

Preservation, contamination, and prevention of food diseases by consumption of meat from the Lubumbashi's market

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Abstract

Street food sales are a common business practice in most South African cities. It is held by young people whose age varies between 20 and 40 years with a sales experience of 6 to 10 years for the most part. Poultry meat was the best-selling meat ahead of beef and goat meat. These resellers drew information on meat preservation from their colleagues and freezing was the most widely used way to lengthen the life or avoid meat losses. Changes in color and odor were the main signs of alteration, the main causes of which were power cuts and exposure to sunlight (freezing and regular defrosting). The lack of compliance with sanitary measures only using disinfectant, hand washing, glove wearing and water to wash equipment and a healthy environment has had a negative impact on meat handling practices plus a lack of training on meat preservation. This exposes consumers to diseases. The latter, although aware of the risk of consumption of street meats, consume them mainly by habits and financial constraints and by the fact that it is nearby. From the above, it should be noted that poor preservation and handling of meat in Lubumbashi and that health promotion on food safety is recommended for meat dealers and education for consumers.

Keywords: Meat; Preservation; Contamination; Consumption; Food; Diseases

1. Introduction

In developing countries, the risks of food contamination are both present at home and at vendors but with a higher risk of contamination of street food (1). According to the WHO, the global burden of food-borne illness is estimated at 600 million people, nearly one in 10 people falls ill each year because of eating contaminated food and 420,000 die (2). Even in developed countries, a third of the total population is likely to suffer from food-borne illnesses each year, 70% of which are linked to the consumption of contaminated food (2-4). The continent of Africa and South-East Asia is considered to have the highest incidence and mortality rates associated with food-borne diseases (5).

The risks to the health of consumers are related to the contamination, survival, and multiplication of pathogenic microorganisms, which can access food through many routes, reflecting poor hygiene conditions throughout the process, such as exposure to ambient temperature, storage conditions, handling, and distribution at the place of sale.(6).

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The purpose of this work is to evaluate the level of knowledge, attitude, and practice on the preservation of meat by retailers(es) of different markets as well as on the risk of consumption of street meat by the population of the city of Lubumbashi.

2. Methodology

This is a cross-sectional descriptive study carried out in the Democratic Republic of Congo specifically in the province of Upper Katanga case of the city of Lubumbashi . It took place in two phases: A pre-survey phase which consisted of testing the questionnaire for validation. The pre-test of the questionnaire was conducted with 50 randomly selected individuals. As a result, unnecessary questions have been removed, others have been modified and used to evaluate the knowledge, attitude, and practice of the meat conservation respondents.

The interview was conducted based on a structured questionnaire consisting of open-ended and preformed closed questions to the population of the city of Lubumbashi (questionnaires on the risk of eating street meat) having freely accepted to answer our questions as well as to the dealers of the meat (questionnaires on the preservation of the meat marketed in the market of Lubumbashi.

After having carried out the quality control on its consistency of collected data, we will proceed to the codification of certain (open-ended) questions. Data encoding and analysis using Epi Info 7.3.

3. Results

3.1. Meat sellers

Table 1 Quiz Acceptance Rates

Quiz	Contact person	Acceptance	Rate in %
Resellers	196	163	83.16
Consumers	142	129	90.84

Our questionnaires aimed at consumers or meat retailers were accepted at the rate of 90.84% and 83.16% respectively; and this acceptance rate to answer our questions approaches the results of Azanaw J, Engdaw GT, Dejene H in their studies in the city of Gondar, northwest Ethiopia with an acceptance rate of 98% (7) as for . Tuglo Lset al carried out in the district of North Dayid, Ghanades respondents with an acceptance rate of 96.2%(8)

3.2. Meat preservation

Table 2 Distribution of sellers by age and year of experience in meat sales

Age group	Frequency	Percentage	Year sales experience	Frequency	Percentage
< 20	3	1,84	1 - 5	46	28,22
20– 30	45	27,61	6– 10	68	41,71
31– 40	83	50,92	11– 15	16	9,82
> 40	32	19,63	16 – 20	14	8,59
			>20	19	11,66
Total	163	100	Total	163	100

The respondents to our meat preservation questionnaire are retailers, most of whom are over 20 years old (98.16%), the same finding in the study of Aduah M et al in Ghana, in this study the majority of RTE meat sellers and consumers were male (97.7% and 71.7%), aged 21 to 40 years (77.3% and 65.4%) and had basic education (73.7% and 54.2%)(9) with more than 5 years of experience in selling and preserving meat (41.71%). EtAdesokan and Raji (10) et al believe

that age, sex, education, and work experience were significantly associated with the level of safe handling of meat by meat handlers which is the opposite in our survey, in which; we find that despite the sales experience, the safety of handling is not guaranteed.

At our retailers, poultry meat was the most sold (43%), followed by beef (26%), then goat (23%) and pork (8%) this situation of Lubumbashi is by far the opposite of that observed in the East of the country in which, the results of the frequency of meat consumption showed that beef was the most consumed product, goat and pig meat were also widely consumed. The least consumed meats were chicken and rabbit (11). And the dealers have passed information on the preservation of meat between them, either 139 cases or 70.91% of cases. As at Sulleyman et al. (12) found that most meat sellers had information on meat safety from relevant stakeholders,

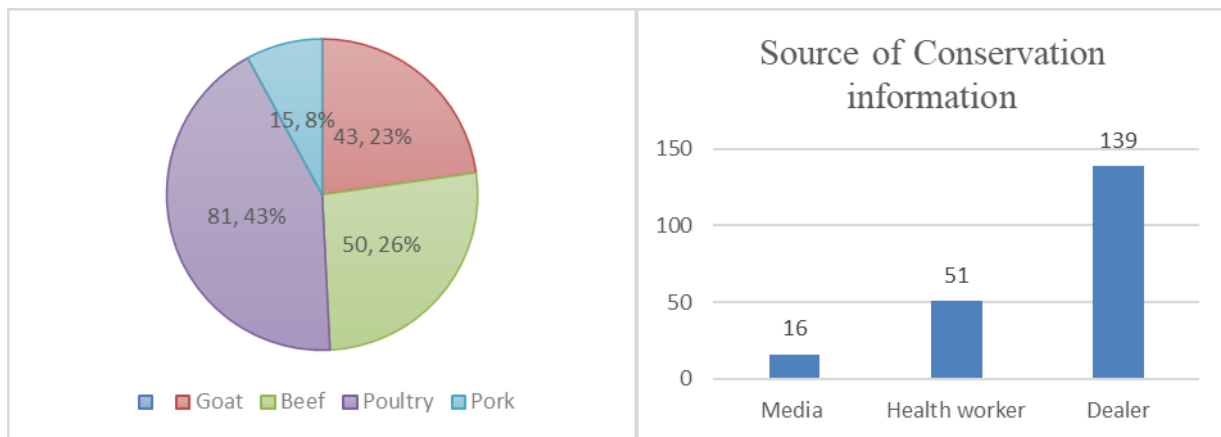


Figure 1 Types of meat and source of preservation methods

The most widely used method of preservation is freezing (83.16%) and only 6.12% of resellers believe they use preservation methods to preserve the health of the consumer, whereas most believe it is necessary to extend the life of the meat and avoid losses. It is true that food preservation involves modifying the inherent properties of the product, mainly the pH and water activity (A_w), to inhibit the growth of pathogenic microorganisms, molds, and spores (13). However, such an alteration in the intrinsic properties of the product means that it is no longer considered “fresh”, a term generally preferred by consumers to be associated with their diet (14), particularly as regards meat products,

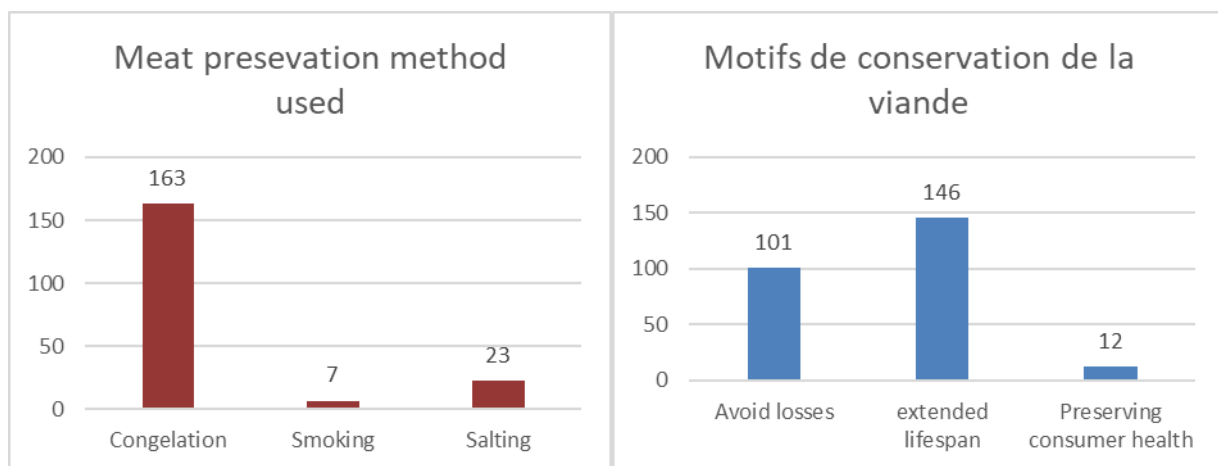


Figure 2 Methods and reasons for preserving meat.

Freezing is widely used by the meat industry as a method of preservation during transport and storage. Nevertheless, freezing may adversely affect the same quality characteristics that it was intended to preserve, resulting in products that do not satisfy consumers(15), Delgado(16) considers that for freezing, the total time it takes for a product to reach the specified freezing temperature at the thermal center is called effective/standard freezing time and as meat products vary in size and shape, and therefore the freezing rate also varies considerably between products; what our salespeople didn't take into account. Reason why many vendors use processing methods using preservative additives (17-20)

Although freezing is one of the most traditional meat preservation processes, it is used to increase the shelf life of meat by inhibiting microbial growth and reducing chemical and enzymatic reactions (21) and to preserve their nutritional properties and initial sensory characteristics (22). In frozen meat products, physical-chemical and biochemical activities are slowed down, causing loss of nutrients, changes in color, texture, and undesirable flavors (23).

The change of color is the most followed sign by retailers to recognize spoiled meats and castigate the untimely cuts in power supply as well as the exposure of meat to sun rays as the main causes of meat products are subject to microbial deterioration and chemical reactions which can negatively affect certain aspects of meat quality, such as its color, texture, and flavor (24)

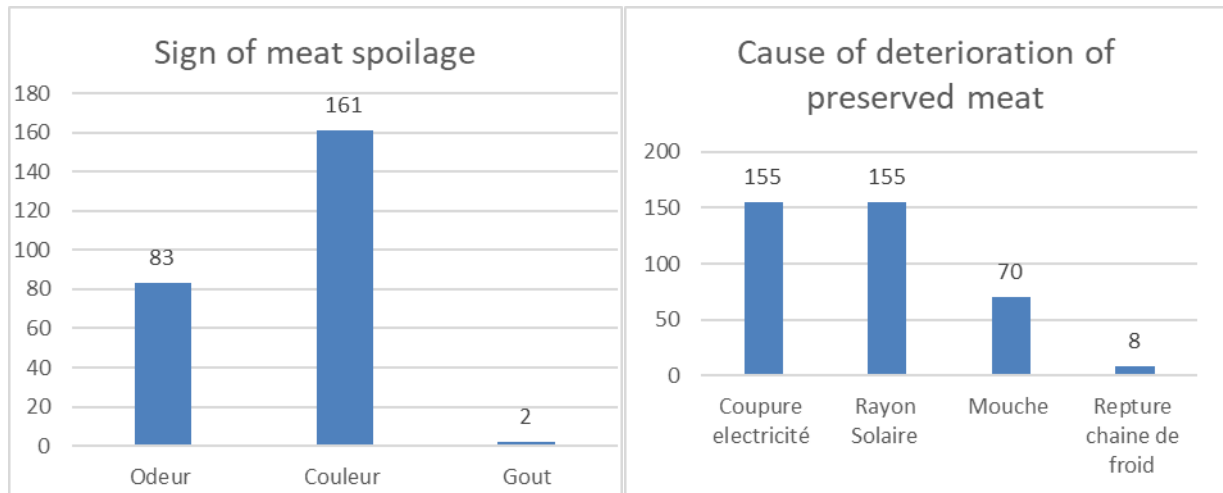


Figure 3 Signs and causes of meat spoilage despite preservation.

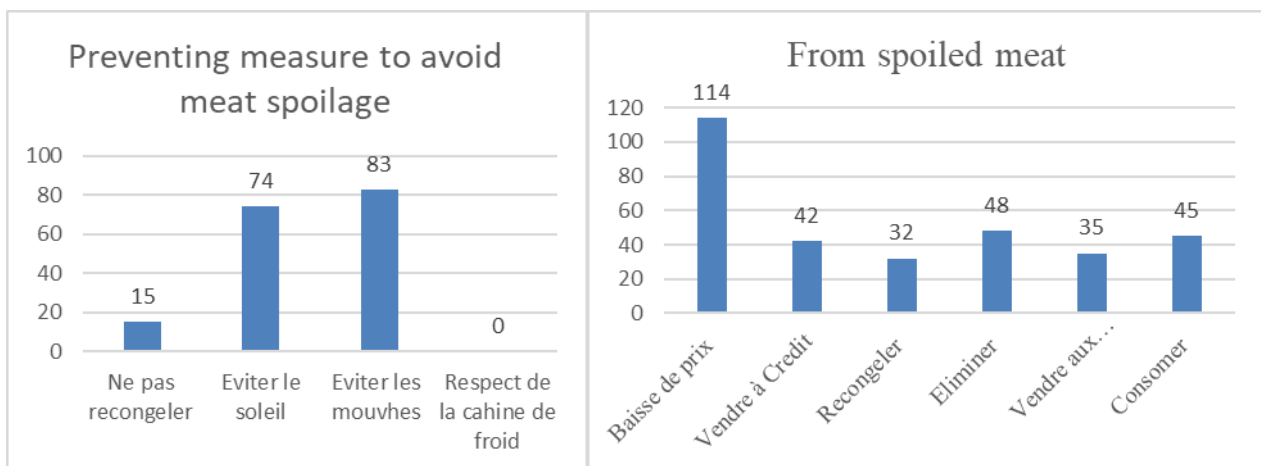


Figure 4 Measures to prevent spoilage of meat and meat products.

As for the preventive measures used to prevent damage, is it simply to avoid sun rays and flies and to a lesser extent to avoid freezing? It is appropriate to note here that respect for the cold chain has not been mentioned by any retailer, because it is unable to resolve the situation of unplanned power cuts . and once the meat is altered, several options are used by the dealers: either it is still sold by price decrease (58.16%) or it is consumed, or it is given on credit; either it is sold to dog breeders and is disposed of (24.48%) or re-frozen. These means are very rudimentary and are likely to alter the meat quite quickly because the deterioration of the meat is not only caused by microorganisms, but also by the progressive oxidation of the latter by accumulation of free radicals... this is how Yasar S and al, have reported that the use of oregano oil extends the shelf life of ground beef until the 6th day of cold storage with no negative effect on the color and smell of the meat due to the reduction of the number of microbes by 2,5 log 10 CFU/g, 22% peroxide index, 22% lipid oxidation, 27% pH-dependent meat spoilage value, 7% dry matter losses and antioxidant activity. 40% losses and restored color and odor reductions(25). And many authors suggest the use of essential oils and chemical preservatives (26-29)

For its protection and to avoid contaminating the meat, the dealer has at the limit just a fly fighter, some wear an apron and have no lava hands or material lava, no disinfectant and none of them uses gloves. Whereas in the study by Tegegne and Phyo (30) it was observed that all meat handlers knew about proper handling of meat and hand washing, but this did not translate into strict food hygiene practices. Adzitey et al. (31) reported that some meat vendors wore aprons when selling meat, and most of them washed their cutting tables and knives at the beginning and end of work each day.

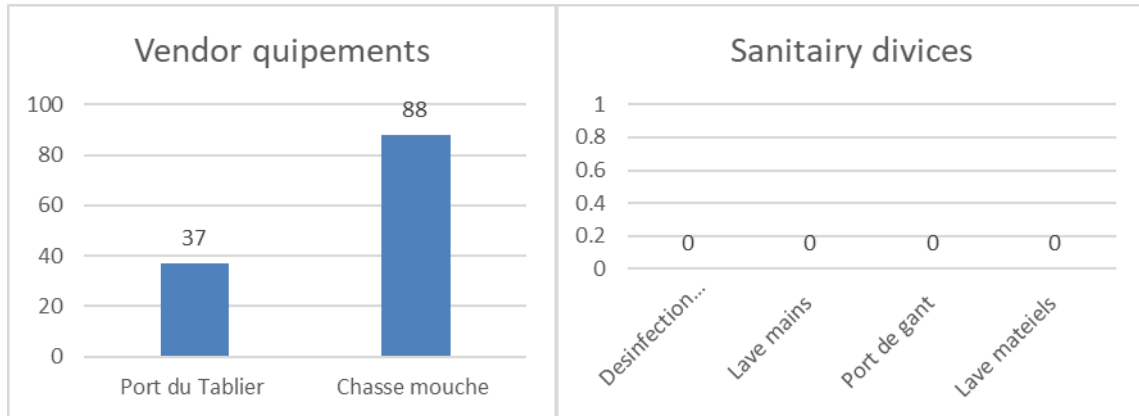


Figure 5 Protective equipment and sanitary devices

Most of the sales structure has a roof and during the day, the meat is kept there mainly on the stalls or mulches out of any cooling system, plus is without any respect of the cold chain.

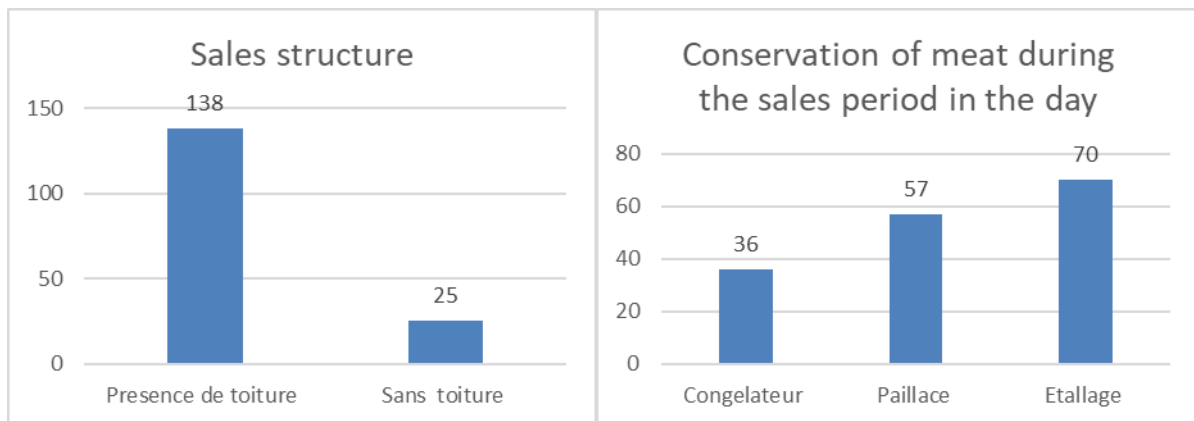


Figure 6 State of the place of sale and preservation of meat

No reseller recognizes having undergone a standardized training on the preservation and handling of meat intended for human consumption and they know at least that the consumption of altered meat can lead to diseases, the loss of customers, contamination, or arrest. Ligua Ma et al felt that training street food vendors should be a priority for improving the safety of street food. Other policies and measures should also be disseminated to improve the knowledge, attitudes, and behavior of vendors on food safety(32). Also, many authors (32,33) have indicated that sellers are very often poor, uneducated, and indifferent to safe food handling, and sellers could not provide proof of food safety training or a valid street trade license.

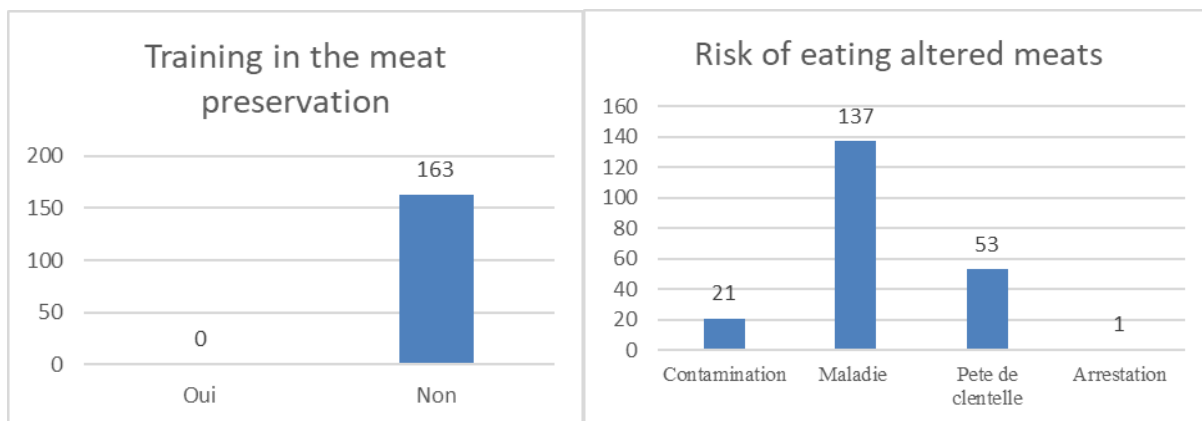


Figure 7 Training and knowledge on meat preservation

3.3. Consumers

Table 3 Consumption and knowledge of the risks of consumption of street meat

Do you eat the meat sold at the edge of the streets	Frequency	Percent	Knowledge of consumption risk	Frequency	%
No	11	8,52	No	20	17,54
Yes	114	88,37	Yes	93	81,57
Non-responding	4	3,10	I do not know	1	0,88
Total	129	100,00%	Total	114	100

88.37% of our consumers attest to having already consumed the meat sold at the edge of the streets and 81.57% of them claim to know the risk related to the consumption of spoiled meat .

Consumers believe that meat sold at the curb is a source of microorganisms including typhoid , cholera, and dirty hand diseases and some even believe it is a source of COVID , this observation was also made by Rané (35) indicated that food sold on the street is generally associated with food-borne illness.

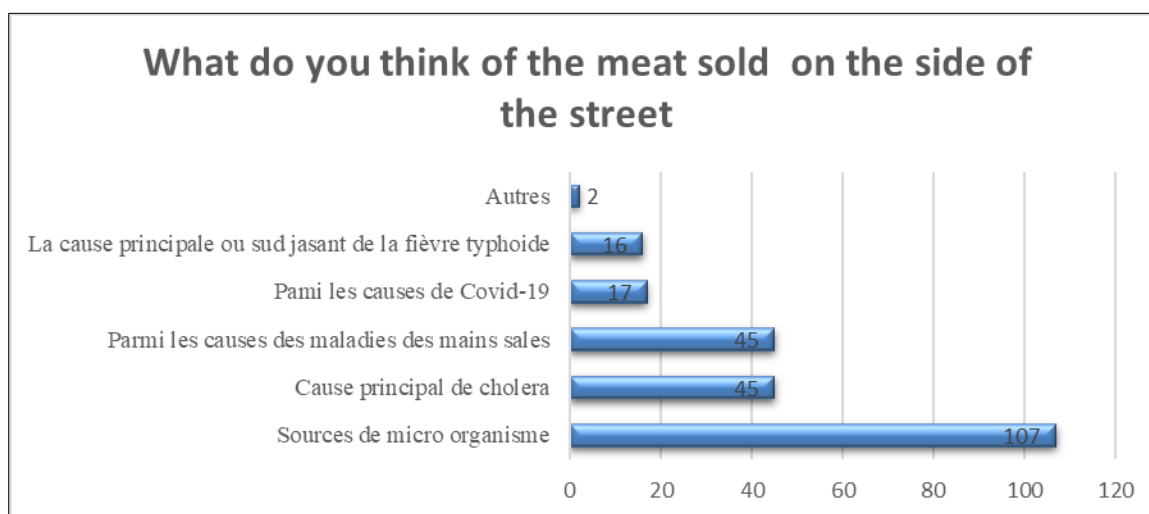


Figure 8 Opinion of the population on street meats

Reasons for consuming streetside meats are mainly financial constraints, habit, long distances to travel to reach a butcher's shop Street foods have been implicated in outbreaks of foodborne illness, particularly Salmonella infections (16, 33), as well as coliform contaminations (34), bacterial contaminations and other infections resulting from vendor

transmission (32). This is a food behavior and food preferences that could be influenced by the dominant food culture (36). Also, food culture can be determined or influenced by food availability, socioeconomic factors, societal and economic transitions, and the dissemination of information through various media(37)

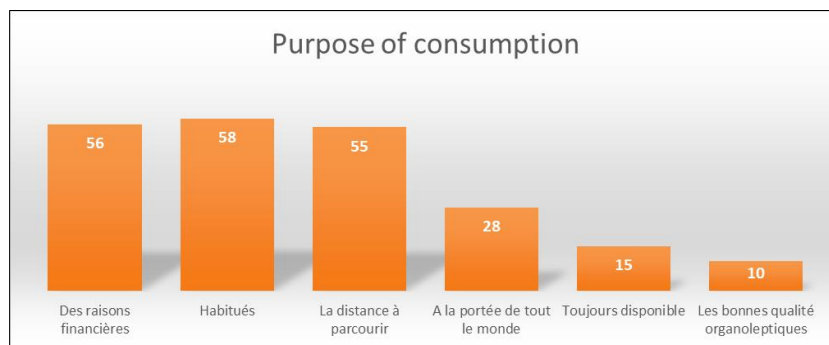


Figure 9 Reason for eating street meat.

4. Conclusion

The study found that meat sellers do not have adequate knowledge about safe food handling practices, although knowledge does not always translate into practice. It is much riskier to eat local meat. This risk is increased in part by the behavior of sellers who handle meat without any training in food safety and using rudimentary means, while poorly constructed and poorly equipped sales structures have contributed to poor safety practices by meat dealers. . Restricted access to water has had a negative impact on the daily operations of hygiene practice. Selling meat in an open or unroofed space exposes the meat to germs, heat, and dust, which compromises food safety. Food safety training. Health promotion on food safety is a necessity for meat retailers and an education for consumers.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no conflict of interest in relation to this article.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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