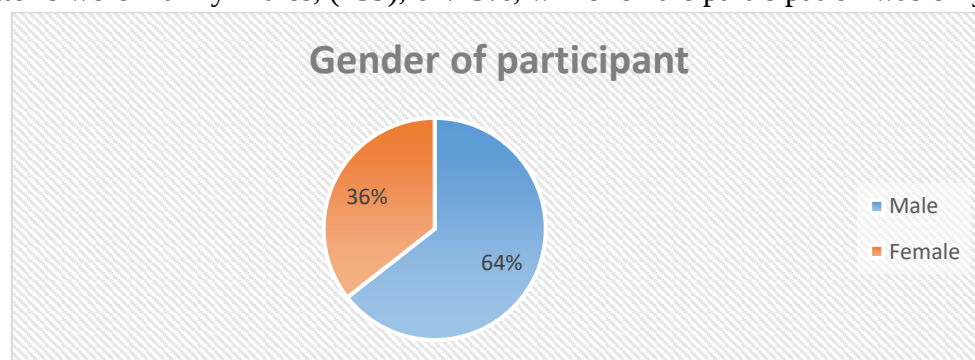


Figure 4.1 demonstrates Gender participation in the meat handling and consuming at butcher shops and abattoirs in Bugesera District.

The results on age showed that, the mean age of participants was 36.32 ± 9.67 years. The 29–38 age group makes up the largest share at 156 (38.81 %), indicating that most participants fall in the early-to-mid career stage. And the least represented age cohort was 59–68 at only 1.99% (8), suggesting minimal

involvement from near-retirement and senior individuals. Overall, the active in utilization of meat hygiene handling practices was between ages 18–48 years old

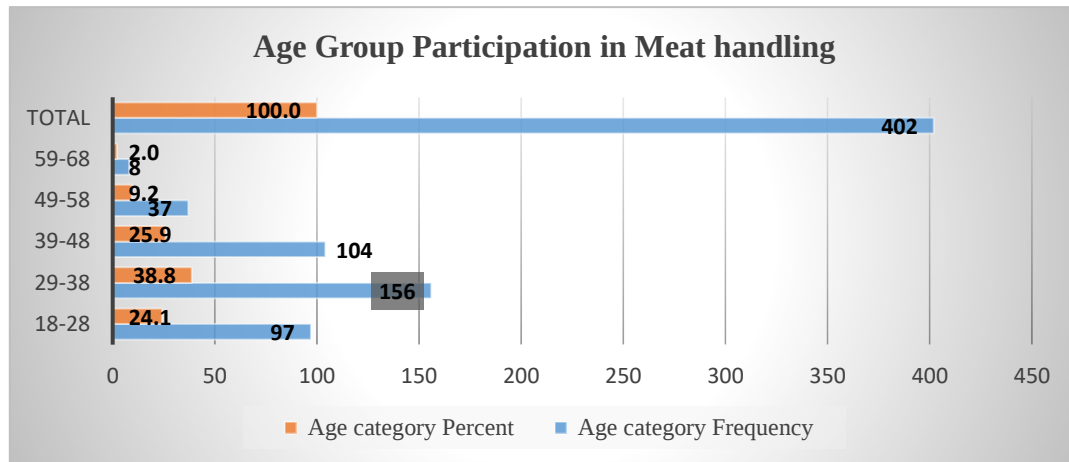


Figure 4.2. Age groups of meat handlers and consumers at butcher shops and abattoirs in Bugesera District, x axis age cohorts and y axis are frequency and % distribution in utilization of hygiene practices.

Results on the occupation status showed that, majority are meat consumers 265 (66%), showing that most participants are customers rather than industry workers. Among professionals in the meat sector, butchers make up 16 %, (64) stall owners 48 % (24) and slaughter men 5% (10), while meat inspectors represent only (2) 1%.

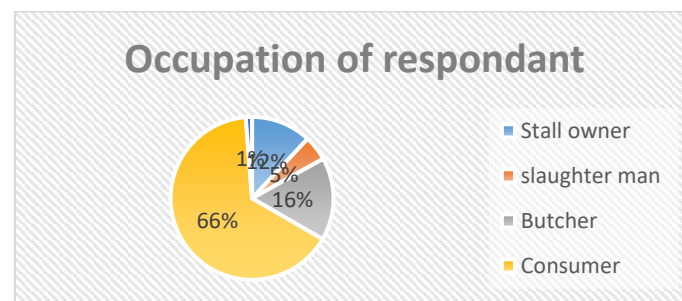


Figure 4.4 occupation of respondent of meat handlers and consumers at butcher shops and abattoirs in Bugesera District.

4.2 Utilization of Standard Procedures of Hygiene Practices Associated with Quality Meat Hygiene Handling Practices in Bugesera District, Rwanda

The results opined that the Utilization of Standard Procedures of Hygiene was being implemented mainly by Meat consumers, who were the majority (263)65.4%, and meat handlers were (139) 34.6%, with significant protective association of hygiene meat handling practices of RR (0.7, 0.35) with OD (0.5), chi square of 2.275, and P value of 0.132, hygiene handling meat practices.

The Results demonstrate that Handwashing after handling meat was high, with (315), 78.4% of meat handlers and (285)70.7% of consumers always washing their hands, although only (117), 41.7% of handlers washed hands before handling meat and just (88) 22.3% always dried their hands.

The use of personal protective equipment was very low, as 95% (382), never used gloves, (367) 92.1%

did not wear aprons, and (386) 96.4% did not wear face masks, despite (383)70.5% having medical certificates and over (1366) 91% using soap and water for cleaning.

Workplace hygiene was generally good, with (379)94.2% reporting efficient waste disposal and (398)98.6% of animals inspected before and after slaughter.

However, risky behavior remained, as (185), 46% of meat handlers handled money while working with meat without washing hands or changing gloves with protective significant of on P value 0.024, 95% CI 0.188–0.897), RR (0.46. 064), and OD 1.0 signifying handling money has no relation with infection outcome.

The results opined that, the level of utilization of standard operating procedures of hygiene practices among meat handlers, the majority 294 (73.1%) demonstrated limited utilization of SOPs, while only 109 (26.9%) showed quality utilization of meat handling SOPs with significant protective association of RR (0.73. 0.3), and P value of 0.024 ,95% CI: 0.480–0.921), and chi square 5.129 meat handling practices, thus meat hygiene procedures is generally low among meat handlers in the study area, highlighting the need for strengthened training, supervision, and enforcement of hygiene standards. Which was also resonated well in FGD discussion

, “We know hygiene procedures are important, but in many cases, we do not have access to proper packaging materials other than paper envelopes at the workplace. Many consumers also do not come with plastic or aluminum made up packaging, which makes it difficult to maintain proper hygiene.” FGD discussion held on 23 /3/2026

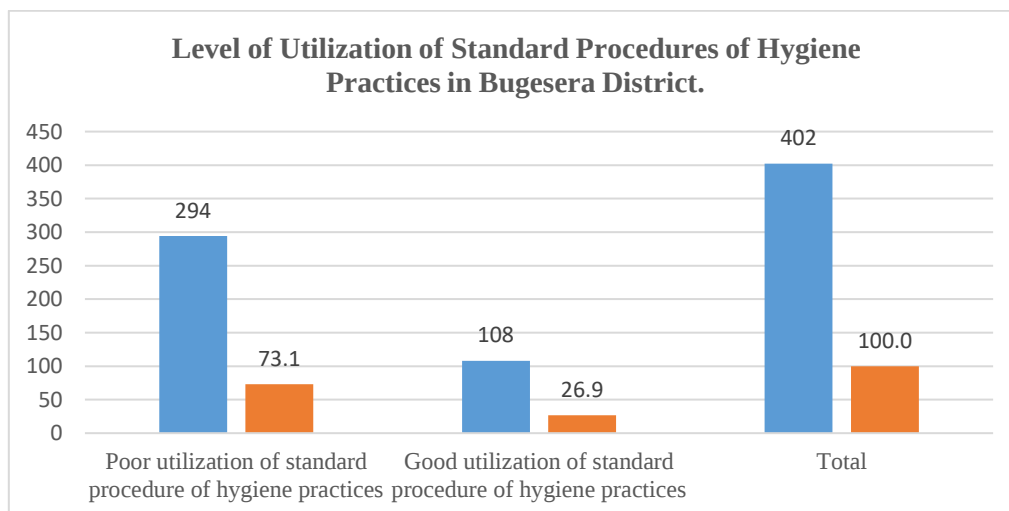


Figure 4.6: level of Utilization of standard procedures of hygiene practices in Bugesera District.

4.5 Knowledge, Attitude, and Practice of Meat Handlers and Consumers Associated with Quality Meat Hygiene Handling in Bugesera District, Rwanda.

Study finds out that most respondents showed good knowledge of meat hygiene: (394) 98% knew that dirty equipment can cause contamination and (396), 98.5% knew contaminated meat can cause illness, while 270 (92.3%) knew that healthy-looking people can carry foodborne pathogens. Additionally, 283 (70.4%) knew that storing raw meat at room temperature increases bacterial growth, though 105 (26.1%) were unsure. However, knowledge of the correct refrigerator storage temperature was low, with 221 (55.2%) not knowing the recommended temperature and only 125 (31.3%) correctly identifying $\leq 4^{\circ}\text{C}$.

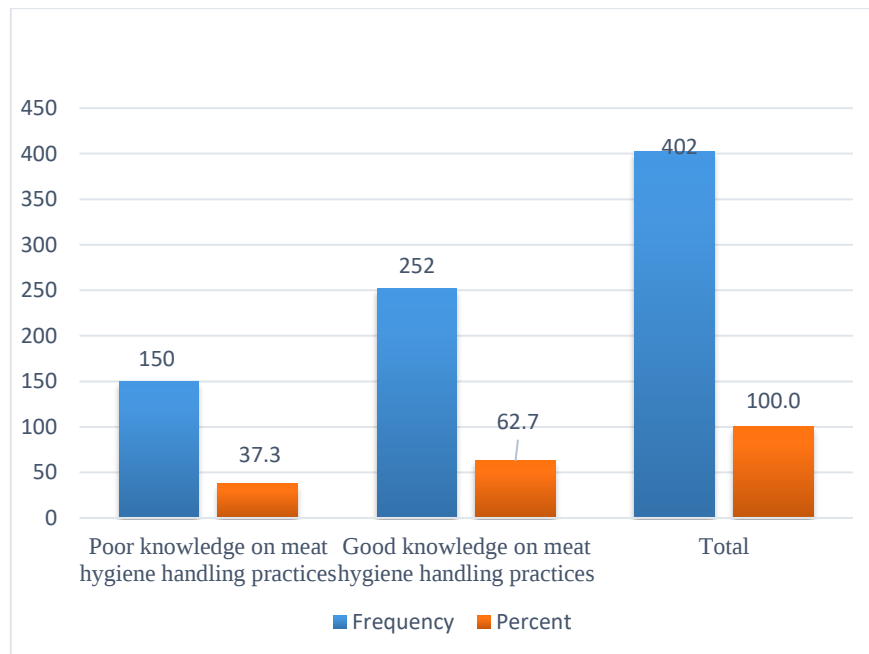


Figure 4.15 Level of Knowledge of meat handlers and consumer on quality meat hygiene handling practice. X axis is distribution and y axis frequency and %

The result demonstrated that meat handlers and consumer in Bugesera district have good knowledge of meat hygiene handling practices. Out of 402 participants, 252 (62.7%) had good knowledge, while 150 (37.3%) had poor knowledge. This indicates that although the majority have adequate knowledge, a considerable proportion still lack sufficient knowledge on meat

The study revealed that, in terms of hygiene awareness, only 90 (22.3%) always washed their hands, while 184 (45.6%) never washed their hands, and 69.1% only sometimes washed their hands.

PPE use was low, with 370 (92.1%) not wearing aprons, 209 (51.8%) not wearing rubber boots, and 358 (88.5%) not wearing hair nets. Additionally, 46% handled money and meat without washing hands or changing gloves, indicating poor overall hygiene practices among meat handlers.

This was also re-echoed during the KII discussion: “Those who have never attended personal hygiene training often do not know the correct procedures.” KII helds 16/ 3/26

Attitude of meat handlers and consumers associated with quality meat hygiene handling in Bugesera District, Rwanda.

The majority of respondent agreed that using PPE is essential for safe meat handling 390 (96.5%) and that good hygiene practices increase customer trust and business 390 (96.5%). A high proportion also agreed that veterinary inspection is necessary even when animals appear healthy 356 (89.1%) and that cold storage is an effective way to prevent meat spoilage 366 (91%). However, about half of the respondents 205 (51%) felt that hygiene regulations are too strict and difficult to follow, indicating a perceived challenges to compliance despite significant protective association on of RR (0.50 0.49) with P value of 0.0023 attitudes toward hygiene practices.

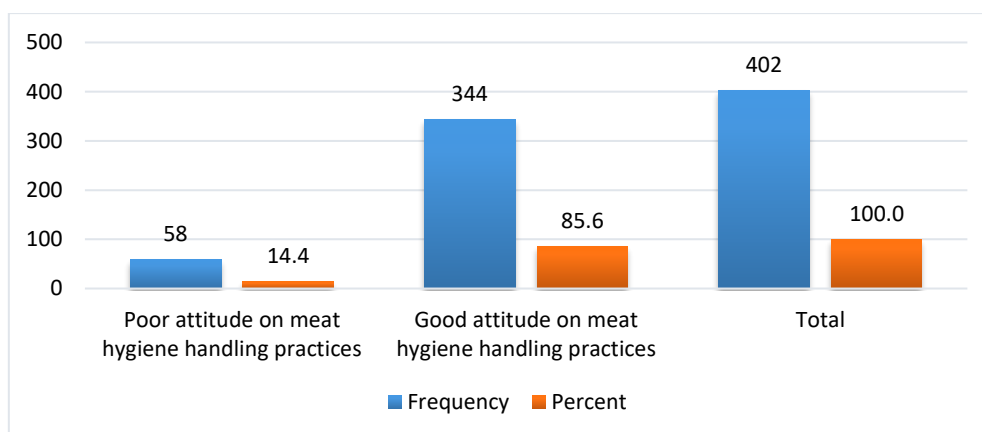


Figure 4.15 level of attitude of meat handlers and consumer on quality meat hygiene handling practice. X axis frequency and % and Y axis is the values attitude on meat handling

The figure shows that most respondents had a good attitude toward meat hygiene handling practices. Out of 402 participants, 344 (85.6%) demonstrated a good attitude, while only 58 (14.4%) had a poor attitude. This indicates that most meat handlers and consumers have positive perceptions toward proper meat hygiene practices.

5 Conclusions

Based on the findings of this study, several conclusions were drawn.

First, the utilization of standard hygiene procedures among meat handlers in Bugesera District remains inadequate. Critical gaps exist in the use of personal protective equipment, proper hand hygiene before meat handling, and prevention of cross-contamination.

Fourth, although knowledge and attitude toward meat hygiene were generally good, these did not automatically translate into safe practices. This highlights the importance of continuous training, supervision, and enforcement of hygiene regulations.

Overall, improving meat hygiene handling practices is essential to protect public health and reduce the risk of food-borne diseases in Bugesera District.

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