Original Research Article

EVALUATION OF THE DIETARY PROFILE OF BASKETBALL PLAYERS IN THE SENIOR FIRST DIVISION TEAMS OF COTE D'IVOIRE

Abstract

Introduction: Diet plays a fundamental role in the performance of athletes in general and basketball players in particular. For a better understanding of the nutrition of the athlete, this work aimed to evaluate the diet of Ivorian female basketball players in pre-competitive periods.

Methodology: A retrospective frequency questionnaire survey was conducted from December 6, 2020 to the end of February 2021, on 86 female basketball players in the senior categories (17-35 years) playing in the first division. The collection of socio-demographic, anthropometric and dietary data before the competition was obtained for each team.

Results: The study showed that 38.38% of the female basketball players had no side activities while 61.62% had a side activity. In general, 84.88% of the players had a normal Body Mass Index (BMI) compared to 06.98% overweight and 2.33% obese. The energy requirements of the women's teams were between 2427 and 2810 Kcal. The overall amount of energy consumed at breakfast in the pre-competitive period was below the required standards, while the amount of energy consumed at lunch and dinner was above the required standards for the players.

Conclusion: In sum, the senior female basketball players of Côte d'Ivoire have a poor dietary profile. Nutritional interventions would be preferable for them in order to improve their nutritional knowledge on the one hand, and the distribution of caloric foods consumed during their different daily meals on the other hand, and to meet their energy needs.

Key words: Basketball, profile, diet, nutrition, energy requirements, macronutrients.

INTRODUCTION

Nutrition is the set of reactions by means of which living organisms process, absorb and use food to ensure the maintenance of life and the growth and normal functioning of organs (**WHO, 2018**). In the world of sport in general and basketball in particular, it is primarily the monitoring of everyday diet. In the daily practice of African basketball, the place of diet is not explicit enough. However, the analysis of the different elements contributing to sports performance shows the determining place of this in the search for an optimal physical aptitude (**Vague, 1990**). In Côte d'Ivoire, we are often only interested in sports nutrition during competitions. However, the daily diet of many of them is unstructured (snacking) and too rich in simple carbohydrates and fats. If body weight is maintained, however its composition may not meet the needs of performance and recovery, resulting in states of poor performance **(Koffi, 2001)**. Also, the fundamental characteristic of the basketball player is his anaerobic lactic power **(Jordan, 1995)**. This results in a depletion of energy reserves, water and extra- and intracellular electronic transfers **(Monod, 2000).** Recovery or regeneration as an anti-fatigue action then plays an important role in the rapid correction of deficit states **(Hindle, 1980)**. However, the replacement or restoration of energy substrates can only be done through nutrition. That is why, playing basketball requires a well-balanced diet **(Jenoure *et al.*, 1995)**. In addition, most of the player's training includes intermittent exercise, although the average activity level is still high **(Bangsbo, 1995).** Therefore, nutrition deserves regular monitoring long before the competition. It meets quantitative criteria, energy intake close to expenditure, and qualitative criteria, macro and micronutrient intake, well defined, the basis of a balanced and varied diet, widely used by athletes **(Pérès, 2000)**. The diet of sportsmen and women, a hot topic, is under-researched in sub-Saharan Africa in general, and in Côte d'Ivoire in particular. However, the provision of corrective measures to help our athletes to have a good

diet and therefore good sports performance requires knowledge of the current situation. It would be appropriate to know the dietary profile of our basketball players.

The general objective of this work is to evaluate the dietary profile of senior basketball players in Abidjan during the pre-competitive period.

Specifically, it seeks to :

- describe the diet during pre-competitive periods ;
- assess the energy requirement during pre-competitive periods;
- establish the energy balance between intake and requirements during pre-competitive periods.

MATERIALS AND METHODS

I. MATERIALS

I.1. Study framework

The study was conducted in Côte d'Ivoire, precisely in Abidjan, during the 2020-2021 national basketball championship season. It was carried out on all the senior basketball teams in the first division. These teams are ABC, VOLTAIRE, SEWE, AFRICA SPORT, DELCATE, CSA, SOA, GSPM, IVESTP, WARRIORS, ASA, AZUR, JCA, FBA, NCA and UE3A.

I.2 Study population

The teams surveyed were of all genders (male, female) from the different basketball teams mentioned above. A total of 20 teams including 12 men’s teams and 8 women's teams from the first division of the national championship. The study was carried out on a sample of 203 players, 117 of whom were boys and 86 girls.

I.3 Duration and type of study

In the context of this work, it is a dietary survey described by the qualitative and quantitative recall of 24 hours. It is a retrospective survey in which the target population was at least 18

years old. The survey was carried out at different times in different team training locations from December 6, 2020 to February 28, 2021.

I.4 Inclusion criteria

All basketball players in the senior first division of the different teams mentioned above were included in our study.

I. 5 Non-inclusion criteria

All basketball players who did not meet the inclusion criteria

II. METHODS

II. 1 Data collection

After authorisation from the President of the medical commission of the Ivorian Basketball Federation (FIB), data collection was recorded using a survey form developed according to the models of the National Health Nutrition Programme (PNNS) and modified for the needs of the team survey.

The survey form contained the following headings:

- socio-demographic characteristics: age, gender, occupation, education, marital status, standard of living;
- anthropometric data: weight, height, BMI ;
- Frequency of food consumption in the pre-competition period: The weight of all food consumed during the various meals was noted on a food consumption sheet, meal by meal. Using this technique, the investigator was able to note on the survey form the nature and quantity of food consumed during the different meals (morning, noon, evening) before the competitions. To enable the weight of the various foods consumed to be measured, the quantities were assessed using household units (spoons, bowls, glasses, slices, etc.). Once the survey form was completed, the conversion of food into nutrients was carried out using a table of compiled food composition **(Souci *et al.*, 1994)**,

synthesizing that of **FAO, 1999**. Energy intakes, as well as quantities of macronutrients (carbohydrates, proteins, fats) were compared to the respective recommended intakes of **FAO (1979)**.

II.2 Anthropometric measurements

The weight of the basketball players was measured using an electronic scale of the brand SECA-813. The height was measured using a vertical wooden measuring rod graduated from 0 to 2010 cm.

The Body Mass Index (BMI), which is a determining indicator in the calculation of a player's physical quality, is composed of the individual's weight and height. It is calculated by the formula :

With : *BMI in kg/m*^{2}  (1)

W (weight) in kilograms (kg)

H (height) in square metres

II.3. Weighing of food

For the weighing of the foods, an electronic kitchen scale of the brand VINCIANN was used: SF-400 with a maximum range of 10000g.

II.4 Dietary behaviour

For the dietary behaviour, a 24-hour recall and food frequency questionnaire was used. This questionnaire offers the possibility of specifying variations in frequency according to season and of indicating portions consumed, and gives good estimates of usual diet **(Kesse-Guyot *et al.*, 2010).**

II.5 Calculation of energy requirements

The HARRIS and BENEDICT equations were used. They took into account weight, height, age, gender and the player's basal metabolic rate and activity level.

Formula for calculating energy requirements

FEMALE: $ER = \left((9{,}99W) + (6{,}25H)\right) - (5A)) - 161 \times \text{Activity factor}$

ABMR (3)

With : ER for energy requirements in kcal

W for Weight in kilograms

H for Height in centimetres

A for Age in year

ABMR for Average Basal Metabolic Rate in kg.cm.year

Activity factor

- 1.2: Sedentary (little or no exercise and office work)
- 1.4: Slightly active (Light exercise or sport 1 to 3 times a week)
- 1.6: Moderately active (moderate exercise or sport 3-5 times a week)
- 1.7: Very active (Intense exercise or sport 6-7 times a week)
- 1.9: Extremely active (daily intense exercise or sport and physical work)

II.6. Data analysis

The data were recorded and processed with the following software:

Nutri-Survey 2007 for calculating the energy values of the food consumed**, Sphinx Plus² 2003** for calculating the means, standard deviations and **Excel 2013** was used to draw the graphs.

RESULTS AND DISCUSSION

I. Results

I.1 Socio-demographic characteristics of the study population

The socio-demographic characteristics of the study population are shown in **Table** I. The survey was carried out on 86 female players. The average age of the players was 22.94 years with a standard deviation of 4.35. Five (5) age groups were identified: 17-20 years; 20-22 years; 22-24 years; 24-26 years; 26-35 years. The most represented age group was 20-22 years (33.74%). The majority of the respondents had a higher education level (64%). The study showed that 97.7% of the female basketball players were single overall. In terms of the side activity variable, 61.63% of the players had a side activity compared to 38.37% who did not.

Table I: Socio-demographic characteristics of the study population.

	FEMALE	
	Number	%
Age (years)		
17-20	17	8,4
20-22	29	14, 3
22-24	14	6,9
24-26	12	5,9
26-35	14	6,9
Education		
Primary level	3	3,5
Secondary level	28	32,8
Higher level	55	64
Marital status		
Married	2	2, 3
Single	84	97,7

Divorced	-	-
Side activity		
Activity	33	35,1
No activity	53	48,6

I.2 Distribution of players by Body Mass Index class

The distribution of the study population by BMI class according to WHO standards is presented in **Table 2**. 84.88% of the female basketball players surveyed had a normal BMI overall compared to 6.98% who were overweight. However, 1% of the women's team was in a state of grade I obesity.

Table 2: Body Mass Index (Kg/m²)

BMI (Kg/m2)	**FEMALE**
	% (n)
Leanness ≤18.40	05.81 (5)
Normal: 18.50≤IMC ≤ 24.9	84.88 (73)
Overweight: 25≤ BMI≤ 29.9	06.98 (6)
Obesity I: 30≤IMC≤ 34.9	02.33 (2)
Obesity II: 35≤IMC≤40.00	00.00 (0)
TOTAL	100.00 (86)

I.4. Energy requirements of players

The vast majority of female basketball players had an energy requirement ranging from 2427 to 2810 Kcal **(Table 3)**.

Table 3: Distribution of basketball players according to their energy needs

ENERGY (KCAL)	FEMALE % (N)
LESS THAN 2427	30.23 (26)
FROM 2427 TO 2810	59.30 (51)
FROM 2810 TO 3192	10.47 (09)
FROM 3192 TO 3575	00 (0)
FROM 3575 TO 3958	00 (0)
4341 AND ABOVE	00 (0)
TOTAL	**100.00 (86)**

The dependence is highly significant. chi2 = 156.98, ddl = 5, 1-p = >99.99%.

I.5. Dietary behaviour

I.5.1. Frequency of meals per day

Table 4 shows the distribution of female basketball players according to daily meal frequency. 64% of female basketball players ate three meals, while 21.2% ate two meals and 14.8% ate four meals.

Table 4: Percentage distribution of players according to meal frequency

Number of meals per day	Number of players	Percentage
1	-	-
2	18	21.2
3	55	64.0
4	13	14.8
TOTAL	86	100

I.5.2. Composition of meals

- ✓ **Breakfast**

Figure 1 shows the breakfast composition of all female basketball players surveyed during the pre-competitive period. The breakfast of all players generally consisted of: bread, eggs, whole milk, and coffee. The consumption of foods such as cereals (bread) and coffee/tea/milk was significantly higher than the standards. The consumption of yoghurt and fruit was a little closer to the standards for all teams. While the consumption of fruit juice, jam was very insignificant compared to the standards.

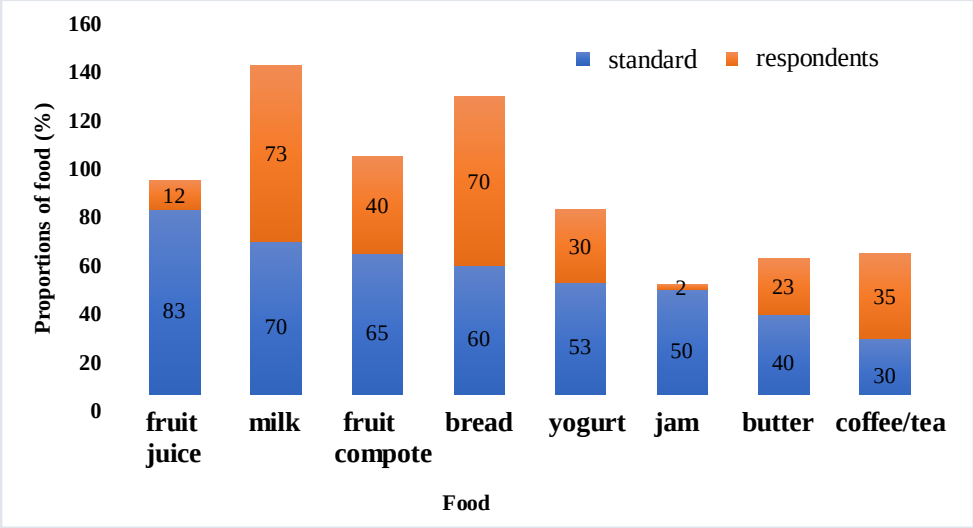

Figure 1: Composition of the surveyed teams' breakfast

✓ **-Lunch**

Figure 2 shows the composition of all female basketball players' lunches during the pre-competitive period. All players' lunches generally consisted of starchy foods, vegetables, fish and dairy products. The consumption of these foods was on average close to the standards. Except for the consumption of meat, fruit and raw vegetables, which was very low compared to the recommended amount.

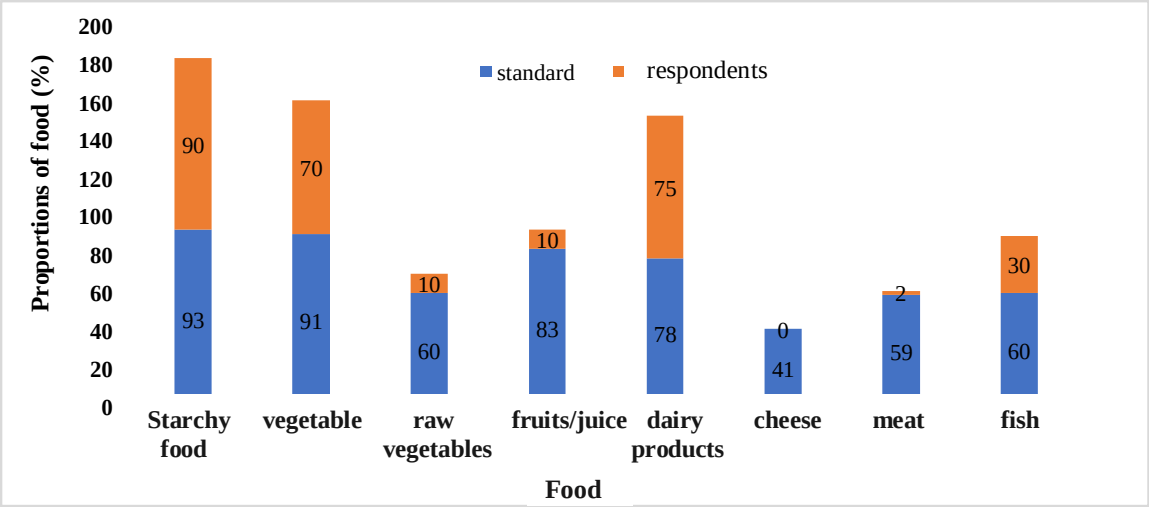

Figure 2: Composition of the surveyed teams' lunch

✓ **Dinner**

Figure 3 shows the composition of the lunch of all basketball players (male, female) during the pre-competitive period. All players' lunches generally consisted of starchy foods, vegetables and fish. The consumption of starch was slightly higher than the reference amount, while the amount of fish and vegetables consumed was somewhat close to the standards. However, the consumption of raw vegetables, fruit/juice and dairy products was very low.

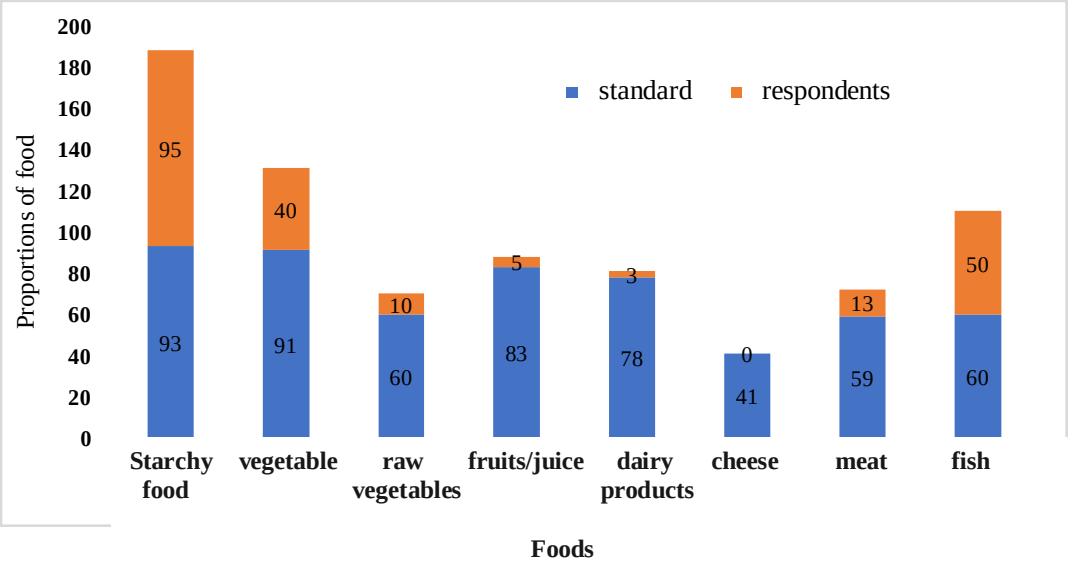

Figure 3: Composition of the surveyed teams' dinner

I.6 Daily energy assessment of macronutrients of the teams

I.6.1. Breakfast

Figure 5 presents the macronutrient energy composition of the most consumed foods "garba" (cassava semolina and grilled tuna) and "coffee with milk and bread" by the women's teams at breakfast. In terms of overall energy intake from breakfast, the meals garba and coffee with milk had 675.11 Kcal and 256.7 Kcal respectively, which were below the standard assessed (843 Kcal). In terms of the carbohydrate energy provided by breakfast, the meals garba and coffee with milk had 457.26 Kcal and 200.2 Kcal respectively, which were lower than the standard assessed (480.16 Kcal). In terms of protein energy for breakfast, the meals garba and coffee with milk and bread had 118.2 Kcal and 21.8 Kcal respectively, which were lower than the standards evaluated (172.41 Kcal). Regarding fats, the energy consumed was much lower than the standard evaluated (190.43 Kcal) for the meals garba (99.65 Kcal) and coffee with milk and bread (34.7 Kcal).

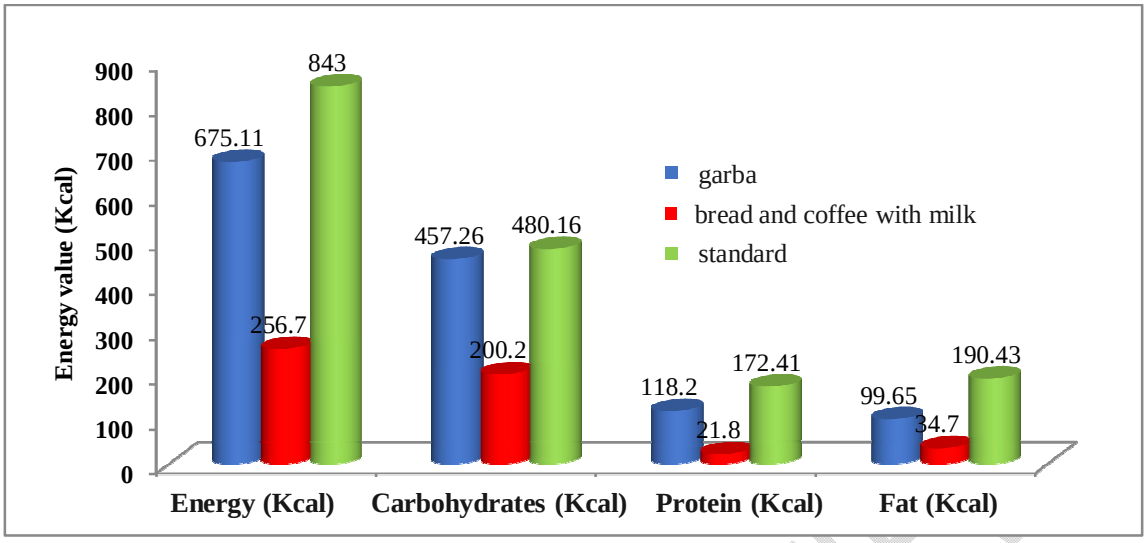

Figure 5: Macronutrient energy composition of women's teams at breakfast

I.6.2. Lunch

Figure 7 shows the macronutrient energy composition of the most consumed foods (attiéké (cassava semolina) with fish and rice with fish sauce) by the women's teams at lunch.

In terms of the overall energy provided by lunch, the meal attiéké with fish had an energy (1054.44 Kcal) higher than the standards assessed (983.5 Kcal) while the meal rice with vegetable sauce (816.69 Kcal) was lower than the standard assessed (983.5 Kcal). In terms of carbohydrate energy for lunch, the meals attiéké with fish and rice with vegetable sauce provided 633.22 Kcal and 575.62 Kcal respectively, which were higher than the standard assessed (540.92 Kcal). In terms of protein energy for lunch, the meals attiéké with fish and rice with vegetable sauce provided 301.1 Kcal and 138.63 Kcal respectively, which were lower than the standard evaluated (344.22 Kcal). With regard to fats, the energy consumed was lower than the standard evaluated (147.52 Kcal) for the meals attiéké with fish (120.12 Kcal) and rice with vegetable sauce (102.56 Kcal).

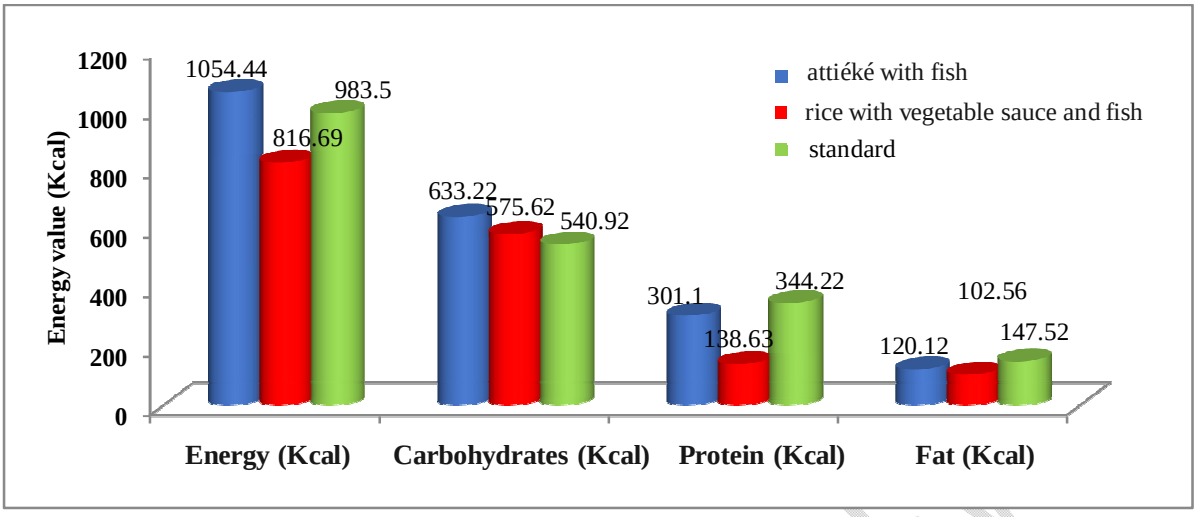

Figure 7: Macronutrient energy composition of female teams at lunch

I.6.3. Dinner

Figure 8 shows the macronutrient energy composition of the most consumed foods (bread with French fries and chicken and rice with fish sauce) by the women's teams at dinner. In terms of the overall energy provided by the dinner, the meals bread with French fries and chicken, and rice with fish sauce provided 1114.33 Kcal and 917.1 Kcal respectively, which were higher than the standard (907.19 Kcal). In terms of carbohydrate energy, the meals (bread with French fries and chicken and rice with fish sauce) provided 720.13 Kcal and 657.21 Kcal respectively, which were higher than the assessed standard (564.21 Kcal). In terms of protein energy intake at dinner, the bread with French fries and chicken had an energy value of 272.87 Kcal, which was higher than the standard assessed (225.87 Kcal), whereas the meal ‘rice and fish sauce’ had an energy value of 158.33 Kcal, which was lower than the standard assessed (225.87 Kcal). With regard to the fat intake of the food consumed at dinner, the energy provided by the ‘bread with French fries and chicken’ (121.33 Kcal) was higher than the standard (117.11 Kcal), while that of the ‘rice and fish sauce’ (101.26 Kcal) was lower than the standard evaluated (117.11 Kcal).

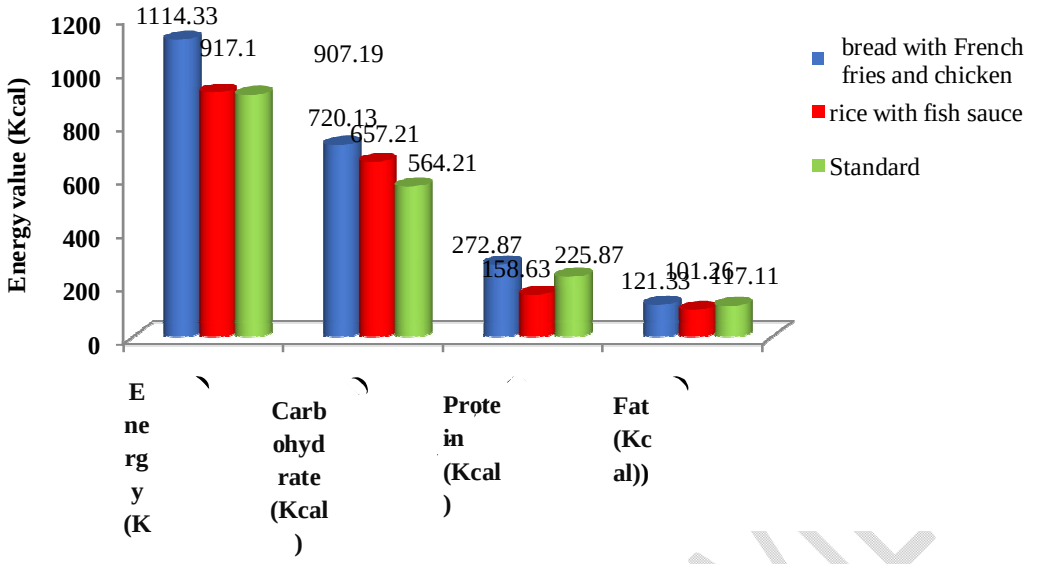

Figure 8: Macronutrient energy composition of women's teams at dinner

II. DISCUSSION

The aim of this study was to assess the dietary profile of female basketball players in the pre-competitive period in order to address nutritional errors. The socio-demographic characteristics of the study population showed that female basketball players had an average age of 22.94 years. The 20-22 age group was the most representative of the women's teams. These results were superior to those of **Coulibaly (2007)** who presented an average age of 18.91±0.1 years for senior basketball players. The majority of the players have a higher level of education (64%). This could be explained by the high level of practice of this discipline in high schools and universities **(Tamara, 2015)**. The study showed that 97.7% of the female basketball players were single. In general, more than half of the players (53.7%) had a side activity. The exercise of the side activity could be explained by the irregular payment of bonuses and salaries. The body mass index of the players is a factor of physical quality for the practice of sport. The study revealed that the majority of female players (84.88%) had a normal body mass index. However, 2.5% of the players were underweight and 9.30% were overweight or obese. This could be due to insufficient or excessive food intake or a lack of

financial means, or probably due to poor food hygiene practices as evidenced by the results of the **Bangui** study **(2010)**. These results could be explained by lack of nutrition education, poor eating habits and neglect. With regard to the quantity of food consumed, the majority of respondents ate three meals a day. On the other hand, the intake from their diet was more or less insufficient to cover their energy requirements. Indeed, the breakfast taken each day was unique and not varied. It consisted of 'garba' and 'bread and coffee with milk'. Although milk was present in their breakfast menu, it did not meet the daily protein requirements. The use of fruit juice and jam were very little use. However, breakfast should provide all the macronutrients and micronutrients. Moreover, breakfast should be considered as a meal in its own right, that is to say it should provide about 30% of the day's energy needs. For lunch and dinner, cereal consumption was good. As for the source of protein, more fish was consumed than meat. However, the basic diet of a basketball player requires four basic groups: milk and dairy products, meat and protein-rich products, fruits and vegetables, cereals and fats **(Mbemba, 2006)**. In the study, overall, the proportions of foods consumed at breakfast, lunch and dinner were below the standards reported by **Poulain (2002) and Coursin (2007)**, but the consumption of cereals at breakfast and starchy foods at lunch and dinner were above the standards. The financial factor, ignorance, habits and food preferences, and lack of nutritional education, seem to be the justifications. In the pre-competition period, the composition of meals did not vary. At breakfast, lunch and dinner, there was a high predominance of cereals/starchy foods. The average daily energy requirements (ER) for female basketball players was 2810 Kcal. For the female basketball players, the overall energy provided by dishes "garba" and "Bread and coffee with milk" at breakfast was 675.11 Kcal and 256.7 Kcal respectively and was below the assessed standard (843 Kcal). The carbohydrate energy provided by the breakfast dishes "garba" and " Bread and coffee with milk " had 457.26 Kcal and 200.2 Kcal respectively, which were below the standards assessed (480.16 Kcal). This

imbalance in macronutrients could be explained by the fact that they are recommended not to eat too much before the match. Unfortunately, this could affect their performance. The restriction of energy intake results in a decrease in reserves: loss of liver glycogen and almost 50% of muscle glycogen reserves (**Bigard and Guezennec, 2013**). In terms of protein energy intake at breakfast, the meals ‘garba’ and ‘coffee with bread’ had 118.2 Kcal and 21.8 Kcal respectively, which were below the assessed standards (172.41 Kcal). Regarding fats, the energy consumed was much lower than the standards evaluated (190.43 Kcal) for the meals "garba" (99.65 Kcal) and ‘bread and coffee with milk’ (34.7 Kcal). The energy intake at breakfast was mostly below the required standard. This energy imbalance may affect the physical and cognitive performance of these young adolescents. Indeed, according to **Thompson (1998)**, young athletes need to achieve energy balance, not only to cover their daily needs related to normal life and training, but also to support their growth, cope with the mental and physical stress of competition, and promote recovery from injury. The menus "rice and vegetable fish sauce" and "attiéké with fish" formed the bulk of the women's teams' lunches. In terms of the overall energy provided by the lunch, the meal "attiéké with fish" provided energy (1054.44 Kcal) above the standard of 983.5 Kcal, while that provided by the menu "rice and vegetable sauce" (816.69 Kcal) was below the standard of 983.5 Kcal. As for the carbohydrate energy provided by lunch, the dishes "attiéké with fish" and "rice with vegetable sauce" provided 633.22 Kcal and 575.62 Kcal respectively, which were higher than the standard assessed (540.92 Kcal). As for the energy produced by the proteins provided by the lunch, the "attiéké with fish" and "rice with vegetable sauce" respectively had 301.1 Kcal and 138.63 Kcal, which were lower than the standard assessed (344.22 Kcal). This imbalance could be explained by the lack of protein foods consumed during the different meals. **Péres (1994)** estimated the protein requirements of sportsmen and women at between 420 Kcal/d and 480 Kcal/d for a 70 kg subject. The protein deficit found in our basketball players was not

found in Portuguese basketball players (600.76 ± 162.4 Kcal/d) according to the study by **Hortas and Matos, 2002.** With regard to fats, the energy supplied was lower than the standard evaluated (147.52 Kcal) for the dishes "attiéké with fish" (120.12 Kcal) and "rice with vegetable sauce" (102.56 Kcal). The energy intake for lunch was higher than the norms assessed. This could be justified by the high consumption of cereal products. Players should aim to achieve a carbohydrate intake that meets the needs of their training programme and optimise the restoration of their muscle glycogen stores between training periods and before matches **(Burke *et al*., 2006)**. The teams' lunch consisted of "bread + French fries + chicken" and "rice + fish sauce". In terms of total energy, the menus "bread + French fries + chicken" and "rice + fish sauce" provided 1114.33 Kcal and 917.1 Kcal respectively, which were above the standard (907.19 Kcal). The carbohydrate energy produced by the dishes (Bread French fries chicken and rice with fish sauce) were 720.13 Kcal and 657.21 Kcal respectively, which were higher than the standard assessed (564.21 Kcal). The protein energy produced by the menu "chicken fried bread" had an energy value of 272.87 Kcal, which was higher than the standard assessed (225.87 Kcal), while the protein of the "rice with fish sauce" menu provided 158.33 Kcal, which was lower than the standard assessed (225.87 Kcal) As regards the fat intake of the foods consumed at the dinner, the energy provided by the fat fraction of the dish "chicken fried bread" (121.33 Kcal) was higher than the standard assessed (117.11 Kcal), while that provided by the menu "rice and fish sauce" (101.26 Kcal) was higher than this standard. The energy intake of the dinner as a whole was higher than the sandards assessed. This could be due to the fact that the basketball players were under parental supervision and had to eat the family menu. In addition, the high energy provided by fats could be due to the lack of knowledge of the sportsman's diet. These results are similar to those of **Rico-Sanz, 1998; Ruiz *et al*., 2005.**

CONCLUSION

At the end of this study, the average age of the sportsmen and women surveyed was 22.40 years and the majority had a higher education level. The study revealed that 53.7% of the basketball players had no side activities, while 46.3% had a side activity and 55.7% had no knowledge of the good dietary habits of the sports person. Concerning the frequency of meals, the sportsmen and women ate three times a day with cooked rice sprinkled as staple food with different sauces from Côte d'Ivoire, women's attiéké (attiéké with fish other than tuna fish with condiments) and also garba (attiéké and fish tuna). Breakfast consisted of coffee with milk, tea (Lipton) and bread with butter or garba, depending on the needs of each person. Dinner in most cases was not different from the eating habits of our country. The food consumed at breakfast, lunch and dinner in terms of overall proportion was below the recommended standards. There was an imbalance in the energy balance. For the female basketball players, the energy intake ranged from 1990.50 Kcal to 2843.88 Kcal with an average of 2417.18 Kcal. In terms of the distribution of the energy provided by the various nutrients, the diet of our sportswomen provided 1810.61 and 1433.03 Kcal/d of carbohydrates, 692.17 and 319.06 Kcal/d of proteins, 341.1 and 550.82 Kcal/d of fats. These intakes were slightly higher than the international recommendations (2700 Kcal) for a population with normal physical activity. The diet of our athletes provided 2094.7 and 1605.82 Kcal/d of Protein, 544.3 and 505.43 Kcal/d of Carbohydrate, 581.27 and 658.68 Kcal/d of fat. Energy intakes were higher than required. Indeed, the recorded carbohydrate intakes were higher and the protein and fat intakes were significantly lower than the recommended standards.

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