

# Knowledge, Attitude And Practices (KAP) Regarding Meat Safety And Sanitation Among Carcass Handlers Operating At The Yaoundé Slaughterhouse, Cameroon.

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**Abstract:** Meat handlers like butchers constitute the main vehicles of microbial contamination of fresh meat and may also be asymptomatic carriers of food-borne pathogens. This study was aimed at evaluating the knowledge, attitude and practices concerning meat safety and sanitation among carcass handlers in Cameroon. Structured written questionnaire, interviews and observations were used to assess the knowledge, attitude and practices on meat safety and sanitation among carcass handlers at the Yaoundé abattoir upon informed consent and ethical clearance by the Cameroon Bioethics Initiative (CAMBIN). Fifty-one out of 100 people working at the Yaoundé abattoir participated to the study. Though the mean scores for carcass handlers' attitude and practice were averagely acceptable (54.69 and 53.12% respectively), that of knowledge was poor (49.02%). There was significant negative relationship between knowledge level and the education level but positive association between the carcass handlers' attitude and knowledge levels ( $p < 0.05$ ). However, there was no significant correlation between practice and knowledge and between practice and attitude ( $P > 0.05$ ). Findings from this study reveal the importance for developing adequate intervention measures during carcass processing to minimise public health risks. In fact, the respondents' scores indicated a need for formal training on meat safety and sanitation as well as the need to improve available facilities and routine practices. In addition, the frequent occurrence of gastro-enteritis among the personnel of the Yaoundé abattoir poses a strong and urgent appeal for foodborne disease surveillance and control at the abattoir level aimed at increasing food safety in the Cameroonian food chain.

**Keywords:** Carcass handlers; KAP; Meat safety; Yaoundé slaughterhouse.

## 1. Introduction

Many factors such as poor hygiene and sanitation in food establishments such as the slaughterhouses contribute greatly to an increased incidence of food-borne diseases [1]; [2]; [3]; [4]. Meat handlers like butchers working at the abattoirs may not only constitute the main vehicles of meat contamination but may also be asymptomatic reservoir of foodborne microorganisms [5]; [6]; [7]. No matter how stringent the codes of good manufacturing practices can be, if personal hygiene is not adequately observed, the risk of contamination

of carcass remains very high at the abattoir. For this reason, special attention must be given to personal hygiene to ensure safe foods for the consumers [8]. As a result, each food handlers should maintain a good level of personal hygiene and personal cleanliness but wears adequate and clean personal protective equipment [8]. On the other hand, sick food workers may play the role of the disease carrier if they do not take a sick leave until a complete recovery or stay on the job while sick [9]; [10]. As far as the Yaoundé abattoir is concerned, the implementation of good hygienic practices will be successful only if the carcass handlers and the

abattoir staff have a good knowledge of personal hygiene and good production practices. Despite the fact that slaughter process and meat handling are critical points and present many opportunities for cross-contamination of carcass with foodborne pathogens, the knowledge, attitude and practices of butchers have rarely been investigated in Cameroonian slaughterhouses. At the Yaoundé abattoir, with the exception of the veterinarians on duty, carcass handlers who may be illiterate in their great number may not have a good understanding of their implication in the microbial contamination of carcass throughout the slaughter process. This study was aimed at shedding light on the knowledge, attitude and practices concerning meat safety and sanitation [11] among carcass handlers at the Yaoundé slaughterhouse as well as the general hygiene and critical aspects for meat safety at abattoir level.

## 2. Material and Methods

### 2.1. Study design and participants

A cross-sectional study was conducted at the Yaoundé abattoir and targeted 100 employees. The participants included butchers (involved in the slaughtering operations and handling carcasses), car drivers (assigned to transport carcasses from the abattoir into various vending sites) and cleaners. Structured written questionnaire, interviews and observations were research techniques used to assess the knowledge, attitude and practices on meat safety and sanitation procedures. The questionnaire had six distinct parts: socio-demographic profile of the respondents, knowledge, attitudes and practices of food hygiene among carcass handlers, prevalence of gastro-enteritis among carcass handlers and the investigators' assessment of the personal hygiene of butchers and carcass transporters and the general level of sanitation of the Yaoundé slaughterhouse. The information on the socio-demographic characteristics of the carcass handlers focused on the region of origin, age, gender, level of education, experience at work, and job description (Table 1).

**Table 1:** Socio-demographic profile of carcass handlers operating at the Yaoundé abattoir

Variables	n (%)
<b>Regions</b>	
Northern	39 (76.5)
Others	12 (23.5)
<b>Age (years)</b>	
Youths (15-32)	29 (56.9)
Adults (> 32)	22 (43.1)
<b>Education level</b>	
Lower (illiterate, primary school)	39 (76.5)
Higher (secondary & tertiary)	12 (23.5)
<b>Experience level</b>	
Inexperienced ( $\leq$ 1 year)	4 (7.8)
Experienced (> 1 year)	47 (92.2)
<b>Job description</b>	
Butchers/ Carcass transporters	44 (86.3)
Others	7 (17.65)

On the other hand, information of knowledge of respondents on food safety (10 questions) mainly assessed their knowledge on the importance of personal hygiene and risk of carcass contamination during meat handling. Participants had the choice to answer the 10 questions 'True', 'False', 'Do not know'. The section on 'attitude' of respondents regarding food safety and sanitation had also 10 questions to which carcass handlers could answer 'Agree', 'Disagree', or 'Uncertain'. For knowledge and attitude section, the correct or "agree" answers were converted to 100% and marks below 50% were considered low knowledge or attitude, 50-74.99% were considered acceptable knowledge and attitude and marks equal to 75% and above were read excellent knowledge and attitude. The practice section consisted of 10 questions. Respondents were asked to answer 'Yes' or 'No'. The marks were converted to poor (below 50%) and good (50% and above) practice. Section five of the questionnaire focused on the cases of gastro-enteritis among carcass processors and handlers at the Yaoundé abattoir. Moreover, section six described the investigators' assessment of personal hygiene level of carcass handlers as well as the general sanitation level of the abattoir on the basis of six items (System of waste disposal, treatment of wastes, use of disinfectant, existence of cooling facilities, control of visitors, carcass handlers' personal hygiene and the general cleanliness in the abattoir). The overall hygiene level of the abattoir was graded either fair, very fair, poor or very poor. This questionnaire was developed and structured following the modification of the previously described by ones [12]; [13]; [4]; [14]. The questionnaires were distributed to respondents and filled in by face-to-face interviews by two experienced veterinary nurses. The purpose of this survey was clearly explained to the participants and confidentiality guaranteed. Ethical clearance was granted by the Cameroon Bioethics Initiative (CAMBIN).

### 2.2. Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics 20. The relationship between the socio-demographic profile of carcass handlers and their KAP levels was determined using Chi-square. Statistical significance for all tests was set at the level of  $p \leq 0.05$  using descriptive statistics

## 3. Results

### 3.1 Socio-demographic profile of carcass handlers operating at the Yaoundé abattoir

Out of 100 butchers only 51 accepted to respond to the questionnaire. Most of the carcass handlers (76.5%) operating at the Yaoundé abattoir were from Northern part of the country (Far-North, North, and Adamawa regions) probably due to the fact that the northern regions of Cameroon constitute the main agro-pastoral sites of the country. The mean age of meat handlers was 30, reflecting the characteristics of the general Cameroonian population dominated by youths. Moreover, all the participants (100%) were males and most (76.5%) had low education level. The majority of the participants (92.2%) were experienced workers (they had worked more than one year). Based on job description, most of the respondents were butchers or carcass transporters (86.3%). No formal training had been given to the meat handlers.

### 3.2 Knowledge, attitude and practices of respondents on carcass safety and sanitation

Tables 2-4 show the KAP results of the carcass handlers. The mean scores for correct answers related to carcass handlers' knowledge, attitude and practice were 49.02, 54.69 and 53.12% respectively. Though meat handlers generally had acceptable attitude and poor hygiene practices towards meat safety and sanitation, they exhibited low knowledge levels generally. In fact, despite 51% and 84.3% of respondents had correct answers to questions pertaining to hand touching as a risk of contamination and hand washing as means of reducing carcass contamination, their general knowledge on other sanitisation procedures such as wearing hand gloves and wearing protective clothing was very low (only 3.9% and 11.8% correct answers respectively). Hand washing was practiced by 84% of respondents. On the other hand, close to 96.1% of the interviewees gave incorrect answers to the question regarding the use of dedicated vehicles for carrying carcasses (Table 2). Participants' knowledge on risk factors such as coughing/sneezing or being on duty while experiencing gastro-enteritis/diarrhoea surprisingly varied between acceptable and excellent (varying between 51 and 96.1% correct answers).

**Table 2:** Carcass handlers 'knowledge on food hygiene and sanitation

Statements	% Correct answers
Hand touching is a risk for carcass contamination	51.0
Coughing/ sneezing during slaughtering is a risk for carcass contamination	51.0
Working while experiencing gastro-enteritis is a risk for carcass contamination	96.1
Eating/drinking during slaughtering is a potential risk for carcass contamination	49.0
Gastro-enteritis can be transmitted via contaminated carcass	70.6
Washing hands before handling carcasses reduces the risk of contamination of carcass	84.3
Wearing hand gloves during handling carcasses reduces the risk of contamination of carcass	3.9
Wearing protective clothing while working reduces the risk of contamination of carcass	11.8
Car used for transporting carcasses into vending sites must be refrigerated	3.9
Car used for transporting carcasses into vending sites is used only for this purpose	68.6

The majority of meat handlers had positive attitude on most of the sanitisation aspects such as keeping working environment clean (washing the abattoir and its facilities and as well as cars used for transporting carcasses into vending sites) and hand hygiene (Table 3). However, at least 96.1% of them disagreed about wearing hand gloves, protective clothing and masks. In addition, 56.9% of carcass handlers showed their disagreement about the importance of disinfecting the abattoir facilities and equipment as a mean to reduce the risk of carcass contamination.

**Table 3:** Carcass handlers 'attitude toward food hygiene and sanitation

Statements	% Agree	% Uncertain
Washing hands before and during slaughtering operations	86.3	0.0
Wearing gloves during/after slaughtering operations	3.9	0.0
Wearing protective clothing during slaughtering	7.8	0.0

operations		
Wearing mask during slaughtering operations	3.9	0.0
Washing the abattoir area before slaughtering operations	100	0.0
Washing the abattoir facilities before slaughtering operations	98.0	0.0
Disinfecting facilities is important in reducing risk of contamination of carcass	43.1	56.9
Not reporting to work when experiencing diarrhoea/gastro-enteritis	100	0.0
Washing car used for transporting carcasses into vending sites	100	0.0
Only using refrigerated car for transporting carcasses into vending sites	3.9	0.0

Majority of carcass handlers who kept the working environment clean and washed hands before slaughtering operations had good hygienic practices. Unfortunately, only 4 to 8% wore hand gloves, masks or protective clothing when hands were washed or wounds not covered (Table 4).

**Table 4:** Carcass handlers 'practices toward food hygiene and sanitation

Statements	% Yes
Do you use hand gloves during slaughtering operations or while handling carcasses	3.9
Do you wear protective clothing during slaughtering operations/while handling carcasses	7.8
Do you wear mask during slaughtering operations	3.9
Do you eat/drink during slaughtering operations	72.5
Do you wash hands/cover wounds with water-proof dressing before handling carcasses	84.3
Do you wash the abattoir/facilities before slaughtering operations	100
Do you use potable water for washing the abattoir/facilities before slaughtering operations	100
Do you use to wash the car used for transporting carcasses into vending sites	100
Do you use refrigerated car for transporting carcasses into vending sites	3.9
Do you use this car for transporting carcasses only	100

Moreover, whereas 72.55% ate or drank during slaughtering operations, only 4% used refrigerated cars for transporting carcass into various vending sites. Where respondents had low score for knowledge, they had also negative attitude and performed poor hygiene practices; for example, since a good number of carcass handlers (51%) did not know that eating/drinking during slaughtering operations could increase contamination, the majority of them (72.55%) had bad hygiene practice on this aspect. Statistically, knowledge level and almost all of the socio-demographic profile of the respondents were not significantly related (Table 5).

**Table 5:** The relationship of carcass handlers 'knowledge level and their socio-demographic characteristics

Variables	Knowledge level			X <sup>2</sup>	P	Prevalence ratio (CI)
	Acceptable	Excellent	n			
<b>Region</b>						
Northern	21	18	39	0.460	0.523	1.633 (0.441-6.047)
Others	5	7	12			
<b>Age</b>						
Youths	15	14	29	0.903	1.00	1.071 (0.354-3.246)
Adults	11	11	22			

			2			
<b>Education</b>						
Lower	16	23	39	0.01	0.019*	0.139 (0.027-0.722)
Higher	10	2	12			
<b>Experience</b>						
Experienced	26	21	47	0.034	0.051	2.238 (1.628-3.076)
Inexperienced	0	4	4			
<b>Job description</b>						
Butchers/transporters	24	20	44	0.202	0.248	3.00 (0.525-17.159)
Others	2	5	7			

A significant negative correlation ( $P < 0.05$ ) between knowledge level on food safety and sanitation practices and the education profile of meat handlers revealed that an increase in education level did not increase knowledge level. Despite no significant influence of working experience on the knowledge levels of carcass handlers on food safety and sanitation ( $P > 0.05$ ), the excellent knowledge level of inexperienced meat handlers was higher than that of the experienced ones (100% against 80.8% respectively). Results in Table 6 show a significant association between the carcass handlers' attitude and their meat safety knowledge ( $p < 0.05$ ). Table 7 reveals no significant relationship between practice and the socio-demographic parameters of the participants. This infers that knowledge, education, working experience and attitude levels of respondents did not have any impact on their practice levels on meat safety and sanitation.

### 3.3 Cases of gastroenteritis among butchers

Responses of the butchers indicated that 31.4% of carcass handlers had experienced gastro-enteritis against the majority (68.6%) who did not have it. Despite the majority of respondents (37.5%) had experienced gastro-enteritis years, 6.25% of them have been experiencing this symptom every year. Moreover, 12.5% of meat handlers were reporting to work even when they were experiencing gastroenteritis.

**Table 6:** The relationship of carcass handlers' attitude level, and their socio-demographic characteristics and knowledge level

Variables	Attitude level		n	X <sup>2</sup>	P	Prevalence ratio (CI)
	Acceptable	Excellent				
<b>Region</b>						
Northern	18	21	39	0.193	0.315	2.571 (0.603-10.967)
Others	3	9	12			
<b>Age</b>						
Youths	11	18	29	0.589	0.774	0.733 (0.238-2.260)
Adults	10	12	22			
<b>Education</b>						
Lower	17	22	39	0.528	0.739	1.545 (0.398-6.003)
Higher	4	8	12			
<b>Experience</b>						
Experienced	20	27	45	0.493	0.634	0.450 (0.044-4.652)
Inexperienced	1	3	4			
<b>Job description</b>						
Butchers/trans	17	27	44	0.35	0.42	0.472

porters				5	7	(0.094-2.375)
Others	4	3	7			
<b>Knowledge level</b>						
Acceptable	17	9	26	0.00	0.001*	9.917 (2.596-37.879)
Excellent	4	21	25			

### 3.4 The investigators' assessment of the general hygienic level of the slaughterhouse

Based on the investigators' assessment, the general hygienic level of the Yaoundé abattoir was below Codex Alimentarius recommendation. This may be due to the lack of the following important sanitary facilities: treatment of wastes, chilling room, controlled entry of visitors into the slaughter area. It was observed that access of visitors to the slaughterhouse was done without any restriction. Visitors could enter the abattoir without wearing hand gloves or protective clothes. Analysis of questionnaire revealed the absence of a chilling room. The waste management system of the study area was also very poor. With the exception of the animal bones that underwent some treatment (grinding into powder), other animal wastes such as blood and fecal wastes were discharged untreated into river-streams.

**Table 7:** Relationship between practice & socio-demographic profile & knowledge & attitude

Variables	Practice level			X <sup>2</sup>	P Value	Prevalence ratio (CI)
	Poor	Good	n			
<b>Region</b>						
Northern	24	15	39	0.748	1.00	0.800 (0.205-3.125)
Others	8	4	12			
<b>Age</b>						
Youths	17	12	29	0.484	0.566	0.661 (0.205-2.114)
Adults	15	7	22			
<b>Education</b>						
Lower	25	14	39	0.718	0.743	1.276 (0.340-4.780)
Higher	7	5	22			
<b>Experience</b>						
Experienced	30	17	47	0.583	0.623	0.567 (0.073-4.394)
Inexperienced	2	2	4			
<b>Job description</b>						
Butchers/transporters	29	15	44	0.241	0.402	2.578 (0.509-13.046)
Others	3	4	7			
<b>Knowledge level</b>						
Acceptable	15	11	26	0.447	0.565	0.642 (0.204-2.017)
Excellent	17	8	25			
<b>Attitude level</b>						
Acceptable	12	9	21	0.489	0.563	0.667 (0.211-2.106)
Excellent	20	10	30			

## 4. Discussion

The hand hygiene (hand washing) practiced by 84% of respondents is one of the most encouraging results of this study as hands of food workers such as butchers are considered as a principal route of food cross contamination [13] and critical aspect of any restriction measure for food safety [15]. A significant negative correlation between knowledge level on food safety and sanitation practices and

the education profile of meat handlers revealed that an increase in education level did not increase knowledge level. Similarly, studies carried out in Ghana, Iraq and Trinidad and Tobago reported that the educational level had no considerable influence on the food safety knowledge of food workers [16]; [17]; [18]. Moreover, in a recent study published by [19], despite an improved overall knowledge score among those with tertiary education, food handlers with lower education levels outperformed those with higher education on many aspects of food safety and sanitation. Despite no significant influence of working experience on the knowledge levels of carcass handlers on food safety and sanitation ( $P > 0.05$ ), the excellent knowledge level of inexperienced meat handlers was curiously higher than that of the experienced ones (100% against 80.8% respectively). Relatively closer to our findings, [18] reported a weak and indirect association between the work experience of food handlers and their food safety knowledge. They concluded like us that the inexperienced workers had higher knowledge on food safety issues than their colleagues who had more experience. It could be that the inexperienced meat handlers were more conscious about preserving their jobs, and so could show more diligence in listening to the instructions related to food safety and sanitation. In addition, the age factor did not significantly influence the knowledge of food handlers on food safety as concluded also by [17]. Results in Table 6 show a significant relationship between the carcass handlers' attitude and knowledge levels ( $p < 0.05$ ). This result is in line with the findings of [20], [2] and [21] who reported positive association between knowledge and attitude ( $p < 0.001$ ). This may underline that improved knowledge will lead to behavioural changes of food handlers. However, this is not always true; for example: though 70.6% of carcass handlers knew that pathogens could be transmitted via contaminated carcass, only 4% agreed to wear hand gloves. In fact, many previous studies support this thesis by demonstrating that increasing knowledge does not necessarily lead to positive changes of attitude (e.g. [22]). Attitude, which is a state of mind relative to a way of thinking or being (<http://wordnet.princeton.edu>) may be influenced by convictions rather than knowledge. Table 7 reveals no significant relationship between practice and the socio-demographic parameters of the participants. This infers that knowledge, education, working experience and attitude levels of respondents did not have any impact on their practice levels on meat safety and sanitation. Good knowledge and attitude does not necessarily lead to good hygiene practice, as reported among others by [2]. This lack of positive correlation between knowledge and practice and between attitude and practice may be due to limited financial resources (cost of buying protective clothes, hand gloves, etc). On the other hand, this discrepancy may likely be attributed to theory cognitive dissonance theory, which admits inconsistencies between attitude and action [23]. Based on this theory, humans are susceptible to exhibit inconsistencies between actions and attitudes and recognition of this inconsistency causes some discomfort (dissonance) that needs to be resolved. In the course of resolving this dissonance, if people do not change their attitude, they will change either their actions or the perception of their action. In addition to the actual inconsistencies between knowledge/attitudes and practices, respondents may also be likely to underreport practices that they recognise as "risky" in terms of food safety [24]. The high prevalence and

frequent occurrence of gastro-enteritis illustrates a strong and urgent appeal for systematic screening among the Yaoundé abattoir personnel in particular and personnel of slaughterhouses across the nation in general. It is interesting to notice that 12.5% of meat handlers were reporting to work even when they were experiencing gastroenteritis; this negative attitude, while being linked to the lack of sick leave scheme, underlines also an urgent need for specific training courses for food safety managers and handlers, including an evaluation process to ensure its effectiveness. Analysis of questionnaire revealed the absence of a chilling room. Storing carcass in the chilling room is naturally intended for slowing down microbial growth. At the Yaoundé abattoir, slaughter starts at midnight but meat retailers arrive at the slaughterhouse to buy meat around 8 am. Consequently, carcasses are exposed at room temperature for about 7 hours before delivery. Proliferation of pathogenic bacteria under this conducive environment is highly expected. The waste management system of the study area was also very poor and associated with several public health concerns. In fact, animal wastes such as blood and fecal wastes were discharged untreated into river-streams. Consequently, the resulting adverse health implications may include spread of infectious diseases and degradation of the quality of the urban and natural environments by biological and chemical pollutants.

## 5. Conclusion

In conclusion, this study contributes to the understanding of the current situation in one of the most important abattoirs in Cameroon and the related public health risks, indicating the need for improved facilities and formal training on food safety and sanitation in order to improve meat safety at the Yaoundé abattoir. It appears from the present research work that KAP study of food handlers in general and that of meat handlers in particular is just a step towards understanding their views. Other strategies including psychological factors that affect their behaviour and practices should be explored.

## 6. Acknowledgments

This study benefited from materials supplied by the CMR/6010 project, which was sponsored by the International Atomic Energy Agency (IAEA) for the account of the Food and Nutrition Research Centre, Institute of Medical Research and Medicinal Plants Studies, Yaounde, Cameroon. We thank Dr Mohamadu Bawe for facilitating the distribution of questionnaires and Mr Felix Kammoe for the statistical analysis of data.

## 7. Conflict of interest statement

The authors declare the absence of any financial and non-financial conflicts of interest.

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### Author Profile



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