

Diagnosis and Characteristics of Street Food Consumption in a City with High Population Growth: Case of Daloa (Côte d'Ivoire)

Clément Kouassi Kouassi¹, Ibourahema Coulibaly², Bakary Coulibaly³, Ibrahim Konate⁴

¹Université Jean Lorougnon GUEDE Daloa, Département Biochimie-Microbiologie, Laboratoire Agrovalorisation, BP 150 Daloa (Côte D'Ivoire)

Université Jean Lorougnon GUEDE Daloa, Département Biochimie-Microbiologie, Laboratoire de Microbiologie, de Bio-Industrie et de Biotechnologie, BP 150 Daloa (Côte D'Ivoire)

Université d'Abobo-Adjamé, Département des Sciences et Technologies des Aliments/ Laboratoire de Biotechnologie et Microbiologie alimentaire, 02 BP 801 Abidjan 02 (Côte d'Ivoire)

²Université Jean Lorougnon GUEDE Daloa, Département Biochimie-Microbiologie, Laboratoire Agrovalorisation, BP 150 Daloa (Côte D'Ivoire)

Université Jean Lorougnon GUEDE Daloa, Département Biochimie-Microbiologie, Laboratoire de Microbiologie, de Bio-Industrie et de Biotechnologie, BP 150 Daloa (Côte D'Ivoire)

³Université Jean Lorougnon GUEDE Daloa, Département Biochimie-Microbiologie, Laboratoire Agrovalorisation, BP 150 Daloa (Côte D'Ivoire)

Université Jean Lorougnon GUEDE Daloa, Département Biochimie-Microbiologie, Laboratoire de Microbiologie, de Bio-Industrie et de Biotechnologie, BP 150 Daloa (Côte D'Ivoire)

⁴Université Jean Lorougnon GUEDE Daloa, Département Biochimie-Microbiologie, Laboratoire Agrovalorisation, BP 150 Daloa (Côte D'Ivoire)

Université Jean Lorougnon GUEDE Daloa, Département Biochimie-Microbiologie, Laboratoire de Microbiologie, de Bio-Industrie et de Biotechnologie, BP 150 Daloa (Côte D'Ivoire)

Abstract: *The present study aimed at controlling the current pattern of street food development in the city of Daloa. A cross-sectional and retrospective survey was carried out among 900 people randomly met in eight of the city's main neighborhoods. The survey revealed that street food is one of the important sources of food for the populations of the said city (88.9% of respondents). These foods were mainly consumed by young people (15-25 years old); overwhelmingly by students (40.8%) and students (33.1%). The main street foods inventoried were water, fruit juices and beverages, milk and milk products, meat and meat products, fish and fish products, and foods made from tubers and vegetables. The main reasons for their consumption were their accessibility and relatively low cost. However, some diseases including gastroenteritis, diarrhea, vomiting, fevers have been reported by street food users following the consumption of certain street foods such as juices and fruit drinks, milk and products. The information obtained in this study is a database of street food consumption in the city of Daloa, which can be used to help strengthen the institutional capacity of street food actors (hygiene training, education and training, administration and management), and to make consumers aware of the risks involved in the consumption of these foods.*

Keywords: street food, Daloa, Côte d'Ivoire, food security

1. Introduction

Rapid urbanization has increased in recent decades in developing countries. It is a reality in Ivory Coast with the main cities that are: Abidjan, Yamoussoukro, Bouaké, Korhogo and Daloa. Daloa, with an area of 5,305 Km², is the third most populous city in Côte d'Ivoire after Abidjan and Bouaké. Its population increased from 163,537 inhabitants in 1998 to a population of 245,350 at the last general census in 2014 [1], [2]. Today, the population is estimated at more than 288,000 inhabitants. With rampant urbanization, Daloa faces profound changes in lifestyles, work activities, family and social relationships, which crystallize the problem of food security. Thus, the constantly growing population with the many administrative changes (commune, chief town of sub-prefecture, department and region, University City), has a clear need for food. Street food has become one of the sources. These foods are defined as ready-to-eat foods and beverages prepared and / or sold

by street or fixed vendors [3], [4]. In Daloa, these foods are sold on roadsides, in markets and in densely populated areas such as schools and bus stations. Because of their affordable costs, street foods play an important role in people's eating habits. However, during processing, these foods can be contaminated by various microorganisms including pathogens. Street foods are known to be frequently associated with diseases and several microbiological analyzes have revealed the presence of many pathogenic microorganisms with loads exceeding the standards [5], [6], [7]. In fact, several outbreaks of disease have been attributed to these foods in various parts of the world, and some infections have been reported in populations consuming these street foods [8], [9], [10] [11]. In addition, there is little information on street foods in Daloa and the health risks associated with their consumption. It is in this context that this study falls under the theme: "Diagnosis and characteristics of street food consumption in a city with high population growth: the case of Daloa (Côte d'Ivoire)". This

study therefore aims to control the current pattern of street food development in the city of Daloa. It also aims to identify, profile the different consumers, identify the main reasons for street food consumption and the risks involved in collecting information from consumers in the city of Daloa.

2. Material and Methods

2.1. Survey for diagnosis, characterization and consumption of street food in Daloa

A survey was conducted in several neighborhoods of the city of Daloa to gather information on different street foods, the main reasons for their consumption, foods causing discomfort and to understand their importance in feeding Daloa populations. To this end, a questionnaire has been prepared taking into account the residents of the main districts of the city of Daloa that are: Commerce, Tazibouo, Labia, Lobia, Soleil, Hubersone and Kennedy. The survey which lasted 3 months (November 2016 to January 2017) involved consumers in large markets, bus stations, in the trade and near schools, high schools and universities. Respondents were of both genders, of all levels of study and of all social strata. The only exclusion criterion was the minimum age of 15 years. In total, the survey covered 900 people. The map below shows the city of Daloa with the different neighborhoods or sites of the survey.

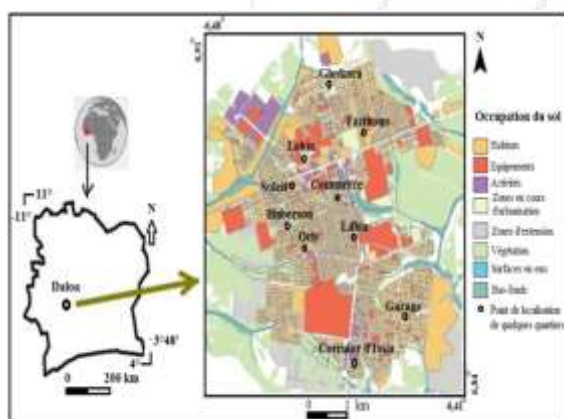


Figure 1: Map of Daloa City with different neighborhoods or survey sites

2.2. Analysis of survey data

The various data obtained were processed with SPSS 11.05 statistical software. Recoding was done for their operation. These data were transmitted on Excel and the results presented as a graph. Some information collected from respondents was expressed as percentages.

3. Results

3.1. Diagnosis and characteristics of street food in the city of Daloa

Figure 2 shows the main street foods in the city of Daloa: water (25.1%), juice and fruit drinks (19.9%), fish and fish products (12%), food and cereal-based foods (11.4%), cereal-based foods (10.6%), milk and milk products (10.6%), and meat and meat products (10.4%). The survey

revealed that the population consuming street foods in Daloa was very important (88.9%, or 800/900 respondents). Street foods were mostly consumed by young people and those aged 15-25 were the most consuming age group (Figure 3). The main reasons for eating these street foods were their accessibility (45.1%) and low cost (33.5%) (Figure 4). This street food was also linked to the socio-professional status of consumers. Students were predominantly consumers (40.8%), followed by students (33.1%) and workers (19.5%) as shown in Figure 5. In addition, the data revealed that consumers were single (81.9%), married (13%) and cohabiting (5.1%) (Figure 6). In general, street food consumption was dominated by the male gender at 61.3% (490/800 of consumers); illustrated in Figure 7. The survey also revealed that the daily prevalence of daily consumption was twice daily (44.3% of consumers (Figure 8)).

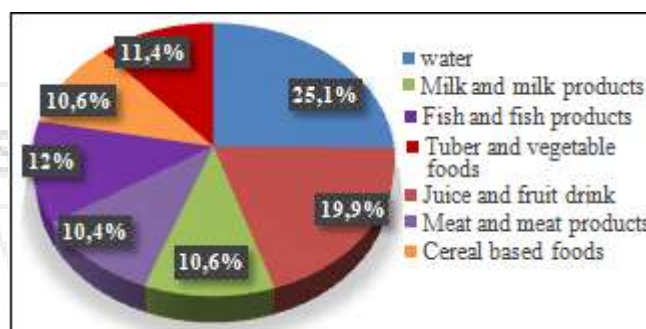


Figure 2: Main Street Foods of Daloa City

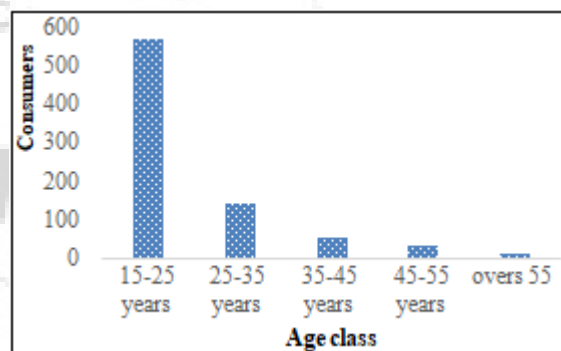


Figure 3: Street food consumption by age group

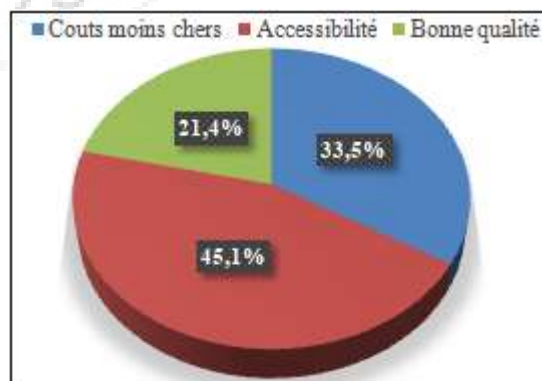


Figure 4: Main reasons for eating street foods

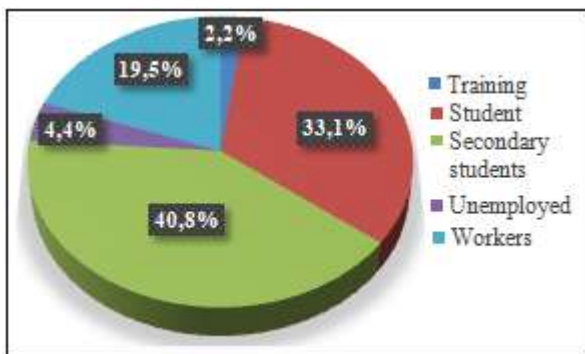


Figure 5: Socio-professional status of Daloa street food consumers

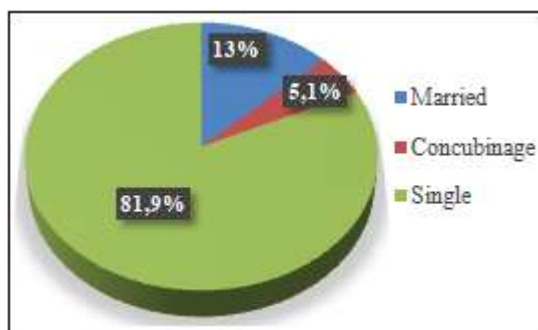


Figure 6: Marital status of street food consumers in Daloa

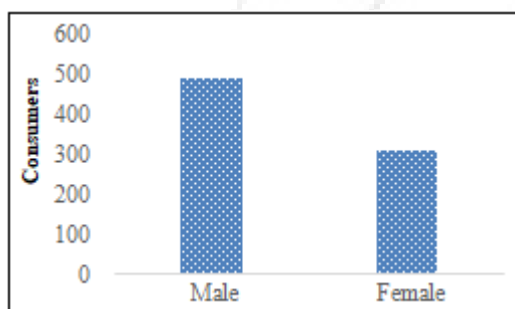


Figure 7: Distribution of street food consumption by gender in Daloa

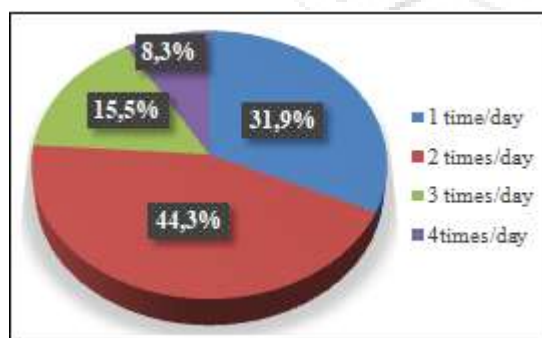


Figure 8: Frequency of daily street food consumption

3.2. Health consequences of street food consumption

The consumption of street foods was not without consequences for the health of consumers. The survey found that 69.4% (or 555/800 of consumers) was uncomfortable with eating street food (Figure 9). The dominant conditions reported were 38.2% diarrhea, 36.8% gastroenteritis, and 15.9% vomiting, respectively, as shown in Figure 10. The foods responsible for these ailments were fruit juices and

drinks (26.7%), meat and meat products (18.6%), and milk and milk products (16.8%) (Figure 11).

In addition, a large number of consumers (33%, ie 264/800 of consumers) did not take any hygienic measures before consuming food; which would increase the health risks.

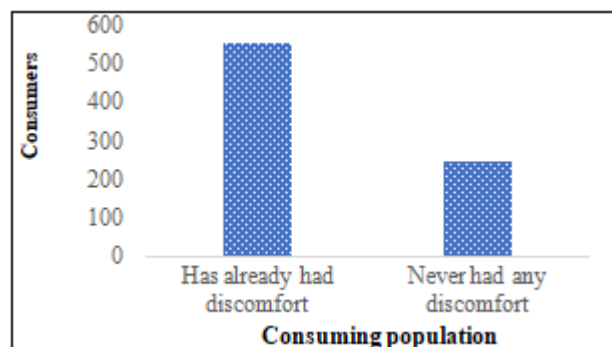


Figure 9: Health consequences of street food consumption

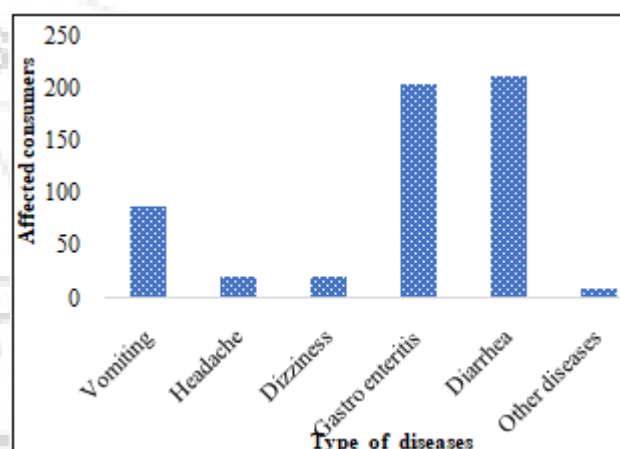


Figure 10: Disorders related to street food consumption

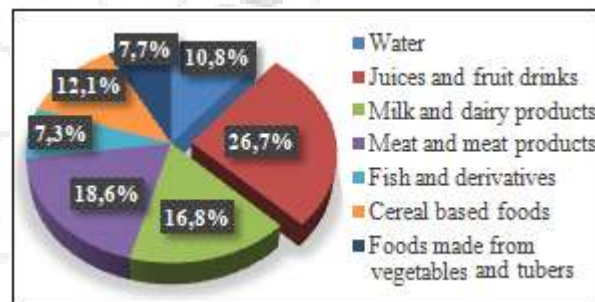


Figure 11: Offending foods as causes of illnesses following street food consumption

4. Discussion

Street foods are widely consumed by the Daloa people. The main foods identified by their importance were: water, fruit juices and drinks, fish and fish products, tuber and vegetable foods, cereal foods, milk and milk products, and meat and meat product. The work of reference [12] has inventoried the same types of street food in Bobo-Dioulasso (Burkina Faso) but with an order of importance different from ours. This difference could be due to the local availability of food and certain eating habits between the different peoples of the two countries. Street food consumption was 71.4% dominated by the youngest (15 and 25), or 571/800. This age group is

largely composed of pupils and students. The lack of income consisting of these could be one of the reasons for their great affluence towards these foods accessible on all the purses. This is what was revealed in the work of reference [13], which reported that 89% of low-income people under the age of 30 were consuming at least one street food every day. In addition, work has shown that street food consumption is linked to occupational status. These results corroborate those of the study with reference [14] which also established a strong link between street food consumption and the professional status of the populations of Ouagadougou (Burkina Faso).

The high consumption of these foods by workers (19.5%) is explained by the distance between the home and the workplace. Indeed, street food would be a good alternative to having to make an expensive trip (time and money) to consume the dishes offered at home as announced by the work of reference [15] in a study similar to Accra (Ghana). The study also revealed that most consumers were single and marked by the male gender. Indeed, the male gender in sub-Saharan Africa and mainly in Côte d'Ivoire is not very inclined in cooking; a socio-cultural factor that accounts for this high proportion of single men eating street foods as reported in previous studies [10], [16]. The main moments of food consumption in Daloa are breakfast, and lunch. In addition, when these foods were eaten more than once a day, it was breakfast and lunch that predominated. These results corroborate the work of references [17] and [5] which stipulated that street food was heavily eaten either in the morning or at noon in Africa by single men, including schoolchildren and students.

The consumption of street foods can affect the health of consumers. A total of 555 consumers out of 800 (69.4%) reported having had discomfort after eating a variety of street foods. These attacks were dominated by gastroenteritis (stomach pain), diarrhea and vomiting. In reference [18], it was also noted that a large proportion (33% or 264/800) of the population consuming street foods (beef in Abidjan, Côte d'Ivoire) presented the same malaise.

Also, the work of the reference [19] in Bamako in Mali showed that 34% of primary school pupils (58/171) consuming food from the neighborhood had the same discomfort. The differences in proportion between the above studies and ours are explained not only by the sample sizes but also by the fact that these two studies were targeted: the consumption of beef on the one hand and the other food sold in the vicinity of primary schools; this study took into account all street food consumers.

The diseases mentioned above are the very characteristics of a type of infection caused by certain microorganisms that have contaminated these foods. Numerous studies have identified the consumption of street food as a real risk of contraction of a food infection because of their methods of preparation, their storage and their sales, which always have hygiene flaws [5], [10], [17], [19], [20]. The discomforts observed in the consuming populations could also be explained by the fact that the populations often forget the fundamental rules of hygiene before the consumption of street foods. Indeed, the survey revealed that 33% of

consumers did not make any provision before street food consumption. These results confirm the work of reference [21], carried out in Côte d'Ivoire on the consumption of lettuce, which stipulated that 44% of consumers did not take any hygienic measures (disinfectant and antiseptic for washing hands and fresh or raw consumable vegetables).

5. Conclusion

Information on street food and its consumption was collected in the first nine places in the city of Daloa. The consumption of street foods is a reality for the people of Daloa. The results obtained from inventorying various street foods, to have knowledge about the profile of consumers, to know the reasons for their consumption but also to know that certain conditions were developed to their ingestion. The diagnosis revealed that 88.9% (or 800/900 of the respondents), marked by the male gender, and consumed street foods that were: fruit juices and drinks, fish and fish products, foods based tubers and vegetables, cereal-based foods, milk and dairy products, and meat and meat products. This population was dominated by young people between the ages of 15 and 25 years old. In addition, the consumption of street food was strongly related to socio-occupational and marital status (students, students, workers, and single people). Major discomfort (gastroenteritis, diarrhea, vomiting) was reported in 69.4% of consumers. Juices and fruit drinks, milk and dairy products and cereal-based foods were among the main foods incriminated respectively 26.7%; 16.8% and 12.1%. Microbiological analyzes should be carried out on street foods in order to identify microbiological hazards, characterize them and communicate these potential dangers for the well-being of the population of Daloa city because street food has become essential in the current development plan for urban catering.

References

- [1] Recensement Général de la Population et de l'Habitation, 2014, (Disponible www.ins.ci/n/documents/rgh/ivoirien18plus.pdf).
- [2] B. T. Zah, "Impact de la migration sur la démographie en Côte d'Ivoire," *Revue de géographie du laboratoire Leïdi*, vol. 13, pp. 284-300, 2015.
- [3] FAO, 2007, *Les bonnes pratiques d'hygiène dans la préparation et la vente des aliments de rue en Afrique*, (Disponible <http://www.fao.org/docrep/010/a0740f/a0740f00.htm>).
- [4] J. T. Compaoré, N. Barro, Z. Belemsigri, C. Komkobo, M. Belem and C. Yameogo, *Leçons de management stratégique: amélioration du secteur de l'alimentation de rue à Ouagadougou, Burkina-Faso*, 1^{ère} Ed. Edition ONG ASMADE, 2000.
- [5] N. Barro, O. Ousmane, A. R. Bello, P. A. Nikiema, A. J. Ilboudo, A. S. Ouattara, C. A. Ouattara and A. S. Traoré, "L'impact de la température de vente sur l'altération de la qualité microbiologique de quelques aliments de rue à Ouagadougou (Burkina Faso)," *Journal des Sciences*, vol. 7, no. 2, pp. 25-32, 2007.
- [6] A. Chenouf, A. Khirani, B. Yabrir, A. Hakem, B. M. Lahrech, K. Houali and N. Chenouf, "Risque dû à la consommation des boissons rafraichissantes sans alcool

- édulcorées,” *Afrique Science*, vol. 10, no. 4, pp. 70-77, 2014.
- [7] Z. Mbadu, M. Ntumba, F. Sumba, M. Benandwenga and T. Ekalakala, “Contrôle de la qualité microbiologique et physicochimique de la boisson artisanale Londo à base de *Mondia whitei* ((Hook. f.) Skeels) (Apocynaceae),” *Congo Sciences*, vol. 4, no. 1, pp. 1-7, 2016.
- [8] FAO, 2014, *The Street Food Initiative in Khulna*, (Disponible <http://www.fao.org/in-action/food-safetybangladesh/news/detail/en/c/411752/>).
- [9] B. Mihajlovic, B. Dixon, H. Couture and J. Farber, “Évaluation qualitative des risques microbiologiques que comportent les jus non pasteurisés de pomme et d’autres fruits,” *International Food Risk Analysis Journal*, vol. 3, no. 6, pp. 1-22, 2013.
- [10] R. V; Bhat and K. Waghay, “Street foods in Africa,” *World Review of Nutrition and Dietetics*, vol. 86, pp. 100-122, 2000.
- [11] M. A. Mamun, S. M. Kabir, M. M. Islam, M. Lubna, S. Islam, T. Akhter and M. Hossain, “Molecular identification and characterization of *Salmonella* species isolated from poultry value chains of Gazipur and Tangail districts of Bangladesh,” *African Journal of Microbiology Research* vol. 11, no. 11, pp. 474-481, 2017.
- [12] K. M. Drabo, T. L. Pare, L. G. Savadogo, Z. Tarnagda, A. N. Zeba, I. Zongo, J. Rouamba, A. Toe, D. Ouédraogo and J. B. Ouédraogo, “Caractéristiques de l’alimentation de rue dans la ville de Bobo-Dioulasso, Burkina Faso,” *Bulletin de la Société de pathologie exotique*, vol. 102, no. 1, pp. 36-40, 2009.
- [13] M. A. Bendeck, M. Chauliac, P. Gerbouin, N. Kante and D. J. Malvy, “Les enjeux de la consommation alimentaire en milieu urbain à Bamako,” *Santé publique*, vol. 12, no. 1, pp. 45-63, 2000.
- [14] Danel P., Etude de la consommation alimentaire à Ouagadougou, Burkina Faso typologie des régimes. Mémoire de fin d’étude en Nutrition Humaine (Département Sociétés et Santé), *Institut National Agronomique Paris-Grignon, Paris, France*, 46p. , 2005.
- [15] P. Mensah, D. Yeboah-manu, K. Owusu-darko and A. Ablordey, “Street foods in Accra? How safe are they?,” *Bulletin of the World Health Organization*, vol. 80, pp. 546-554, 2002.
- [16] M. Chastanet, *La cuisine de Tombouctou (Mali), entre Afrique subsaharienne et Maghreb*. Ed. Horizons Maghrebins, 2002.
- [17] L. O. Randrianomenjanahary, *Contribution à l’étude de la qualité microbiologique d’un aliment de rue dans la ville de Talatan’ny Volonondry (Madagascar) : cas du Koba Ravina*. Thèse de la Faculté de Médecine, de Pharmacie et d’Odontostomatologie, Université Cheikh Anta Diop, Dakar, Sénégal, 2006.
- [18] K. A. Kouassi, A. T. Dadie, K. F. N’Guessan, K. C. Yao, K. M. Dje and Y. G. Loukou, “Conditions hygiéniques des vendeurs et affections liées à la consommation de la viande bovine cuite vendue aux abords des rues de la ville d’Abidjan (Côte d’Ivoire),” *Microbiologie Hygiène Alimentaire*, vol. 24, no. 71, pp. 15-20, 2012.
- [19] W. M. Pick, M. H. Ross and Y. Dada, “The reproductive and occupational health of women street vendors in Johannesburg, South Africa,” *Social Sciences & Medicine*, vol. 54, pp. 193-204, 2002.
- [20] C. R. Katinan, S. Aw, K. O. Chatigre, K. M. Bohoussou and N. E. Assidjo, “Évaluation de la qualité chimique et microbiologique des laits caillés artisanaux produits et consommés dans la ville de Yamoussoukro, Côte d’Ivoire,” *Journal of Applied Biosciences*, vol. 55, pp. 4020-4027, 2012.
- [21] K. J. Sackou, J. S. Claon, A. S. Oga, K. T. Aguessi, D. Lorougnon, Y. Diby and K. I. Kouadio, “Qualité sanitaire des laitues cultivées à Abidjan,” *Microbiologie Hygiène Alimentaire*, vol. 18, no. 52, pp. 48-50, 2006.