

# Knowledge of Hygienic Quality of Meat Products and Their Consumption by the Population of Sarh (CHAD)

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**Abstract** In the interest of guaranteeing food safety and human health, the hygiene of meat products is not to meet the needs of consumers. Hygiene knowledge and the way of processing and consumption in households are very important. Our study aims to evaluate and analyze the safety of meat products and their consumption in the city of Sarh. A survey was conducted on 114 people including 20 people in slaughterhouses, 37 people in households, 43 people in markets, and 14 people in restaurants. The maximum age of respondents is 71 years old and the minimum age is 18 years old. Data was entered under Excel software and XL-STAT software. According to an analysis of the data, the results show that in households and restaurants the surveyed population has an acceptable knowledge of hygiene of meat products that the population surveyed in markets and slaughterhouses smoked fish is much more consumed, 59,47% of the population consume at least three times a week. Descriptive statistics allowed us to have the dispersion parameters (mean, standard deviation, extreme, and frequency) and analysis of variance (ANOVA). Was performed to compare the averages. The comparison with the Newman-Kuls test at the 5% threshold. The effects of significance are described as significant ( $p < 0,05$ ) and insignificant ( $p > 0,05$ ). In households, 72,97% of the population consumes fish, and 59,46% of smoked fish. In the market, 34,88% of people surveyed are sellers of fresh meat, 30,23% are sellers of smoked fish, and 9,30% are sellers of dried meat.

**Keywords:** hygiene of meat products, food hygiene, processing, consumption

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## 1. Introduction

The protection of public health remains a central concern of veterinarians. The quality of meat products is very important to guarantee human health in the first place and animal health in particular. To offer healthy products for consumption, many researchers have conducted studies on the hygienic quality and the establishment of transformation and treatment methods for long-term conservation, and their sale on the market in consumption with consumer demand and their specific needs.

The lack of means and equipment for the treatment and transformation of meat products, this transformation and treatment remain archaic in the city of Sarh, these products are consumed fresh, smoked, or dried except for

boxes of preserves. Fish and meat are also consumed by grilling in specific points and restaurants.

The fish is smoked or dried for preservation as well as the meat, the processing of these products is done according to the traditional method which constitutes a significant saving and a significant source of protein for the consumer [1].

Fish is produced in greater quantities in the city of Sarh than meat, compared to market prices the smoked and dried fish is consumed much more by the population. Tins are consumed less and this is due to the abundance of fish on the market. Are these meat products safe for consumption?

Meat products constitute a nutritional contribution to human consumption but these meat products constitute an adequate medium for microorganisms such as *Escherichia coli* [2].

During and after slaughter, the hygiene of these meat products must be enhanced to guarantee the health of consumers [3].

The general objective of this work is knowledge of the quality of meat products and their consumption by the population. The specific objectives are as follows:

- Evaluate the risks of contamination of meat products;
- Evaluate the hygiene of the production and processing structures at the points of sale and the consumption of meat products in the city of Sarh.

This work is divided into two parts:

- The first part is the bibliographical synthesis;
- The second is the experimental part.

## 2. Material and Methods

### 2.1. Equipment

#### 2.1.1. Geographic Location of the City of Sarh

The studies and research were carried out in the city of Sarh located in the south-east of the country about 150 km from the border of the Central African Republic, the city of Sarh, formerly Fort Archambault, is the capital of the Moyen Chari region. and the Department of Bahr Koh.

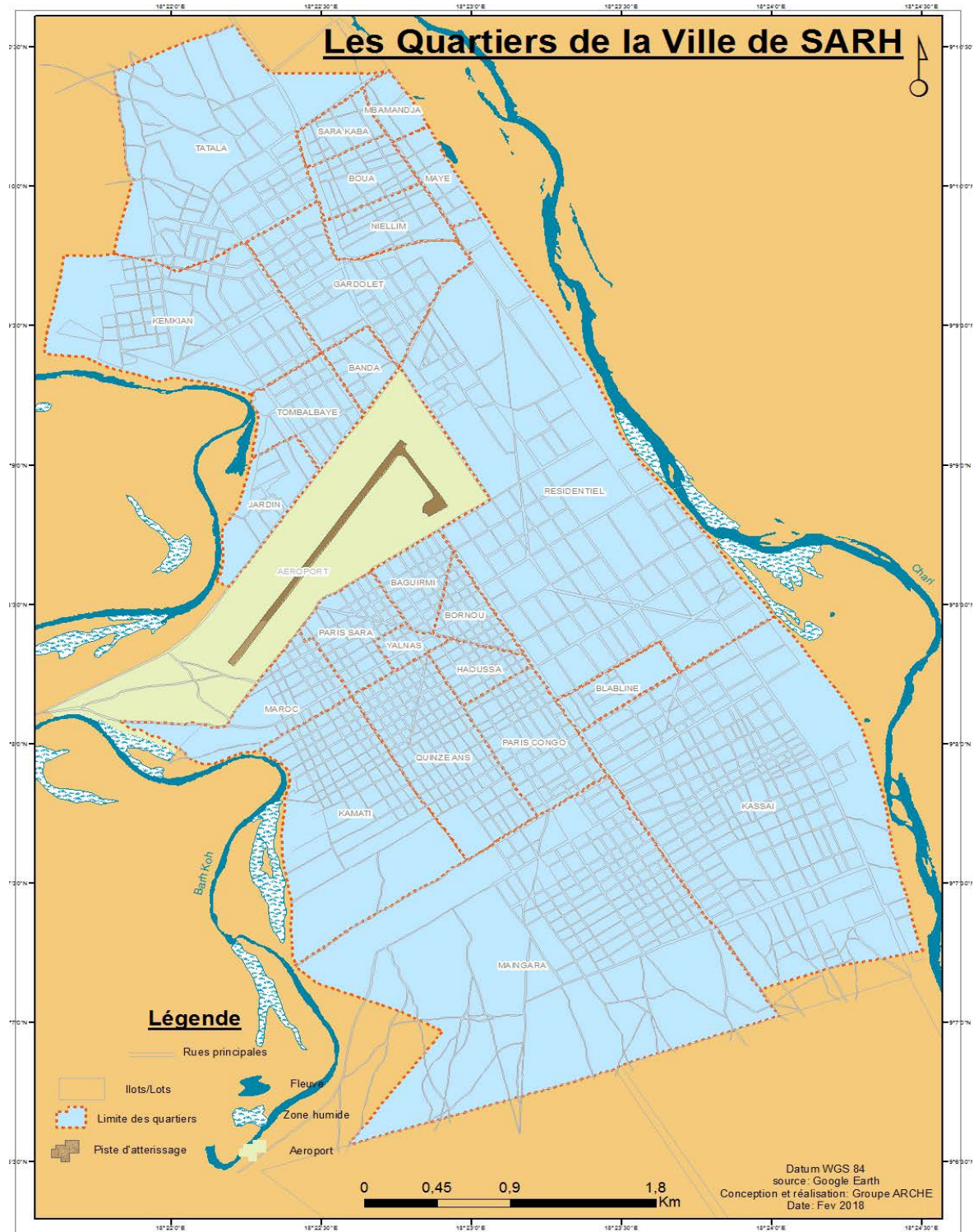


Figure 1. Map of the city of Sarh (source: 2011 urban development support plan)

Geographically, it lies between 9°13 North latitude and 18°23 East longitude. Framed to the east and west by two rivers, the Chari and the Bahr-Koh, the city, which was built in a vast floodplain, can only extend to the north and the South. It extends partially over 12Km from north to south and covers an area of approximately 3,000 ha. The average altitude oscillates around 370m [4].

### 2.1.2. Sarh Slaughterhouses

Facilities for slaughtering domestic animals and handling meat for human consumption

- Bégou slaughterhouse

The slaughterhouse is located at the exit of the town of Sarh, towards Kyabé a few meters after the NSTT (Nouvelle Société Textile du Tchad). The slaughter takes place in a closed building divided into three (3) a slaughter room for large ruminants, a slaughter room for small ruminants, and one for washing the viscera every day from 5 a.m. to 9 a.m. The veterinary staff at the slaughterhouse consists of a technician and a trainee. The establishment does not meet the standards even if it is built, and the rule of ISHIKAWA (5 M) is not respected.

- Kassai slaughter area

Located southeast of the town of Sarh in the Kassai district, the slaughter is carried out in a sheet metal shed with a slaughter track, the staff is composed of a veterinary officer. Slaughtering takes place from 6 a.m. to 9 a.m. Hygiene is not respected at the Kassai slaughter area.

### 2.1.3. Trade

Trade in the city of Sarh is dominated by the informal sector. It is an activity practiced by men, women, and young people. It brings together traders from the formal sector (shopkeepers, food stores, hardware stores, etc.) and informal (retail vendors located in markets, street vendors, etc.).

Market facilities: markets, bus stations, livestock markets, slaughterhouse

The market facilities of the city of Sarh are made up of the central market, other neighborhood and livestock markets, slaughterhouses, bus stations, etc.

#### 2.1.3.1. Meat Products sold in These Markets and Neighborhoods

The meat products sold in these markets and the neighborhoods are among others:

##### A. Meat

Dried, fresh, and in the market and neighborhood grills (grilled meats) of multiple origins: camelina, bovine, sheep, and goat. For preservation, in the town of Sarh, the meat is dried in an archaic way in the sun, the dried meat is commonly called "Charmoute" in local Arabic, in some households the meat is smoked for preservation.

Pork is sold in neighborhoods and on the streets.

##### B. Pisces

The fish are sold fresh, dried, and smoked in the markets and districts of the city of Sarh, in the restaurants the fish is grilled, and in the cafeterias, the fish is prepared as a soup.

Fish ranks first in household consumption and is a very important source of protein for consumers.

##### C. Cans

Tin cans also complement household food, they are sold in markets, shops, and food stores.

##### D. Broilers

Much more sold in restaurants and meat grills.

### 2.1.3.2. Surveys

The survey is based on the rules of ISHIKAWA (of five M) and carried out against specific sheets which can be found in the appendix.

## 2.2. Methods

### 2.2.1. Types of Studies

The study aims to study the impropriety of meat products, the processing methods of meat products, and their consumption in households in the city of Sarh. The ISHIKAWA rule is used to characterize these products and their organoleptic qualities.

### 2.2.2. Study Population

The study was carried out throughout the city of Sarh, in households, consumer cases, markets, restaurants, and major city streets.

### 2.2.3. Sample Size

The method used for the sampling is non-probability and the selection is made at random in streets, neighborhoods, markets, households, and public places for men and women aged at least 18 years. The LORENZ formula is used for determining the sample size:

$$n = \frac{z^2 * \hat{p}(1 - \hat{p})}{\varepsilon^2}$$

n ≡ sample size.

Z ≡ the value in the normal curve corresponding to the level of Confidence, 95% = 1.96.

p = expected prevalence = 50%

q = (1-p) not expected prevalence = 50%

d = margin of error = 0.05

This is the value of the distribution of Z corresponding to the risk  $\alpha$ . This value corresponding to a 95% confidence level is 1.96. The estimated sample size is 80 people including households, vendors, restaurateurs, and men in the street.

### 2.2.4. Study Process

All dialogue begins with a greeting, a presentation of the interviewer to the interviewee then an explanation of our purpose of the visit, the purpose of the study, and telling the respondent how long our interview can take after a mutual agreement we can already pull out our survey sheet then start the interview. At the end of the interview, a brief contribution in the form of sensitization on the hygiene of meat products is brought to the survey.

## 2.3. Animal Slaughter Processes

### 2.3.1. Reception and Housing of Animals

Reception helps determine the character and appearance of the animal upon arrival, characters and appearances may be normal or abnormal. A rest period is observed by the animals on their arrival to allow the veterinarian to analyze and compare the characters and aspects of the animal before and after rest. Animals intended for

slaughter are put on a water diet at least 24 hours before slaughter to reduce contamination of the carcass by microbial flora, which was not the case in the slaughterhouses studied.

#### 2.3.1.1. Ante-mortem inspection

Observation and analysis of the behavior of animals intended for slaughter are called "ante-mortem inspection" inspection, animals considered abnormal, that is to say sick, are excluded from slaughter.

#### 2.3.1.2. Driving animals to slaughter

It must be done according to the rules of the art to avoid trauma and injury to animals so as not to have consequences on the nature of the carcasses or their contamination.

#### 2.3.2. Bleeding

The opening of the jugular vein is called the bleeding the non-respect of the processes and the lack of hygiene can lead to petechiae in the muscles and the rapid denaturation of the carcass, the bleeding on the ground can also lead to the contamination of the carcass.

#### 2.3.3. Dressing and Opening of the Abdomen

The risk of contamination is very high if hygiene is not respected, the meat is in contact with the outside environment, and soiled work equipment can cause contamination of the carcass by the microbial flora of the contents of the casings.

#### 2.3.4. Post-mortem Inspection

When the meats are subjected to sanitary control at the time of slaughter, the classic post-mortem inspection procedures are a priori, well applied in the sense that all of

the carcass and the elements of the 5th quarter undergo an anatomopathological examination. complete, including lymph node examination. In the event of anomalies or lesions, the parts deemed unhealthy is seized immediately; recourse to the deposit for additional examinations is not applied due to lack of means (absence of a cold storage room, absence of a laboratory Moreover, even if the live animal is subjected to a summary clinical examination, the sanctions of the ante-mortem inspection (rest and water diet, isolation of sick or suspect animals) cannot be applied due to this fact. that the animals are slaughtered immediately on their arrival at the slaughterhouse and also because of the absence of stabling rooms and a sanitary barn.

#### 2.3.5. Survey

Our survey sheet (appendix) contains several questions per well-specified sheet which enabled us to collect data. The sheet was developed using a Word spreadsheet. These questions enabled us to assess the level of education, age, and knowledge of the hygiene of meat products, and professional activities, and to highlight socio-demographic characteristics.

Our survey aims to find out:

- The hygienic practice and handling of meat products.
- Household consumption of meat products
- The way of preserving meat products
- Hygiene of meat products sales environments.

#### 2.3.6. Data Processing and Statistical Analysis

Word and Excel 2013 which allowed us to enter and do descriptive statistics and the comparison was performed using Analysis of Variance (ANOVA).



Figure 2. meat show



Figure 3. ANNEXE 2 : L'aire d'abattage de KASSAI

### 3. Results and Discussion

#### 3.1. Slaughterhouse



Figure 4. meat Inspection at BEGOU slaughterhouse (source [5])



Figure 5. meat Inspection at BEGOU slaughterhouse (source [5])

##### 3.1.1. Sociodemographic Characteristics of the Study Population

In the two slaughterhouses, 20 people have surveyed whose Maximum age is 50 years, the Minimum is 18 years and the average of this age group is 32.70, which gives 95% male and 5%. female sex. For the level of study, 45% have a primary level, 35% Koranic level, 15% secondary level, and 5% Superior level.

Table 1. Sociodemographic characteristics of the population in slaughterhouses

nature	modality	number	%
gender	male	19	95,00
	Female	1	5,00
Level of studies	Primary school	9	45,00
	Koranic school	7	35,00
	Middle and High school	3	15,00
	Graduate	1	5,00
Age			
Minimum	Average	Maximum	Standard deviation
18,000	32,700	50,000	2,221

##### 3.1.2. Assessment of Knowledge of Food Hygiene at the Slaughterhouse Level

In the slaughterhouses, the study population has archaic work equipment, and the washing of the workplace and materials is done by everyone after each operation.

Table 2. Assessment of knowledge of food hygiene at the slaughterhouse level

Nature	Modality	number	%
Work equipment	yes	20	100,00
washed after each operation	Yes	20	100,00
Easy to wash	no	20	100,00



Figure 6. washing of offal at the slaughter area of KASSAI (source [5])



Figure 7. washing of offal at the slaughter area of KASSAI (source [5])



Figure 8. washing of offal at the slaughter area of BEGOU (source [5])



Figure 9. washing of offal at the slaughter area of BEGOU (source [5])

## 3.2. Housework

### 3.2.1. Sociodemographic Characteristics of the Study Population in Households

In households, 37 people have surveyed whose maximum age is 50, the minimum age is 20, and the average is 34.027 with a standard deviation of 1.384. Of the 37 respondents, 72.97% are female and 27.03% are male. We have four levels of education, 40.54% have a secondary education level, 32.43% have a primary education level, 21.62% have a higher education level and 5.41% have a level of Koranic study.

Table 3. Sociodemographic characteristics of the population in households

nature	modality	number	%
gender	male	27	72,97
	Female	10	27,03
Level of studies	Primary school	2	5,41
	Koranic school	12	32,43
	Middle and High school	15	40,54
	Graduate	8	21,62
Age			
Minimum	Average	Maximum	Standard deviation
20,000	34,027	50,000	1,384

Type of product consumed in households

Of the 37 households surveyed, 72.97% per day in households consume fish and 27.03% consume meat.

Figure 13: Type of product consumed in households

Characteristics of products consumed in households

Smoked fish is consumed a lot in households with a percentage of 59.46% which shows in the table below.

Table 4. Characteristics of products consumed in households

Nature	Modalities	number	%
Most consumed	Fresh fish	1	2,70
	Smoked fish	22	59,46
	Dried fish	4	10,81
	Fresh meat	9	24,32
	Dried meat	1	2,70
	Fresh fish	11	29,73
Less consumed	Smoked fish	4	10,81
	Dried fish	12	32,43
	Fresh meat	1	2,70
	Smoked meat	7	18,92
	Fresh fish	1	2,70
	Dried fish	1	2,70

### 3.2.2. Supply of meat products to households

Households were randomly selected from different neighborhoods, according to statistical analysis 91.89% of households source meat products from markets.

Figure 4 and Figure 5 supplies of meat products.

### 2.2.3. Household-level Food hygiene Knowledge Assessment

The table shows us that 54.05% of people surveyed in households do not wash their hands before touching meat products, 89.49% rewash their hands before cooking and 97.30% wash their hands after washing before handling. meat products, 100% of households surveyed wash kitchen utensils.

Table 5. Assessment of knowledge of food hygiene at the household level

Nature	Modality	Number	%
Hand washing before touching the product	no	20	54,05
	Yes	17	45,95
Rewash hands before cooking	no	5	13,51
	Yes	32	86,49
lavage des mains après toilette	no	1	2,70
	Yes	36	97,30
Washing of kitchen equipment	yes	37	100,00
	No	0	0

The table below shows us that 100% also reuse these same utensils for other operations, cook meat foods well before consumption and keep the products away from insects and rodents, 67.57% separate them. meat products of other products.

Table 6. Knowledge of food hygiene at household level

Nature	modality	Number	%
Keep out of insects, rodents and others	yes	37	100,00
	no	0	0
Separation of meat products from other products	no	12	32,43
	yes	25	67,57
Reuse of materials and utensils for other	Yes	37	100,00
	No	0	0
Cook food well	yes	37	100,00
	no	0	0

## 2.2.4. Food Storage in Households



**Figure 10.** Transportation of meat by the rickshaw, Motorcycles and Tricycles (source [5])



**Figure 11.** Transportation of meat by the rickshaw, Motorcycles and Tricycles (source [5])



**Figure 12.** Transportation of meat by the rickshaw, Motorcycles and Tricycles (source [5])

According to data collected from households, 94.59% of households surveyed do not reheat already cooked food before serving, 83.78% do not keep food hot after cooking and do not refrigerate food after cooking, the kitchen.

**Table 7. Assessment of household food preservation knowledge**

Nature	Modality	Number	%
Cook food well	Yes	37	100,00
	no	0	0
Reheat already cooked food before serving	No	35	94,59
	Yes	2	5,41
Hot food maintenance after cooking	no	31	83,78
	Yes	6	16,22
Refrigeration of food after cooking	No	31	83,78
	Yes	6	16,22

## 3.3. Market

### 3.3.1. Sociodemographic Characteristics of the Study Population in the Markets

The maximum age of people surveyed in the markets is 71, the minimum age is 18 with an average of 34.372 and a standard deviation of 1.757. In terms of education, 58.14% of respondents have a primary level of study, 20.93% have a level of Koranic study, 18.60% have a secondary level of study, and 2.33% n 'have no level of education.

**Table 8. Sociodemographic characteristics of the population in the markets**

Nature	Modality	Number	%
Gender	Male	26	60,46
	Female	17	39,53
Level of studies	None	1	2,33
	Koranic school	9	20,93
	Primary school	25	58,14
	Middle and high school	8	18,60
Age			
Maximum	Average	Minimum	Standard deviation
71,000	34,372	18,000	1,757

### 3.3.2. Type of Products Sold in Markets

Of the 43 people surveyed in the markets, 53.49% of respondents are sellers of fish (dried, fresh or smoked), and 46.51% are fish sellers.

### 3.3.3. Characteristics of the Products Sold in the Markets

Of the 43 people surveyed, 34.88% are sellers of fresh meat, 30.23% are sellers of smoked fish, 20.93% of fresh fish, 9.30% are sellers of dried meat, and 4, 65% are sellers of dried fish.

The products are placed on the table, in the cuvettes, in the bags, or in others. 46, 51% of the products are displayed on the tables, 39.53% are displayed in the cuvettes, 11.63% of the products are displayed in the bags, and 2.33 in other containers.

Of the products surveyed, 13.95% have changed color and odor, that is to say in the process of putrefying.

**Table 9. Characteristics of products sold in markets**

Nature	Modality	Number	%
Nature of sold products	fresh meat	15	34,88
	Fresh fish	9	20,93
	Smoked fish	13	30,23
	Dried fish	6	4,65
	Dried meat	4	9,30
	Other	1	2,33
Where the products are stored	bowl	17	39,53
	bag	5	11,63
	table	20	46,51
The product has changed color	no	37	86,05
	yes	6	13,95
The product has changed smell	No	37	86,05
	Yes	6	13,95

### 3.3.4. Assessment of Hygiene Knowledge of Meat Products on the Study Population in the Markets

In the studied population, 97.67% of the studied population wash the surface in contact with the product, 83.72% wear clean clothes, and 72.09% of the studied population do not wear specific clothes, we note the presence of flies around meat products which are sold on the market at a percentage of 62.79%

**Table 10. Assessment of knowledge of meat products hygiene in the study population in the markets**

Nature	modality	Number	%
Wearing clean clothes	no	1	2,33
	Yes	42	97,67
Wearing specific clothes	no	7	16,28
	yes	36	83,72
Presence of flies around products	no	31	72,09
	yes	12	27,91
Washing of surfaces in contact with the product	no	16	37,21
	yes	27	62,79

## 3.4. Restaurant

### 3.4.1. Sociodemographic Characteristics of the Study Population in Restaurants

We have 14 people were surveyed in restaurants including 64.29% of grill points, 21.43% of taverns, and 14.29% of restaurants. There are 71.43% male and 28.57% female. The level of education of the study population is distributed as follows: 35.71% have a level of Koranic study, 28.57% have a primary or secondary level of study, and 7.14% have no level of study.

**Table 11. Sociodemographic characteristics of the study population in restaurants**

Nature	Modality	Number	%
Gender	Female	4	28,57
	Male	10	71,43
lieu de travail	foodie	3	21,43
	Grill point	9	64,29
	restaurant	2	14,29
	None	1	7,14
Level of studies	Koranic school	5	35,71
	Primary school	4	28,57
	Middle and high school	4	28,57

### 3.4.2. Transformation Structures and Their Environments

On the grill points, restaurants, and study restaurants, 92.86% of their ventilation is natural and 14.29% of the structures have natural type toilets, of which 7.14% of these toilets are 10m away. and 7.14% are 24m away.

**Table 12. Transformation structures and their environments**

Nature	Modality	Number	%
type of restaurant ventilation	Artificial	1	7,14
	Natural	13	92,86
Presence of toilets	no	11	78,57
	Yes	2	14,29
type of toilet	Natural	2	14,29
	non	12	85,71
Distance between product and toilet	10 m	1	7,14
	24 m	1	7,14

**Table 13. Environmental hygiene practice in restaurants**

Nature	Modality	Number	%
Sweeping of the ground	Yes	14	100,00
	no	0	0
How many times a day	1	12	85,71
	2	2	14,29
lavage du sol	no	13	92,86
	Yes	1	7,14
Disinfected soil	no	14	100,00
	yes	0	0

### 3.4.3. Structures of Meat Products Processing

The table below shows us that 85.71% of the processing structures surveyed do not have running water, the water is paid for by itinerant carriers, we note the presence of domestic animals in a proportion of 28.57%, the state of the kitchen is acceptable at 71.43%, not acceptable at 14.29% and satisfactory at 14.29%.

**Table 14. Transformation structures of meat products**

Nature	Modality	Number	%
Presence of water	No	12	85,71
	yes	2	14,29
Presence of domestic animals	No	10	71,43
	yes	4	28,57
Estate of the kitchen	acceptable	10	71,43
	not acceptable	2	14,29
	Satisfying	2	14,29
Hot food kept warm	No	5	35,71
	yes	9	64,29

## 4. Discussion

### 4.1. Socio-demographic Characteristics of the Studied Population

The age of the population studied in the city of Sarh is between 20 years to 40 years in slaughterhouses, 20 years to 50 years in households, and 18 years to 70 years in markets. Our results in slaughterhouses and households are similar to those of Malley (2001), De Jong [6], and Doutoum et al [7] who found the age of the population to be between 16 and 50 years old. Our results are different from those of Gueye [8] on a fairly old population with an age range between 25 years and 60 years, while in the



markets, our results are similar to those of Gueye (1981) whose population studied is quite old with an age range between 25 years and 70 years.

#### 4.2. Assessment of Knowledge of Food Hygiene at the Slaughterhouse Level

The slaughter area or meat preparation establishments do not meet hygienic standards. Our results are similar to those obtained by Hadjer [9] and Zakaria [10] in Chad; on the other hand Langtar [11] found fairly acceptable results.

Our results on knowledge of hygiene in slaughterhouses are superior to those of Langtar [11]: 20% and 80% in Chad as well as those of Doutoum et al [7].

#### 4.3. Characteristics of products Consumed in Households

The products consumed in the household are characterized by: fish (dried, smoked, and fresh), meat (dried, smoked and fresh). According to statistics, smoked fish is consumed a lot in the city of Sarh.

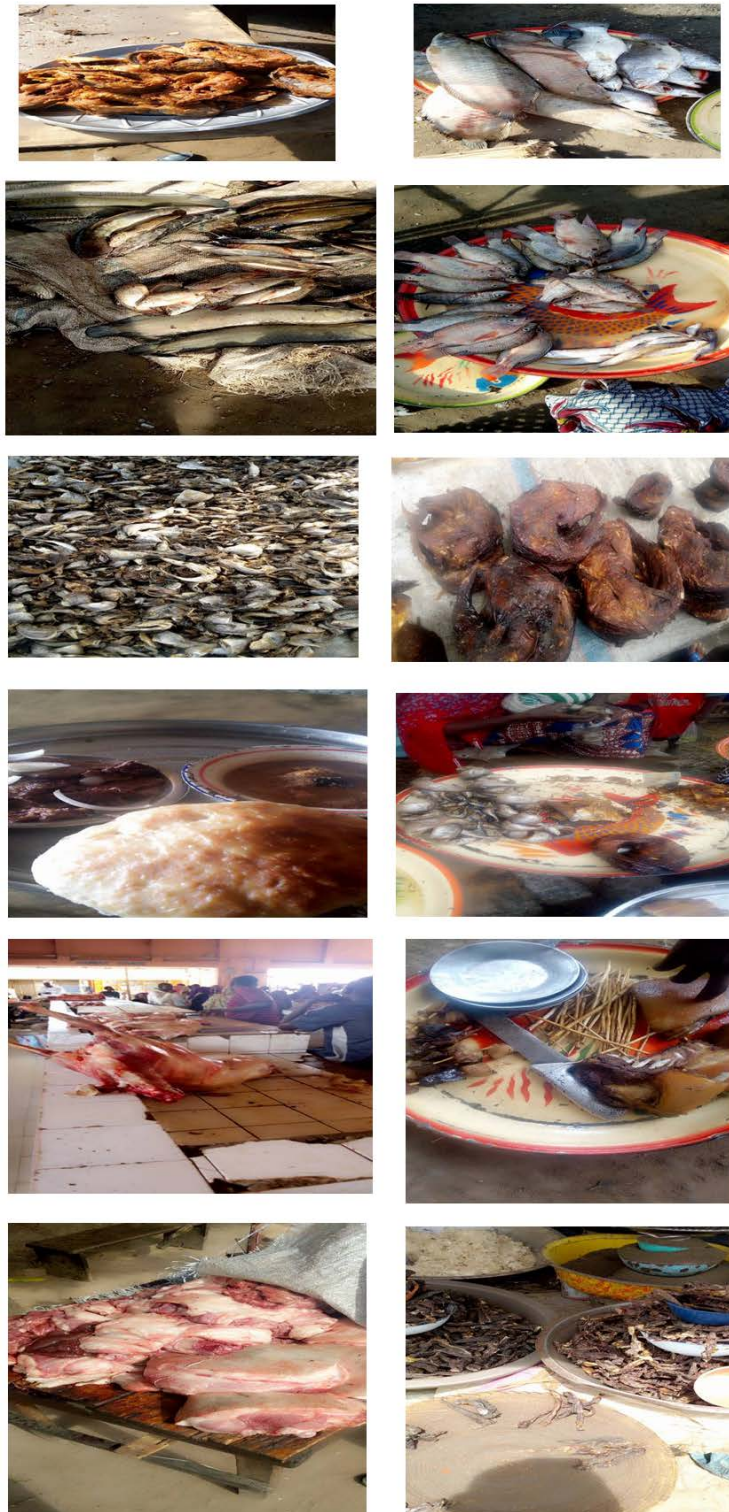


Figure 13. show of meat and products (source [5])

#### 4.4.4. Knowledge of Food Hygiene for Meat Products in Households

The households surveyed have an acceptable knowledge of the hygiene of meat products.

#### 4.4.5. Supply of Meat Products in Households

Meat products such as fish and meat are purchased both from resellers in markets and urban producers (sea fishermen, lagoons, and poultry farmers), our results are similar to those obtained by FAO in 2007.

#### 4.4.6. Assessment of Knowledge of Food Preservation in Households

Our results showed that in households in the city of Sarh, most households, meat products are not stored in refrigerators, the products are prepared immediately after purchase at points of sale, and hygiene and conservation of food in households are not acceptable, this is due to lack of means, lack of electricity and awareness raising on the conservation of food after cooking.

#### 4.4.7. Sociodemographic Characteristics of the Study Population in the Markets

In the markets, 58.14% of the respondents have a primary education level which is caused by the early abandonment of lessons by girls and boys due to lack of means which leads us to say that in the city of Sarh, the level of study of the population studied in the markets is not acceptable, these results are comparable to those of Doutoum et al [3].

#### 4.4.8. Characteristics of the Products Sold on the Markets

Meat products in the markets of Sarh city are dominated by fish and meat of multiple natures. Statistics show us that fish ranks first in city markets followed by meat.

#### 4.4.9. Assessment of Knowledge of Meat Products Hygiene in the Market Study Population

The hygiene of the materials and containers used for the sale of these meat products in the markets is acceptable, but the hygiene of the products is not acceptable, we note the presence of flies around these products and these products are without covers. These observations are similar to those of Mayore et al [1].

Our results are similar to those obtained by Kebede [12] in Cameroon. Langtar [11], Hadjer [9] and Doutoum et al [3] in Chad, reported that foods sold by men are often safer than those sold by women (72% versus 30%).

On the other hand, Musengarurema [13] in Rwanda found that hygiene is quite satisfactory regardless of the gender. These observations were also made by Diarrassouba [14] in Cameroon.

#### 4.4.10. Processing Structures and Their Environments in Restaurant

The processing structures (the taverns, the grill points and the restaurants) are built of well-structured brick, some of which are sheet metal and we also have the sheds made of sheet metal or straw. Some of these structures

have more or less distant traditional type toilets. Structuring and arrangement of toilets in meat processing structures are acceptable, these results are different from those of Attamar [15] who reported the absence of these structures.

#### 4.4.11. Environmental Hygiene Practice in Restaurants

Environmental hygiene in restaurants is satisfactory. Our results do not agree with those of Tidjani et al. [16] in Chad as well as those of Redmond) Doutoum et al [17] reported that food is unsafe for women than for men.

#### 4.4.12. Structures of Transformation of Meat Products

Our results showed that most kitchens in restaurants do not have running water. Environmental hygiene for processing meat products is acceptable, unlike the results of Doutoum et al [3] on work carried out in Abéché.

### 4.5. Suggestions

Much remains to be done on the hygienic level of meat products to guarantee the safety of consumers. From the slaughterhouse to the point of sale, meats, steakhouses, fish products, and poultry must be covered to protect against the risk of contamination.

#### Slaughterhouse

To provide quality meat for consumption:

«Ante-mortem inspection should be introduced in slaughterhouses.

- Training of technicians to clarify the purpose of inspection at slaughter points.
- Construction of an adequate slaughter structure for the preparation of meat.
- Requirement for butchers to carry out medical examinations and have a medical record to avoid contamination of meat by butchers and laborers in the event of zoonotic diseases.
- Water permanently for washing the carcass and the elements of the 5th quarter.
- Prohibition of washing the carcass with water from the CHARI river
- Wearing specific clothing, boots, and gloves when working in slaughterhouses.
- Inspection of pigmeat by the veterinary services is to be established.

#### Consumers

The consumer is the most exposed to intoxication and contamination from meat products and therefore to this fact.

The consumer must demand quality.

Consumers only have to pay for controlled and stamped products.

### 4.6. Outlook

For a good mastery of the hygiene of meat products, the training of food control officers and the awareness of the population is very important.

The strict control of meat products will allow us to make healthy products available to consumers.

Knowledge of microbial proliferation from the preparation to the points of sale and households will allow us to take adequate measures to eliminate this proliferation.

Equipping preparation and processing places with specific equipment and materials will allow us to avoid microbial contamination and good conservation of meat products.

The establishment of specific means of transport is necessary.

## 5. Conclusion

The population explosion in the world was the cause of the food crisis. People face food challenges, and eating habits have changed around the world and in Chad in particular. This change gave rise to overproduction and the birth of various establishments and places of sale of these food products, including meat products. These processed meat products or sold in certain places can be a source of intoxication if hygiene is lacking.

The studies were carried out in the city of Sarh, of which 114 people were surveyed in households, restaurants, markets, and establishments intended for the preparation of these meat products on the hygiene of meat products and their consumption in the city of Sarh. 45% of people surveyed in slaughterhouses have a primary education level, in households, 40.54% of the population have a secondary education level and 5.41% have a Koranic education level. In the markets, 58.14% of people surveyed have a primary education level and 2.33% have no education level. 72.97% of households consume at least fish per day, and 59.46% of smoked fish. 91, 89% of households obtain meat products from the markets, and 97.30% wash their hands after washing before handling the meat products. Households have an acceptable knowledge of meat product hygiene. In the markets 58.14% of the people surveyed have a primary education level, 53.49% are sellers of fish, 97.67% wash the surface in contact with the product, 83.72% wear clothes that are clean and 72.09% do not wear specific clothes and there is the presence of flies around the 62.79% of meat products sold in the markets. % of men and 28.57% of women, 35.71% have a level of Koranic study and 7.14% have no level of study, 14.29% of structures have natural type toilets, 85,71% clean the floor twice a day, the kitchen is in fair condition.

The results showed that the population studied in households and restaurants has an acceptable knowledge of hygiene than that studied in slaughterhouses and markets.

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