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Consumption, food habits and potential pathological profiles in the population of the District of Abidjan

Abstract: Dietary habits play a crucial role in a person's overall health, and their impact on disease patterns within the population is a growing public health concern. The main purpose of this study is to analyze the dietary habits of the Ivorian population from the angle of domestic consumption and consumption outside the home and establish trends in the most frequent pathological profiles in the Ivorian population. A descriptive cross-sectional study was conducted using a questionnaire comprising several sections. The latter included information on age, sex, anthropometric parameters, eating behaviours, food frequencies, and energy value of the household food ration. The population studied had a weight of 54.59 ± 9.17 kg and an age of 28.11 ± 2.64 years. The average population size is 1.48 ± 0.45 m and the average BMI is 22.71 ± 5.56 (kg/m²). It is observed that 6.06% of cases of thinness, 45.86% of normal build, 19.29% of cases of overweight and 21.12% of cases of obesity. Several household lifestyle habits expose them to overweight, obesity and other risks of nutritional factors. Most households (81.75%) have a balanced weekly consumption of different food groups. The average food ration of the population is 2549.86 ± 444.33 kcal. Nearly half of the population (50.7%) were declared to have a pathology and a medical history.

Keywords: food habits, pathological profiles, population, District of Abidjan.



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Consommations, habitudes alimentaires et profils pathologiques potentiels dans la population du District d'Abidjan

Resume: Les habitudes alimentaires jouent un rôle crucial dans la santé globale d'une personne, et leur impact sur les profils pathologiques au sein de la population est un sujet de préoccupation croissante dans le domaine de la santé publique. L'objectif général de cette étude est d'analyser les habitudes alimentaires de la population ivoirienne sous l'angle de la consommation domestique et la consommation hors domicile et établir les tendances des profils pathologiques les plus fréquents dans la population ivoirienne. Une étude transversale descriptive a été menée par le biais d'un questionnaire comportant plusieurs sections. Ce dernier comprenait des informations sur l'âge, le sexe, les paramètres anthropométriques, les comportements alimentaires, les fréquences alimentaires, la valeur énergétique de la ration alimentaire des ménages. La population étudiée présente un poids de $54,59 \pm 9,17$ kg et un âge de $28,11 \pm 2,64$ ans. La taille moyenne de la population est de $1,48 \pm 0,45$ m et l'IMC moyen est de $22,71 \pm 5,56$ (kg/m²). Il est observé 6,06% de cas de maigreur, 45,86 % de corpulence normale, 19,29% de cas de surpoids et 21,12% de cas d'obésité. Plusieurs habitudes de vie des ménages les exposent au surpoids, à l'obésité et d'autres risques de facteurs nutritionnels. La plupart des ménages (81,75%) ont une consommation hebdomadaire équilibrée des différents groupes d'aliments. La ration alimentaire moyenne de la population est de $2549,86 \pm 444,33$ kcal. Près de la moitié de la population (50,7%) ont été déclarés porteurs d'une pathologie et ayant des antécédents médicaux.

Mots clés: habitudes alimentaires, profils pathologiques, population, District d'Abidjan.



Introduction

Dietary habits play a crucial role in a person's overall health, and their impact on disease patterns within the population is a matter of growing public health concern (*Biscontin, 2018*). In Côte d'Ivoire, a country, characterized by cultural diversity and gastronomic richness, traditional eating habits are at the heart of daily life (*PNMIN, 2015*). However, the Ivorian population is facing profound transformations in its diet, which reflect a remarkable dietary transition, with the rapid evolution of lifestyle and social and economic factors (*David et al., 2019*). The dietary transition involves introducing processed food products and the increasing influence of Western diets, characterized by a high proportion of fat, added sugars and a high salt content (*Janin, 2019*). This change in eating habits comes with many potential nutritional risks. The problem that emerges from this food dynamic is based on the paradoxical coexistence of malnutrition in all its forms (*WHO, 2021*). On the one hand, the persistent prevalence of undernutrition, particularly among vulnerable groups such as children and pregnant women, poses a continuing public health challenge. On the other hand, the nutritional transition is accompanied by a worrying increase in diseases linked to an unbalanced diet, such as cardiovascular diseases, diabetes and obesity (*Plan National Multisectoriel de Nutrition, 2016*). Additionally, rapid urbanization, rising incomes and the increasing availability of fast food have led to a decrease in the consumption of traditional foods and an increase in the consumption of ready-to-eat foods,

often rich in empty calories and low in essential nutrients (*Kouassi et al., 2022; Dolislager et al., 2022*). It is significant to note that these potential nutritional risks specifically affect different categories of the Ivorian population. The most vulnerable groups include children, pregnant and lactating women, the elderly, and low-income populations (*Plan National Multisectoriel de Nutrition, 2016*). In order to understand this complex dynamic, it is imperative to analyze the socio-economic, cultural and environmental factors that shape dietary habits and, therefore, influence the health of individuals. The general objective of this study is to analyze the dietary habits of the Ivorian population from the angle of domestic consumption and consumption outside the home and establish trends in the most frequent pathological profiles in the Ivorian population.

Methodology

A descriptive cross-sectional study took place in the municipalities of the District of Abidjan: Abobo, Adjamé, Anyama, Attécoubé, Bingerville, Cocody, Koumassi, Marcory, Port-Bouët, Treichville and Yopougon. These sites were selected by the INS (National Institute of Statistics) in Ivory Coast. A face-to-face interview was performed with the respondents to ensure a good understanding of all the questions (*Dop et al., 2003*). The interrogation was followed by anthropometric measurement. A representative sample of the urban and rural population is envisaged to reflect the diversity of eating habits. It is with this in mind that the choice of a two-stage stratified random sampling is best indicated in the Abidjan District. Thus, 40 enumeration zones spread across the 11 municipalities were selected to be enumerated and then 25 households were selected by a systematic drawing in each enumeration zone.

A structured questionnaire was used to capture information on socio-demographic characteristics, dietary habits and eating behaviors of household members. Anthropometric parameters measured included height (m), weight (kg), and body mass index (BMI). Body mass index (BMI) was calculated from the subject's weight and height, $BMI = \text{Weight (kg)} / \text{height}^2 \text{ (m}^2\text{)}$ (*OMS, 2003*).

Concerning the estimation of the quantity of food, the method used was that of the quantitative dietary survey by interview (*Dop et al., 2003*). Diet composition is calculated using West African food composition tables. This table gives for each product the composition of 100 g according to the different nutritional elements. Metabolizable energy values for all foods are provided in Kilocalories (Kcal). They were calculated from the values of proteins, lipids, total carbohydrates and fibers by applying the energy conversion factors (11): $\text{Energy (Kcal/100g)} = (\% \text{ Protein} \times 4) + (\% \text{ Lipid} \times 9) + (\% \text{ Total Carbohydrates} \times 4) + (\% \text{ Fiber} \times 2)$.

An interview protocol was designed to collect data on eating habits, medical history and possible diet-related pathologies on a representative sample. Any medical history, general health of the individual and possible diet-related diseases (diabetes, cardiovascular diseases, night blindness, etc.) were identified. The data was entered and coded in Excel. Data analysis was performed using XLSTAT 2016 software. Appropriate statistical methods to analyze the qualitative and quantitative data from the interviews, such as descriptive analyzes were performed.

The results of the study

The study involved 927 households with an average size of 4 members per household. Of the 927 households, 60.5% were headed by men and 39.5% by women. Among the heads of households, 59.4% were married, 63.84% were educated and 84.15% resided in urban areas. The average age of heads of households is 32.80 ± 11.17 years. More than half of heads of households are self-employed (50.49%) (*Table 1*). Structuring the population surveyed according to sex gives 1763 women and 1945 men, i.e. a sex ratio of 1.10 with an average age of 28.11 ± 2.64 years. The population studied is made up of 572 children (0 to 9 years old) or 15.44% of the total number. There were 649 adolescents aged between 10 and 17 years old, representing 17.51% of the sample and 18.77% of young people aged between 18 and 25 years old, with a total of 696 people. Adults and the elderly were represented in the sample with respective percentages of 40.84% and 7.44%.

On average, the average weight and age of the population is 54.59 ± 9.17 kg and 28.11 ± 2.64 years. The average population size is 1.48 ± 0.45 m and the average BMI is 22.71 ± 5.56 (kg/m²) (*Table 2*). *Table 3* shows that 5.94% of the population is in a state of severe and moderate acute malnutrition (*Table 3*). There are 6.06% cases of thinness (BMI < 18.5 kg/m²) of which 2.77% are male and 3.29% are female. It is presented that 45.86% of the population has a normal build (between 18.5 and 24.9 kg/m²). The proportion of excess weight in the population reaches 19.29%, with 8.47% of boys and 10.82% of girls. Class I (moderate) obesity is presented by 13.07% of the population, of which 4.33% are boys and 8.74% are girls. Severe obesity is only presented by 4.57% of girls and 1.72% of boys; while morbid obesity is 3.48%. During this survey, questions were asked about the general state of health of the individual and the identification of possible diet-related illnesses. Nearly half of the population (50.70%) were declared to be carrying a pathology and having a medical history whose age ranged from 5 to 85 years while 49.3% of the population were declared healthy. The majority of respondents affected by these pathologies were adults and elderly people (*Table 4*).

Most individuals in the sample usually eat three times a day: morning, noon and evening. Nearly 70.93% of people had taken the three main meals the day before the survey, 23.7% had taken two, 3.57% had taken four and the prevalence of those who eat only one meal per day is 1.8%. Concerning staggered schedules, more than two-thirds of the population (68%), household members eat at staggered schedules several times a week (*Figure 1*). Snacking is observed in both sexes, but the prevalence is higher among women (44.32%) than among men (31.7%). Most household members (82.4%) had the habit of eating two meals away from home and one meal at home; 13.9% eat two meals at home and one meal out, while 3.7% say they never eat out. The day preceding the interview, 94.11% of households reported having consumed food in eating places such as kiosks, maquis, restaurants, and street stands and 2.19% consumed in canteens. Regarding food sharing within the household, it is interesting to note that 11.86% of household heads share a meal; 25.01% of children are served in groups of two or three children per dish, depending on the type; 5.5% of household members take their meals as a group and 57.63% of household members do not share their meals (*Figure 1*).

The duration of meal consumption by household members varies depending on the meal consumed but is generally very short. During the week, breakfast time is 5 to 15 minutes for 72% of households, 15 to 30 minutes for lunch (66%) and dinner (58%). Almost all households report consuming juices, sugary drinks and soft drinks daily, including 89% at least once a day

and 11% at least three times per day. However, this consumption during meals generally remains low (39.58%). The survey shows that the majority of households surveyed (68.25%) consume alcoholic beverages and 31.75% do not consume them. The majority of individuals in the sample (39.12%) frequently consume beer and 6.62% consume wine at least once a day; while, 20.75% consume alcohol 3 times a week, and 1.76% take Dolo (*Figure 1*). Regarding the consumption of sugar and salt, 41.08% of the population declare that they frequently add salt and sugar to foods or drinks that are already sweet or salty, while 26.55% only add it occasionally and 32.36% rarely or never add any. As for tobacco consumption, only 2.78% consume tobacco such as cigarettes and 97.22% do not consume it. In the entire population studied, 42.05% practice physical activity while 57.95% do not. Girls (4.49%) are less active than boys (37.56%).

Most households report eating a balanced diet (81.75%). This result was confirmed by the weekly consumption of the different food groups. Indeed, 68% of members consume dairy products, 73% consume fish/seafood, 12% do not consume eggs, 77% of households consume meat and 51% offal. It is worth noting that 85% of households consume vegetables twice a day and 66% consume vegetables twice a day (*Figure 2*).

The average food ration of the population is 2549.86 ± 444.33 kcal. The average daily energy intake provided by foods consumed by the different age groups are respectively 2105.81 ± 401.79 kcal for children, 2428.15 ± 465.99 kcal for adolescents, 2701.98 ± 584.85 kcal for young people, 2940.89 ± 167.24 kcal for adults and 2572.48 ± 601.78 for the elderly (*Table 5*). The average quantities of macronutrients in energy intakes are reported in Appendix (*Table 6*). These quantities depend on age groups. It appears from this study that the average macronutrient intakes of the population are 344.945 ± 130.78 g for carbohydrates, 93.949 ± 24.330 g for proteins and 80.254 ± 18.77 g for lipids. The carbohydrate consumption of the elderly is higher than that of other age groups. The contents of carbohydrates, proteins and lipids as a percentage of the ratio compared to the recommended nutritional intakes (ANC) of the typical groups of the Ivorian population are presented in the Appendix (*Figure 3*). The carbohydrate and protein intake of each group is higher than the recommended intakes except in children (14.9% for proteins). However, the lipid intake of all typical groups is lower than the recommended intake.

Discussion

The food consumption of populations, characterized by the shape of the food pyramid, increasingly constitutes an element of nutritional risk assessment. This representation nevertheless remains limited if the individual consumption characteristics are not considered. The general objective of this study is to analyze the dietary habits of the Ivorian population from the angle of domestic consumption and consumption outside the home and establish trends in the most frequent pathological profiles in the Ivorian population. The District of Abidjan constitutes the first large urban agglomeration in Côte d'Ivoire which, moreover, integrates local rural entities. The total sample is 3708 people with a structure of 47.55% women and 52.45% men and the average household size of the study is four members. These results are similar to those observed in the General Population and Housing Census (RGPH) where the Autonomous District of Abidjan had an average of 4.5 people per household, 52% men and 48% women. It appears that the population studied is young with an average of 28.11 ± 2.64 years. These results are similar to those obtained by the National Institute of Statistics in Côte d'Ivoire which at the

end of their survey demonstrated that 75.6% of the population is under 35 years old. Indeed, Côte d'Ivoire is experiencing rapid demographic growth, with a high birth rate and a high proportion of young people in its population (*Stratégie Nationale...*, 2021).

According to the nutritional assessment in children, 5.94% of the population is in a state of severe acute malnutrition (SAM) and moderate (MAM). These results are different from those obtained by the INS (*Enquête par grappes...*, 2017). Indeed, this study stated that the percentage of wasted children in the city of Abidjan is 5.3%. At the adult population level, a percentage of 6.06% of cases of malnutrition are recorded, of which 2.77% are males and 3.29% are females. These observations could be the consequences of dietary habits. Indeed, it appears from this study that only 23.7% of the population studied consumes two meals per day. This remark could also be due to socioeconomic variables. Furthermore, these claims prove that the consumption level of certain people does not cover their nutritional needs, hence the appearance of deficiency diseases. Overweight and obesity are more pronounced among women with a prevalence of 27.61%. This difference could be explained by the percentage of snacking and fat consumption. Indeed, in this study, 44.32% of women have the habit of snacking. These results are higher than those obtained by the STEPS survey, which stated that, in Abidjan, 36% of women are overweight compared to 23.7% of men (*STEPS*, 2005).

The regularity of meals and their duration makes it possible to understand different eating behaviours. Among our population, nearly 70.93% of people had taken the three main meals the day before the survey, 23.7% had taken two, and 3.57% had taken four meals. and the prevalence of those who eat only one meal per day is 1.8%. These different meals provide energy which will be used to benefit households; Skipping the morning or midday meal has a direct impact on snacking (*De Jaeger*, 2016).

The day preceding the interview, 94.11% of households reported having consumed food in eating places such as kiosks, maquis, restaurants, and street stands and 2.19% consumed in canteens. Therefore, most households eat away from home and generally consume quick meals. These are foods, being fatter and more refined, to give a better taste to attract the customer and more calories, promoting weight gain, hypertension and other nutritional diseases (*McDonald*, 2007).

In our population, 81.75% of respondents think they eat a balanced diet, 18.25% of them consume unbalanced meals and this increases the risk of contracting certain diseases such as obesity. Indeed, obesity can be caused by a poor diet. The latter must be diversified and above all balanced. It is also a means of protection against diabetes and heart disease, obesity and excess cholesterol. The most harmful eating habits are the consumption of foods rich in sugar and fat, irregular meals with little variety, an anarchic diet during and outside meals, associated with a lack of physical activity (*Shields*, 2005).

The present study reveals that the average energy intake of the population is 2549.86 ± 444.33 kcal. The average ratios obtained among adolescents, young people, adults and the elderly, however, comply with the standards proposed by Charvet (*Charvet*, 2007). The quantitative distribution of the ratio shows that the macronutrient intake specifically of carbohydrates, proteins and lipids of the typical groups of the population does not comply with the recommendations. For the energy ration, the carbohydrate intake is between 61.68 and 67.50%, while the lipid intake is between 14.74 and 20.70%. These results are far from a balanced

distribution proposed by Martin for whom carbohydrate intake should be 50% to 55%, 30% to 35% for lipids and 10 to 15% for proteins (*Potier de Courcy et al., 2003*).

Concerning the nutritional pathological profile, it was found that 41.65% of the population of our study presented a pathology and had a medical history; the pathologies affected adults and the elderly. This prevalence can be explained by several factors related to lifestyle, dietary habits and physiological changes associated with aging (*Bauduceau et al., 2017*). Indeed, food choices and nutritional habits established over time can have an impact on long-term health. Adults and older people have generally had more time to develop eating habits, and some of these habits can contribute to contracting these different pathologies (*Regimbal, 2020*). Additionally, sedentary habits associated with less active lifestyles may contribute to nutritional problems (*Biscontin, 2018*). Also, nutritional needs change with age. Older adults may have different nutritional needs due to physiological changes, muscle loss, decreased appetite, etc. (*Aubert, 2018*). Hence the difficulty for them to maintain a balanced diet. Finally, adults and older adults may be more likely to develop nutrition-related chronic health problems due to factors such as pre-existing illnesses, metabolic problems or specific age-related medical conditions (*Mabiama, 2021*). In this study, obesity has a higher prevalence than the other pathologies identified. It induces many health risks such as diabetes, hypertension, arthritis and cardiovascular diseases (*Latham, 2001*). The combination of infectious pathologies and chronic non-communicable diseases, on the one hand, and problems of malnutrition due to deficiency and obesity, on the other hand, poses a real problem for the healthcare services of these countries (*OMS, 2023*), we know that excessive consumption of calories, fat, cholesterol, alcohol and salt, as well as insufficient consumption of fruits, vegetables and fiber, coupled with a sedentary lifestyle largely contribute to the increase in incidence chronic diseases of wealthy populations (*Wharton et al., 2020*).

Conclusion

The present study aimed to analyze the dietary habits of the Ivorian population from the perspective of domestic consumption and consumption outside the home and establish trends in the most frequent pathological profiles in the Ivorian population. It appears that the population studied is young with an average of 28.11 ± 2.64 years. The population studied weighs 54.59 ± 9.17 Kg and an age of 28.11 ± 2.64 years; The average population size is 1.48 ± 0.45 m and the average BMI is 22.71 ± 5.56 (Kg/m²). 6.06% are thin; 45.86% a normal build; 19.29% overweight; 21.12% obesity. Several household lifestyle habits expose them to overweight, obesity and other risks of nutritional factors. 81.75% of households have a balanced weekly consumption of different food groups. The average food ration of the population is 2549.86 ± 444.33 kcal. 50.70% of the population were declared to have a pathology and a medical history. This study showed that certain eating habits can be potential factors for overweight and obesity. Anthropometric parameters were influenced by dietary habits, physical activity.

Thus, uncontrolled eating during and outside of meals, associated with a lack of physical activity can be a risk factor for weight gain. To prevent excess weight in the population, we must make them aware of a balanced diet, appropriate regular physical activity and respect for quality sleep.

Conflict of interests

The authors declare no conflict of interest.

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Appendix

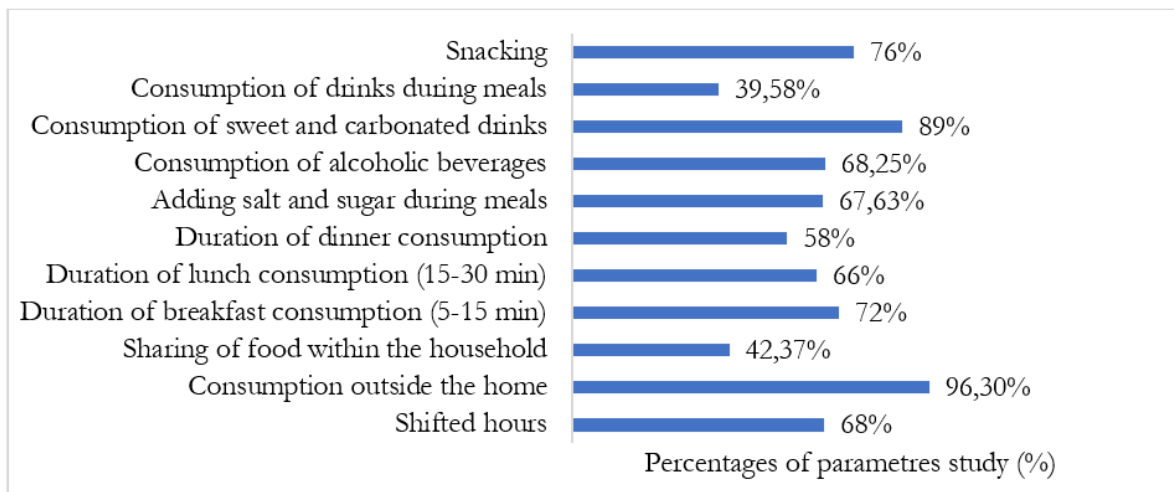


Figure 1. Eating habits and behavior of households in the Abidjan District

These eating habits and behaviors are likely to be nutritional risk factors for the Ivorian population.

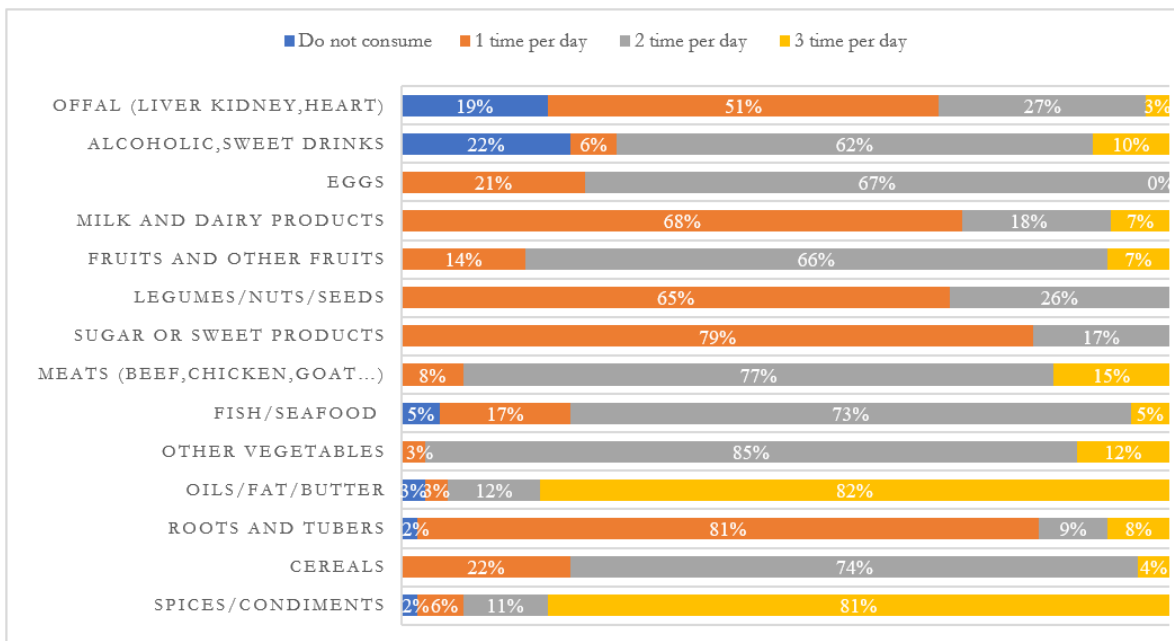


Figure 2. Frequency of daily consumption of different household food groups

This result confirms that most households have a balanced weekly consumption of different food groups (81.75%).

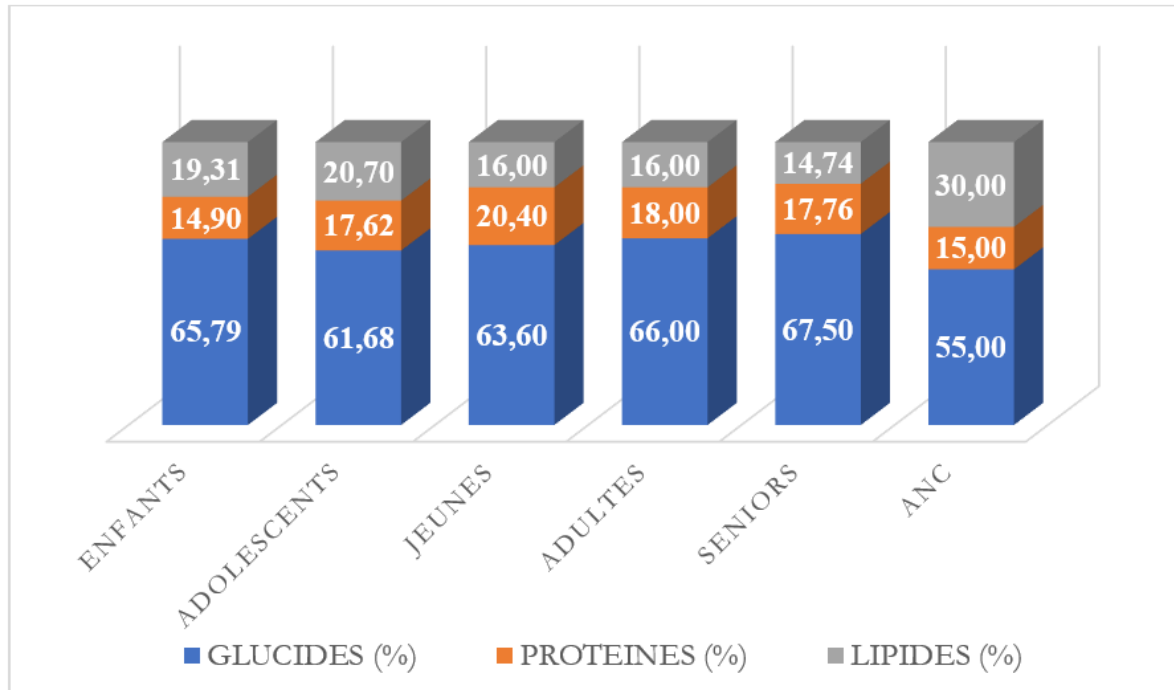


Figure 3. Quantitative representation of the food ration compared to the Recommended Nutritional Intakes (ANC) of typical groups of the Ivorian population

Figure 3 indicates sufficient energy intake for each typical population group while the percentage shares of different types of nutrients are not really balanced.

Table 1. Sociodemographic and economic characteristics of households

Features Heads of households	Categories	Frequency (N=927)	Percentage (%)
Sex	Male	561	60.50
	Feminine	366	39.50
Age	19-25	45	4.90
	26-59	618	66.70
	60 and over	264	28.40
Place of residence	Urban	780	84.15
	Rural	147	15.85
Marital status	Bride)	550	59.40
	Divorced/Separated	23	2.47
	Widower widow	32	3.46
	Bachelor	322	34.63
Educational level	Unschooling	307	33.17
	Traditional teaching	28	2.97
	Primary	124	13.36
	Secondary	275	29.69
Professional status	Superior	193	20.79
	Frame (high/medium/single)	206	22.27
	Self-employed	468	50.49

	Housewives	4	4.95
	Unemployed/retired	206	22.27
Household water source	Faucet	803	86.63
	Well	23	2.47
	Mineral water	101	10.89

Table 2. Anthropometric characteristics of typical groups of the population of Abidjan

Typical groups	Weight (kg)	Size (m)	Age (years)	BMI (kg/m ²)
Child (0 to 9 years old)	12.81 ± 4.40	0.91 ± 0.03	2.84 ± 1.70	15.58 ± 6.63
Adolescent (10 to 18 years old)	53.83 ± 8.94	1.58 ± 0.58	14.07 ± 1.16	21.56 ± 3.70
Young (19 to 25 years old)	67.27 ± 6.31	1.57 ± 0.32	21.15 ± 1.96	27.01 ± 5.12
Adult (26 to 59 years old)	76.08 ± 15.87	1.68 ± 0.82	35.34 ± 7.37	27.08 ± 8.35
Elderly (60 and over)	62.98 ± 10.34	1.66 ± 0.51	67.14 ± 1.02	22.32 ± 3.99
TOTAL	54.59 ± 9.17	1.48 ± 0.45	28.11 ± 2.64	22.71 ± 5.56

Table 3. Distribution of different BMI classes (kg/m²) according to sex

Settings	Sex			
	BMI class (kg/m ²)	Total of both sexes (%)	Male (%)	Feminine (%)
Severe acute malnutrition (SAM)		2.72	1.46	1.26
Moderate Acute Malnutrition (MAM)		3.22	1.70	1.52
Thinness (BMI < 18.5)		6.06	2.77	3.29
Normal build (BMI between 18.5 and 24.9)		45.86	30.50	15.36
Overweight (BMI between 25 and 29.9)		19.29	8.47	10.82
Moderate obesity (BMI between 30-34.9)		13.07	4.33	8.74
Severe obesity (BMI between 35-39.9)		6.29	1.72	4.57
Morbid obesity (BMI 40 and above)		3.48	1.46	2.02

Table 4. Proportions of pathologies identified in the Ivorian population

Pathologies	Percentages (%)	Numbers (N=1880)
Diabetes	4.21%	156
Prostate	2.43%	90
Arthritis	2.07%	77
Colopathy	0.81%	30
Stroke	0.54%	20
Rheuthoid	0.75%	28
Heart attack	0.54%	20
Venous insufficiency	0.47%	17
Osteoporosis	0.75%	28
Hypertension	3.29%	122
Moderate obesity	13.07%	485
Severe obesity	6.29%	233
Morbid obesity	3.48%	129
Undernutrition	6.06%	225
Acute malnutrition	5.94%	220
TOTAL	50.70%	1880

Table 5. Food ration according to population groups

Typical groups	Food ration (Kcal)
Child (0-9 years)	2105.81 ± 401.79
Teenager (10-17 years old)	2428.16 ± 465.99
Young (18-25 years old)	2701.98 ± 584.85
Adult (26-59 years)	2940.89 ± 167.24
Elderly (60 and over)	2572.48 ± 601.78
Total population	2549.86 ± 444.33

Table 6. Average daily macronutrient intake according to age groups

Typical groups	Carbohydrates (g/d)	Proteins (g/d)	Lipids (g/d)
Child	279.020 ± 122.86	63.174 ± 21.952	81.893 ± 18.54
Teenager	297.449 ± 136.82	84.986 ± 27.134	99.824 ± 20.18
Young	358.012 ± 127.44	114,834 ± 24,605	90.066 ± 19.80
Adult	404.373 ± 137.67	110,283 ± 24,510	98.030 ± 36.10
Person elderly	366.579 ± 126.01	96.468 ± 22.371	80.033 ± 20.71
Total population	344.945 ± 130.78	93.949 ± 24.330	80.254 ± 18.77