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Research Article

Nutritious Local Food and Health Status Overview of 44 Treated Obese Patients in a Dietetic Clinic of Golfe 2 Commune (Greater Lome): A Retrospective Study

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Abstract

The consumption of local food is one of the solutions often advocated to meet public health challenges emanating from the food transitions experienced by West African cities. However, this subject is weakly discussed with regard to scientific research in the field of food and nutrition in Greater Lome, the first urban center of Togo. Indeed, research aims to assess the effects of the diet based on healthy local foods during the global treatment of obesity in Golfe 2 Commune of Greater Lome. It is a retrospective study based on data collected from a dietetic clinic's records concerning 44 obese patients. From their first consultation, participant's data were recorded. A dietary survey was performed to gain insight into their eating habits as well as several body parameters. They were also proposed a diet based on local foods selected for their nutritional value and potential benefits. Anthropometric measurements and abdominal circumference of the patients was taken at the start of the program and during their subsequent visits. The results of the dietary survey revealed participants unhealthy eating habits: regularly, 50% consume fatty foods, 42.86% sugary foods and 96.43% stock cubes. These eating habits contributed to the patients' overweight status. The comparison of the anthropometric measurements collected before and after the intervention showed a decrease in body mass index, from 35.16 kg/m ²to 31.85 kg/m ², reducing obesity and metabolic risk. Furthermore, a 6.23 cm reduction in abdominal circumference and a 1.44-point decrease in visceral fat score were noted. These data tend to suggest that diets based on healthy and nutritious local foods can represent an endogenous and sustainable contributing approach in combating obesity and promoting overall well-being.

Keywords

Dietary Transition, Obesity and Overweight, Healthy Local Foods, Improving Overall Health

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1. Introduction

Obesity has now become a global epidemic. In the world, by 2030, over 2.9 billion adults are likely to be living with high body mass index (BMI). Indeed, 487 million men and 643 million are expected to live with obesity (BMI 30kg/m^2 and above) by 2030 and 0,4 billion people will attend obesity class II (BMI 35kg/m^2 and above) at the same period [1]. The World Health Organization (WHO) estimates that current annual global cost of obesity is around 990 US $ billion [2]. From the same perspective, it is admitted that potential total savings can afford 429 US$ billion on average if overweight and obesity prevalence is reduced by 5% between 2020 and 2060 [2]. However, the prevalence of obesity continues to increase. In industrialized countries, especially in Europa, this prevalence is expected to increase from 15 to 18% for men (BMI 30-<35 kg/m^2). For this period, it is projected that obese women (BMI 30-<35 kg/m^2) rate can raise from 14% to 15% [1]. This increase in the prevalence of obesity is also observed in African countries [3]. Projections show that between 2021 and 2050, obesity prevalence of women in western sub-Saharan Africa will grow from 45,2 to 58,1% on average. For the same period, it was estimated that the prevalence of obesity among men will increase from 38,7% to 57,4% on average [4]. In Togo, this trend is also worrying: the prevalence of overweight among women of reproductive age (14-49 years old) was estimated at 32,82% [5]. It is counted in the five countries that have the higher overweight rates in sub-Saharan Africa. In this alarming picture where the scales are tipping towards ever more worrying figures, the gaze of health professionals is turning, with increasing acuity, towards diets and their influence on weight management and general well-being [6].

While the search for solutions has given rise to a plethora of studies, the spotlight is now turning towards an emerging concept that of a diet rooted in the local culture, composed mainly of local foods [7]. Within the Togolese socio-cultural fabric, where gastronomy has a relatively sacred character, nutritious endogenous diets stand as the center of health, drawing their essence from the very heart of local culinary riches [8-10]. Fruits, vegetables, cereals and peas, readily available in local markets, can forge the pillars of these ancestral dietary practices as an endogenous path to sustainable nutritional security [11]. However, this nutritional harmony is threatened by Western influence, symbolized by the advent of fast food and industrialized products, whose harmful impact on health is high [12-14]. At the heart of this struggle between culinary traditions and modernity, a vital health issue is emerging. Navigating between inherited flavors and contemporary temptations, it is necessary to explore the delicate balance between tradition and modernity in the Togolese plate, a challenge for health. Diets based on nutritious local foods are indicated as promoting health safety [15]. The present study, which is part of Sustainable Development Goal (SDG) No. 2, has the overall objective of contributing to the reduction of the prevalence of metabolic diseases in Togo, by evaluating specifically the effectiveness of a diet based on nutritious local foods on obesity and in improving health. It explores the potential benefits of healthy endogenous diets in Togo in combating obesity and diseases related to an unbalanced diet.

2. Material and Methods

2.1. Study Area

This study took place in a dietetic clinic located in the commune of Golfe 2 in Lome, Togo. This clinic is distinguished by its holistic approach to nutrition, emphasizing the use of nutritious and safe local foods to improve patients' overall health. Services offered include individual consultations, nutrition education and ongoing monitoring. The healthcare professionals involved are nutritionists and dietitians, all with experience in managing specific diets and health conditions.

2.2. Research Approach

This study is a retrospective observational study based on clinical data from patients followed at the clinic. It aimed at evaluating the impact of diets based on local foods on patients treated for obesity through changes in their anthropometric parameters. The main objective is to provide an accurate overview of their dietary habits, including assessing the frequency of consumption of different food groups such as fats, sugars, grains, vegetables, meats, as well as the use of salt and stock cubes. It was thus supposed to provide valuable information on the consequences of nutritional interventions on weight loss and improving overall health.

2.3. Sampling

The target population is composed of patients treated at the clinic. Patients included in the study were aged 18 years and older and suffering from obesity. Excluded patients were those who had been followed within the clinic for more than 6 months. 44 patients met the inclusion criteria. Data were taken from the clinic’s medical records.

2.4. Ethical Consideration

The study was conducted retrospectively using data from the clinical registries of the patients followed. Informed consent was obtained from each participant in advance, guaranteeing their agreement for the use of their data for research purposes, in accordance with current ethical standards. The information collected including medical and anthropometric parameters was carefully anonymized to preserve patient confidentiality and privacy. In addition, strict

data management and security protocols were implemented to ensure the protection of sensitive information throughout the analysis process.

2.5. Study Protocol

2.5.1. Data Collection

Data were extracted from the clinic's records. For each patient, information regarding pre- and post-dietary anthropometric measurements was collected. Upon entry into the program, an initial nutritional assessment followed by a dietary survey was conducted. The following parameters were collected such as anthropometric measurements (weight, height, body mass index (BMI), visceral fat, body fat, muscle mass, abdominal circumference and resting metabolic rate) were measured. A dietary questionnaire also helped to record patients' eating habits.

2.5.2. Personalized Diet

Personalized diets were recommended to patients taking their general health and needs into account. These diets were based on local foods, mainly minimally processed products, rich in fiber, lean proteins and unsaturated fats. A dietary calendar was established to meet the specific needs of each patient from the beginning of follow-up, to ensure regular monitoring adapted to their health status as well as their resting metabolism. The recommended diet included foods such as local cereals (fonio, millet, sorghum, corn), leafy vegetables (cassava, moringa, baobab leaves, African spinach), tubers (yam, sweet potato, cassava, taro), proteins from local sources such as fish (tilapia, captain), legumes (beans, cowpeas (black-eyed peas), peanuts and local fruits (mango, papaya, plantain, guava). The calendar allowed for close monitoring of nutritional intake and adjustment of meals according to the progress of the patients. These foods are often minimally processed, high in fiber and offer a good nutritional balance.

2.5.3. Dietary Monitoring

Patients were regularly monitored, and a nutritional assessment was performed every 14 days from the start of dietary support. Weight and Body Mass Index (BMI) were measured to assess weight loss progress. Visceral fat measurement is useful to estimate the amount of fat around internal organs and is therefore an indicator of cardiovascular diseases risks. Body fat was assessed to monitor the proportion of total body fat. Muscle mass gives information about the preservation or increase of lean body mass during weight loss. Abdominal circumference is also checked as a key indicator of abdominal fat reduction. Anthropometric parameters were measured using an impedance meter, which assesses not only the weight but also the body composition of the patients. This device provides the detailed following data. Body weight was measured in kilograms. Body mass index was automatically calculated by the impedance meter based on the patients' height and weight (BMI = Weight (kg) / Height (m^2)). Body fat is assessed as the proportion of total body fat expressed in percentage. Muscle mass was evaluated as the amount of lean mass in the body. Visceral fat derived from the measurement of fat around internal organs. Resting metabolism or basal metabolic rate (BMR) or still the amount of energy (calories) the body expends at rest was also essential for assessing individual caloric needs and adapting diet. Abdominal circumference was measured manually using a tape measure to track visceral fat reduction. Patients' height was measured using a wall-mounted height chart, a precise measuring device. This measurement data is essential for calculating BMI.

2.5.4. Data Analysis

The descriptive analysis first focused on the results of the dietary survey, which provided an overview of the patients' dietary habits upon entry into the study. The sample characteristics and anthropometric parameters were then summarized through the presentation of means, standard deviations, and percentages measured at the beginning of the study and during dietary follow-up.

2.5.5. Study Limitations

Variable follow-up duration: Patients were followed for different lengths of time depending on their program entry date, which may introduce variations in the results.

Small sample size: The small sample size limits the scope of the conclusions, and further larger-scale studies would be needed to generalize the results.

3. Results

3.1. Sociodemographic Information

The study sample included 44 selected patients. The baseline characteristics of the participants were as follows: The distribution of participants shows a female predominance with 68.18% women versus 31.82% men. This difference could indicate greater participation of women in diet programs. This trend could be linked to specific concerns about health and physical appearance among women, or to greater sensitivity to public health messages.

The mean age of participants was 39.86 years old with a standard deviation of 12.32; these data indicate age diversity among respondents. This distribution is crucial because eating behaviors can vary with age, particularly in terms of metabolism, nutritional needs, and health awareness.

3.2. Follow-up Duration

The mean follow-up duration is 10.44 weeks. It is similar to previous studies that observed significant changes after

10- to 12-week interventions. However, the high variability in duration (standard deviation of 6.32 weeks) suggests that some participants may have benefited from a shorter follow-up, thus limiting the intervention's effects.

3.3. Identified Eating Habits

The results of this survey are presented as percentages, highlighting the frequency of consumption of different food groups. This data allow for the establishment of an initial nutritional profile of the patients.

Table 1. Shows a predominance of regular consumption of stock cubes (96.43%) and fatty foods (50%), dietary habits linked to increased risks of chronic diseases, such as hypertension and obesity. These dietary habits are of concern because they are linked to increased risks of chronic diseases such as hypertension and obesity.

Table 1. *Eating habits of patients according to the frequency of consumption of different types of food.*

Category	Rare (%)	Sometimes (%)	Often (%)	Never (%)
Fatty foods	14,29	35,71	50,00	-
Stocked cubes	-	3,57	96,43	-
Cereals	-	53,57	46,43	-
Starchy foods	7,14	67,86	25,00	-
Sugar and sweet foods	21,43	35,71	42,86	-
Salt	-	10,71	89,29	-
5 fruits and vegetables	32,14	14,29	-	53,57
Meat	7,14	28,57	64,29	-
Fish	3,57	71,43	21,43	3,57

3.4. Variation of Anthropometric Parameters

Anthropometric parameters were assessed before and after the intervention, and the results indicate a significant improvement in several parameters after the intervention, including a decrease in body mass index (BMI), visceral fat, and body fat. This suggests that the recommended diet is associated with a positive effect on the participants' weight management and body composition. However, a slight decrease in muscle mass was also observed, which may require adjustments in the program to include more activities that promote muscle mass preservation, such as resistance exercises.

3.4.1. Body Mass Index

Participants' BMI significantly decreased after the intervention, from a mean of 35.16 ± 6.64 to 31.85 ± 6.27, with a mean change of -3.31, representing an overall weight loss. This decrease in BMI is consistent with research on the positive effect of local diets on weight management, particularly after similar interventions. Furthermore, the observed differences, ranging from -0.6 to 15.4 as described in *Table 2*. indicate a large variability in participants' response to the dietary program.

Table 2. *Variations in anthropometric parameters before and after the intervention.*

Anthropometric parameters	Average before intervention	Average after intervention	Variation mean	Min difference	Max difference
BMI	35,16 ±6,644	31,85 ±6,27	3,31 ±0,37	-0,6	15,4
Visceral fat	12,39 ±4,35	10,95 ±4,16	1,44 ±0,19	-1	13
Body fat	43,75 ±11,09	40,93 ±10,10	2,82 ±0,99	-5,6	18
Muscles	25,40 ±4,95	26,74 ±5,01	-1,34 ±-0,06	-9,9	2,9

Anthropometric parameters	Average before intervention	Average after intervention	Variation mean	Min difference	Max difference
Abdominal circumference	107,76 ±12,22	101,53 ±13,35	6,17 ±-1,13	-10	29

±: Standard deviation; Difference Min: Mean difference before and after the follow-up of the participant with the minimum of variation; Difference Max: Mean difference before and after the follow-up of the participant with the minimum of variation; -: indicate an increase after the follow-up

3.4.2. Visceral Fat

The decrease in visceral fat is clearly evident, with the average decreasing from 12.39 ± 4.35% to 10.95 ± 4.16%, representing an average reduction of 1.44. Visceral fat is particularly dangerous because it surrounds internal organs and is linked to an increased risk of metabolic diseases such as type 2 diabetes and cardiovascular disease. This reduction may be directly related to the improvement in participants' eating habits, favoring the consumption of less processed, fiber-rich foods, in line with local dietary recommendations. The variability observed between participants (with a maximum difference of 13 and a minimum of -1) may be attributed to factors such as individual differences in basal metabolic rate, physical activity, and adherence to the recommended diet. Some participants may have benefited from greater lifestyle changes, reflected in a higher reduction in visceral fat.

3.4.3. Body Fat

Body fat decreased from 43.75% to 40.93% on average. This 2.82% decrease demonstrates a significant improvement in participants' body composition. A reduction in body fat is often linked to an increase in protein and fiber consumption, which promote satiety, and a reduction in total calorie intake. The reduction in total body fat confirms that the observed weight loss is primarily due to fat loss rather than muscle mass loss. The observed variability among participants (with a minimum difference of -5.6% and a maximum difference of 18%) can be attributed to several factors, including individual differences in diet adherence, physical activity levels, and underlying health conditions.

Some participants may have benefited from a more pronounced loss of body fat due to more radical lifestyle changes or their initial health status.

3.4.4. Muscle

Muscle mass increased slightly at the end of the follow-up from 25.40% to 26.74%, with an average change of 1.34%. This suggests that, despite the overall weight loss and reduction in body fat, participants were able to maintain or even increase their muscle mass. This slight increase in muscle mass at the end of the observations shows that participants not only lost fat but also maintained or even increased their muscle mass. However, the minimal difference linked with change observed with some participants is -9.9 kg. This fact could indicate insufficient protein intake or physical activity, which may have led to greater muscle loss.

3.4.5. Abdominal Circumference

The mean abdominal circumference decreased from 107.76 cm to 101.53 cm, a mean reduction of 6.17 cm. The reduction in abdominal circumference reflects visceral fat loss. The observed variability (with a minimum difference of -10 cm and a maximum of 29 cm) may be explained by several factors: dietary recommendations more closely followed or more physical activity engagement, way of abdominal fat loss. Baseline body composition, genetics, and hormonal differences may also have influenced these results.

4. Discussion

The research results are based on the following indicators: sociodemographic parameters, age, patients follow-up duration, interviewed people eating habits, Body Mass Index (BMI), Visceral Fat, Body Fat, Muscle, Abdominal circumference.

The majority of participants were women (68.18%). According to other studies, these results mean that women are more likely to participate in weight loss and health programs [16]. However, male participation is low (31.82%). It raises the issue of men's reluctance or willingness to adhere to these types of interventions. The results highlight also the importance of adapting awareness programs to encourage greater male participation in weight management initiatives.

With a mean age of 39.86 years, this study includes an adult population in the life stage where the risks associated with obesity and chronic diseases increase. This age distribution is consistent with other weight management studies, which indicate that people aged 23 to 70 are more likely to seek solutions to manage their weight due to the increased health risks related to this demographic factor [17]. The variability in age (standard deviation of 12.32 years) allows for a diversity of age groups to be reached, but the results could be improved with a subgroup analysis to better understand the effect of age on weight loss.

The mean patients' follow-up duration of the research protocol is 10.44. Studies have shown that longer interventions (12 months or more) are often necessary for sustained changes in eating behavior and weight management [18-21].

A longer duration would likely have observed greater improvements in some participants.

Regular consumption of stock cubes (96.43%) and fatty foods (50%) involve chronic diseases risks such as hypertension and obesity [22, 23]. Healthy food projects implementation to reduce the consumption of these products and promote a diet rich in fruits and vegetables (5 fruits & vegetables theory) should be a priority to improve health outcomes. These results are similar to the findings of M. Batubo et al., [24] and S. Kenao et al., [25], who observed dietary behaviors in Togo. Their work highlighted the impact of processed and high-salt foods on the population. The regular consumption of these products indicates a strong influence of urbanization and the modernization of diets, as observed in other African studies [26, 27]. Strategies to reduce the consumption of these foods, such as educational campaigns on the dangers of salt and saturated fat, could improve public health outcomes.

The body mass decrease observed (BMI) is an indicator of a low-calorie diet combined with a high-fiber diet, typical of nutritious and safe local foods. It leads to a reduction of the BMI [28, 29]. However, G. A. Bray [30] has affirmed that BMI alone may not be sufficient to assess progress, as it does not distinguish between fat mass and muscle mass. The research findings are consistent with previous papers considering that only BMI cannot distinguish body composition, as highlighted by Y. Wu et al., [31] and B. Sibal et al. [32]. Some participants may have had more moderate weight loss, while others experienced more drastic declines in BMI. This could be related to individual factors such as metabolism, physical activity, or even compliance with the recommended diet [33].

The observed variability among the survey participants (with a minimum difference of -5.6% and a maximum difference of 18%) concerning body fat can be attributed to several factors including individual differences in diet adherence, physical activity levels, and underlying health conditions. Health benefits of this situation is close with those of the body mass decrease observed even if they are not the same. This finding is consistent with similar studies, such as those of C. Phosat, et al [34] and D. Azzolino et al., [35]. Their work shows that diets high in fiber and protein help preserve muscle mass while promoting fat loss. It is therefore important to combine this type of diet with physical exercise to maintain or increase muscle mass. This overall reduction in body fat is a positive sign of the effectiveness of dietary intervention. It shows that adopting a local nutritious diet can not only reduce body fat but also contribute to improve overall body composition, thus leading to better weight management and to the prevention of obesity-related chronic diseases. Some participants may have benefited from more pronounced body fat loss due to more contemporary lifestyle changes or their initial health status. This research outcome is consistent with similar studies, such as those of D. Saxena et al., [36] and M.-E Harper et al., [37] which show that diets high in fiber and protein help preserve muscle mass while promoting fat loss. It is therefore important to combine this type of diet with physical exercises to maintain or increase muscle mass. This overall reduction in body fat is a positive sign of the effectiveness of dietary intervention. It shows that adopting a local diet can not only reduce body fat but also improve overall body composition, thus contributing to better weight management and the prevention of obesity-related chronic diseases.

Studies show that, during calorie restriction, inadequate protein intake can lead to loss of muscle mass unless it is compensated by increased physical exercise [38]. In contrast, participants whose observation revealed a maximum muscle gain of 2.9 kg likely benefited from an adequate protein intake and a consistent exercise program combined with a nutrient-dense diet [39]. This finding corroborates the nutritional knowledge about which high-protein diets, combined with exercise, can preserve or increase muscle mass while promoting fat loss [40]. The same is valuable with previous research on the beneficial effects of local foods on health and weight management [41].

The decrease in visceral fat observed in the study reinforces the potential benefits of a diet based on local foods for metabolic health. This trend in result is close to the works of H. Kahleova et al., [42], S. T. Shetty et al., [43] and Koskina K. C. et al., [44]. According to these writings, reductions in visceral fat are directly linked to improvements in insulin sensitivity and reduced risks of cardiovascular disease. It suggests that such dietary interventions could play a key role in preventing chronic diseases related to obesity and metabolic syndrome, while promoting better weight management and an overall improvement in the quality of life of individuals.

The abdominal circumference observed varies between 10 cm (minimum) and 29 cm (maximum) for the patients. It may be explained by several factors. Individuals who lost the most centimeters around the abdomen may have followed dietary recommendations more closely or engaged in more physical activity, thus reinforcing the effect of diet on abdominal fat loss [45]. Other factors such as baseline body composition, genetics, and hormonal differences may also have influenced these results. This upshot is comparable to those obtained in other researches on local food diets, which have shown significant reductions in abdominal fat of participants [46]. Overall, this reduction in abdominal circumference may allow to consider possible effectiveness of the nutritious local food-based intervention in improving body composition, reducing the risk of chronic diseases, and promoting better metabolic health. The reduced risks associated with adopting a healthy local diet are also protective factors against obesity-related comorbidities that affect people concerned: the major risks of developing type 2 diabetes and blood pressure disorders. The health complications that can result from this include fatty liver disease, insulin resistance, low immunity, delayed healing, and intense fatigue without significant exertion.

Moreover, from the perspective of territorialized food systems, it is necessary to establish agri-food supply chains that promote local food and nutritional security based on territorial anchoring and the application of agroecological principles. From an agroecological point of view, local food production must be able to meet the food and nutritional needs of the population in each region. However, production must be based on natural inputs (fertilizers) and resources (land, water, seeds) that are easily accessible to all social groups. From a microbiological and phytochemical perspective, these foods production more controlled could get good levels of vitamins, minerals, and macronutrients that do not deteriorate easily over time. Preservation, packaging, and processing techniques, for their part, must comply with acceptable standards so that the end consumer is not poisoned by consuming contaminated or fatty food. But in these processes, the soil, air, and water must be protected from pollution and degradation for a better environmental and health quality of life for humans, plants, and animals. At the same time, from an economic perspective, producers and other actors in the agri-food value chains based in the municipalities of Togo's regions must be able to earn a decent income from their activities to ensure their physical security (food, housing, lighting, health, education, communication, transportation) and social security (equal access to resources). Furthermore, local authorities must organize themselves to map the resources (human, technical, financial, and logistical) of their respective territories, both singularly and collectively. To do this, following the same logic as K. E. Assinou and K. Kpotchou [47], several socioeconomic and political bodies must be involved in territorialized, inclusive and ongoing nutritional education policies and programs to bring about change. These include nutrition and health professionals, researchers in the agri-food and nutrition fields, agriculture professionals, the media, national education stakeholders, religious stakeholders, non-governmental organizations and associations, and public authorities at the local, regional, and national levels. In doing so, the populations of Greater Lome, and indeed the rest of Togo, will be able to adopt sustainable diets, starting with the consumption of healthy and nutritious local foods that can protect them from chronic diseases caused by poor nutrition [48-50].

5. Conclusions

This research allows to consider the likely effectiveness of diets based on healthy local products contribute to improve anthropometric parameters qualities of patients observed. The results indicate an improvement in body composition, particularly visceral fat, a key factor in the prevention of chronic diseases. This key factor related to obesity showed significant reductions in body weight, body mass index, and abdominal circumference, as well as a decrease in visceral fat. This approach represents a promising avenue for the prevention and treatment of chronic diseases linked to excess weight. The results reinforce the idea that a diet rooted in local traditions and adapted to cultural habits can play a vital role in the long-term management of metabolic disorders. These diets, often rich in fiber, vitamins, and minerals, have proven effective not only in promoting weight loss but also in improving individuals' overall health, particularly by reducing risk factors associated with cardiovascular diseases and diabetes. It is recommended to integrate local and safe diets improving into public health strategies by supporting local agricultural initiatives, promoting nutrition education programs and raising public awareness of the importance of these diets for health. Local foods, often less processed and more nutritious, could become a pillar of policies for the prevention and management of metabolic diseases. However, further studies are needed to explore the underlying mechanisms responsible for the observed effects, particularly the reduction of visceral fat. It would also be relevant to assess the long-term impact of these diets in various cultural and socioeconomic contexts to assess their widespread applicability. Longer-term longitudinal studies would be interesting to observe the lasting effects of local diets on chronic disease management. Continuous assessment of anthropometric and biochemical parameters would confirm long-term benefits. Research should explore the effects of local diets in different regions and cultures to identify specific patterns or foods with a particularly beneficial impact on metabolic health. Comparing results across diverse populations would provide a better understanding of the regional effectiveness of these diets. By transforming these diets sustainable, population-specific nutrition programs linked with local food can not only support weight loss; they can also contribute to overall health improvement, while promoting local economic development and preserving food traditions and originality.

Abbreviations

BMI	Body Mass Index (BMI)
BMR	Basal Metabolic Rate (BMR)
Min	Minimal
Max	Maximal
SDG	Sustainable Development Goals

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Author Contributions

Mamy Eklou: Formal Analysis, Writing – original draft, Validation.

Komivi Hospice Kpotoufe: Investigation.

Mamatchi Melila: Conceptualization, Formal analysis.
Kwami Lumo Awaga: Validation.
Magnoudewa Kilimou: Conceptualization.
Kou'santa Amouzou: Resources and supervision.

Conflicts of Interest

The authors declare no conflicts of interest.

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