World Journal of Nutrition and Health, 2019, Vol. 7, No. 1, 23-29
Available online at http://pubs.sciepub.com/jnh/7/1/5
Published by Science and Education Publishing
DOI:10.12691/jnh-7-1-5

Nutritional Status of Children from 6 to 24 Months and Feeding Practices of Mothers During the Weaning Periode in the Municipality of Man (Côte D'Ivoire)

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Received June 04, 2019; Revised July 14, 2019; Accepted July 22, 2019

Abstract Malnutrition is a real public health problem in the world, particularly in sub-Saharan Africa. This nutritional deficiency is particularly severe during the period of supplemental feeding between 6 and 24 months. However, very few studies in Côte d'Ivoire have focused on the causal analysis of child malnutrition during the withdrawal period. The purpose of this study is to determine the nutritional status of children aged 6 to 24 months and to analyse the determinants of dietary practices during weaning in the west of Côte d'Ivoire, particularly in the municipality of Man. For the purpose of this study, a descriptive cross-sectional survey was carried out among households of 480 mother-child couples in the municipality of Man. The nutrition status of children during weaning indicated a higher prevalence for stunting compared to underweight and wasting. Among the 480 children, 39.37% are affected by protein-energy malnutrition with a prevalence of 31.66% for stunting, 11.66% for wasting and 23.12% for underweight. The most common mode of breastfeeding by mothers is breastfeeding, with a prevalence of 89.37% for 3.78% of breastfeeding exclusively. The average duration of breastfeeding is 16.3 months. On the whole, the proportion of mothers who introduce supplements before 6 months is higher with 65.77% compared to 20.88% for mothers who introduce them after 6 months. Also, the nutritional quality of the boiled food consumed was not in accordance with the nutritional recommendations for protein content (4.45-7.10 g / 100 g MS) and lipid content (0.98-7.25g/100gMS).

Keywords: *nutritional status, weaning, food practices, malnutrition, municipality of Man*

Cite This Article: Loba Sonia Euphrasie, Gbakayoro Jean Brice, Agbo Adouko Edith Chiakoun, Gbogouri Albarin Grodji, and Brou Kouakou, "Nutritional Status of Children from 6 to 24 Months and Feeding Practices of Mothers During the Weaning Periode in the Municipality of Man (Côte D'Ivoire)." *World Journal of Nutrition and Health*, vol. 7, no. 1 (2019): 23-29. doi: 10.12691/jnh-7-1-5.

1. Introduction

More than one-third of children under the age of five worldwide suffer from protein-energy malnutrition. Almost half of the 10.7 million annual deaths of children under five in developing countries are linked to protein-energy malnutrition [1]. Although the prevalence of different forms of protein-energy malnutrition is slowly decreasing, a recent study by the World Health Organization has shown that out of a quarter of children suffering from protein-protein malnutrition, 26.7% (150 million) are underweight and 32.5% (182 million) are still stunted. Also, according to the World Health Organization, of the 182 million stunted children, 26% live in Africa. Malnutrition is therefore a major public health problem in Africa [1]. Côte d'Ivoire, a developing country, is not immune to this scourge. Protein-energy malnutrition contributes to the country's high infant mortality (68/1000) [2]. The most common form of malnutrition in Côte d'Ivoire is stunting, where prevalence raised from 34 per cent in 2006 to 30 per cent in 2012. Despite this decrease of 4%, this rate is considered serious, particularly in the north and west of Côte d'Ivoire, with rates reaching 39.3% and 34.2% respectively [3]. This nutritional deficiency is mainly introduced during the first thousand (1000) days of a child's life and nutritional deficits are particularly severe in children between 6 and 24 months of age [4]. Indeed, from birth to 4 months of age, all the nutritional needs of the child are perfectly covered by breast milk. On the other hand, at the age of 6 months, breast milk becomes qualitatively and quantitatively insufficient for the infant, whose nutritional needs are increasing. This is the so-called weaning period during which mothers are advised to introduce supplements in liquid or semi-solid form to supplement the intake of breast milk [5]. However, it is during this period of introduction of supplemental foods that many cases of nutritional deficiencies are noted [4]. The determinants of complementary feeding practices

could therefore influence the nutritional status of the child during weaning. The objective of this work is to determine the nutritional status of children aged from 6 to 24 months and to analyse the main determinants of dietary practices during weaning in the west of Côte d'Ivoire, more precisely in the town of Man.

2. Materials and Methods

2.1. Study Framework

The survey was carried out in eight (8) villages and 16 (16) districts of the municipality of Man, chosen according to their geographical situations in relation to the district administrator's office of Man. The villages surveyed are: in the north the villages of Gouimpleu and Bantegouin; in the south the villages of Zélé and Blolé; in the east the villages of Voungoué and Krikouma; in the west the villages of Bigouin and Kassiapleu. The districts investigated are: to the north the districts of Kenedy, Dioulabougou, Air-France and Belle-Ville; to the south the districts of Petit-Paris, Lycée, Résidentiel and Houphouet-Ville; to the east the districts of Kpangouin1, Kpangouin 2, Grand Gbapleu Extension and Fraternité; to the west the districts of Tanpleu, Campus, Danyagouine 1 and Danyagouine 2.

2.2. Studied Population

This study is a descriptive cross-sectional random sample survey due to population dispersion and the lack of a recent household list. This survey was conducted from March 2017 to July 2017. In total, this work was carried out on 480 mother-and-child couples from different households. In order to obtain the 480 mother-child couples, in each village 30 mother-child couples were selected and 15 mother-child couples were selected by neighborhoods within the different households. This resulted in 240 couples in rural areas and 240 couples in urban areas. The inclusion criteria were as follows: the age of the child of the couple should be between 6 and 24 months; the couples chosen are those who reside permanently in the municipality of Man (period 1 year). The exclusion criteria were: the couple whose child had been hospitalized more than a week before the survey due to illness; children with birth defects; children receiving nutritional supplements; children declared malnourished before 7 months.

2.3. Course of the Study

The study was conducted in three phases. The first was a survey of mothers on the socio-economic characteristics of households, on food practices. The second part consisted of the determination of anthropometric measurements of children. The third part consisted of the physico-chemical analysis of the porridges most consumed by children. The survey on the socio-economic characteristics of mothers should focus on the standard of living of the household, the level of education of mothers, the gender of the child and the age of the child. As regards the survey of feeding practices, it covered the mode of breastfeeding, the duration of breastfeeding, the age at which supplement foods were introduced and the ingredients used in the preparation of porridge. With regard to the consumption of porridge, three 24-hour reminders were carried out on a sub-sample of 259 households to search for the most consumed porridge. The quantity of consumption of the porridge was estimated using household measures.

2.3.1. Measurements of Anthropometric Parameters

The children's nutritional status was assessed from anthropometric parameters such as weight and height. The weight of children was measured using an electronic scale and a baby scale. The children's height was measured to the nearest mm using a horizontal height gauge (graduated in cm). Anthropometric indices such as height / age (H/A), weight / age (W / A) and weight / height (W / H) were used to assess the nutritional status. They were expressed in Z-scores and compared to WHO standards [6]. Stunting, wasting and underweight were defined as H / A, W / A and W /H < -2 Z scores respectively. Protein-energy malnutrition is defined by the presence of at least one of the three types of malnutrition. Children were said to be malnourished if one of the three indices was less than < -2 Z-scores.

2.3.2. Biochemical Selection and Characterization of the most Consumed Porridge

After the three 24-hour reminders, the most recurring porridges were selected. These are the porridges commonly known as rice porridge, maize porridge and *Anangobaka* porridge with two variants: the one obtained from fermented maize (Anangfm) paste and the one obtained from bolero flour (commercial industrial flour) (anangbf). For each frequently consumed porridge, 32 samples were taken, including 16 samples in rural areas for two porridge samples per village and 16 samples in urban areas for one porridge per neighborhood. Physico–chemical analysis of porridge to determine dry matter, ash, proteins, fibers, carbohydrates, lipids, energy value and energy density. The proximate compositions of porridges were determined using the method proposed by the Association of Official Analytical [7]. About 5 g of porridge was weighed into a crucible and dried to constant weight in an oven at 100°C, for moisture determination. The dried sample from moisture determination was weighed into a crucible and put in a furnace at 600°C for 6 hours, in order to determine the ash content. The fat content was determined by extraction with petroleum ether using soxhlet extractor. Protein was determined using Kjeldahl apparatus, and multiplying % N by 6.25. Crude fiber content was determined by adding 100 ml digestion reagent (20 g trichloroacetic acid, 50 ml nitric acid, 450 ml distilled water and 500 ml acetic acid) into a 250 ml conical flask containing about 2 g of the sample. The mixture was boiled, refluxed, cooled, washed with hot water and methylated spirit, filtered, dried overnight at 105°C, cooled in a desiccator, weighed and incinerated in a muffle furnace at 600°C for 4 hours. Carbohydrates content was determined by nutrient difference using the following equation:

$$\%\ Carbohydrates = \left[100 - \left(\%\ proteins + ?\%\ lipids + \%\ ash + \%\ fibers\right)\right] \quad (1)$$

Energy value was calculated with 4 Kcal/g for carbohydrates, 4 Kcal/g for proteins and 9 Kcal/g for lipids according to [8] and expressed on a dry matter basis using the following equation:

$$Energie\ value = \left(\%\ proteins \times 4\right) + \left(\%\ carbohydrates \times 4\right) + \left(\%\ lipids \times 9\right). \quad (2)$$

Energy value was reported to the moist sample for energy density determination. Energy density was expressed using the following equation:

$$Energy\ density = \left(energy\ value \times \%\ dry\ matter\ of\ moist\ sample\right)/100. \quad (3)$$

2.4. Statistical Analyses

A questionnaire was developed using Sphinx software plus (sphinx development, Altais-74650 Chavanod-FRANCE Park), which was designed for surveys, and the data was processed before being converted into Excel file. Anthropometric indexes were calculated using Emergency Nutrition Assessment 2011. The levels of significance of the effects of different socio-demographic factors on the anthropometric characteristics of children were tested using the Chi-2 test using Epi-info Version 3.5.4 software. 2012. Analysis of biochemical endpoint results was performed using STATISTICA 7.1 software (Stats of t Inc., head office in Tulsa, USA) and averages were compared using Duncan's 5% test. The different letters on the same line at the table level indicate that there is a significant difference between the averages for the parameters concerned ($p \leq 0.05$).

3. Results

3.1. Nutritional Status of Children during Weaning

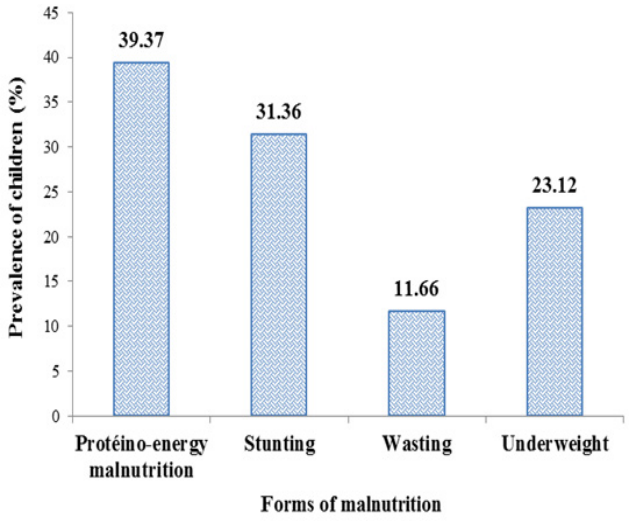

Figure 1. Prevalence of malnutrition during weaning

Figure 1 shows the prevalence of protein-energy malnutrition, stunting, wasting and underweight among all children surveyed. The results obtained showed that of the 480 children surveyed 189 children (39.37%) are affected by protein - energy malnutrition. Also, protein-energy malnutrition expressed by stunting, underweight and wasting have indicated that children in the municipality of Man are more affected by stunting than wasting and underweight, with prevalence of 31.66%, 11.66% and 23.12% respectively.

3.2. Nutritional Status of Children by Place of Residence

Table 1 shows the prevalence of protein-energy malnutrition by place malnutrition. The analysis of the results obtained showed a strong correlation only between stunting and the residential environment ($P < 0.05$). Children in rural areas were more affected by stunting than those in urban areas, with rates of 37.91% compared to 25.41%.

Table 1. PREVALENCE of MALNUTRITION by PLACE of RESIDENCE

Forms of malnutrition	Place of Residence		Significance level
	Rural	Urban	
Stunting	37.91 % [a]	25.41 % [b]	0.001
Wasting	11.66 % [c]	11.46 [c]	1.05
Underweigt	27.08 % [k]	25.41 % [k]	0.08

3.3. Nutritional Status of Children by Household Standard of Living

Table 2 shows the prevalence of malnutrition by household standard of living. The results obtained showed that the forms of malnutrition studied did not vary significantly with the standard of living of the household ($p > 0.05$).

Table 2. PREVALENCE of MALNUTRITION by STANDARD of LIVING

Forms of malnutrition	Standard of living			Significance level
	Low	Average	High	
Stunting	26.41 %[a]	20.02 %[a]	18.4 %[a]	0.07
Wasting	11.52 %[m]	12.92 %[m]	9.85 %[m]	0.08
Underweigt	21.02 %[e]	23.41 %[e]	19.75 %[e]	0.08

3.4. Nutritional Status of Children by Level of Education of Mothers

The educational level of mothers (no level, primary, secondary and higher) is shown in Table 3, the results obtained showed that the majority of mothers have no level of education at all, namely 66.7% of mothers with primary education account for 20.4% and 12.90% of mothers have secondary and higher education. With regard to forms of malnourishment, only stunting and wasting were significantly influenced by the level of education of mothers ($p < 0.05$). Children of educated mothers are less affected by stunting and wasting than those of uneducated mothers with rates of 29.04 compared to 41.83% for stunting. The prevalence of wasting is 6.4%

among children of educated mothers compared to 14.06% among children of uneducated mothers.

Table 3. PREVALENCE of MALNUTRITION by LEVEL of EDUCATION

Forms of malnutrition	Education level			Significance level
	Nought	Primary	Secondary and more	
Stunting	41.83 %[a]	29.06 %[b]	29.03 %[b]	0.001
Wasting	14.06 %[k]	7.14 %[l]	6.4 %[l]	0.02
Underweigt	23.75 %[d]	23.46 %[d]	19.35 %[d]	0.08
Percentage	66.7 %	20.4 %	12.90 %	

3.5. Nutritional Status of Children by Age of Child

In terms of age, the results showed that the 12-24 month age group was the most represented with 279 children or 58.33%, compared with 22.08% for 9-11 months and 19.59% for 6-8 months (Table 4). However, as the age class of children has increased, the prevalence of stunting, wasting and underweight has increased. The highest prevalence of stunting, wasting and underweight occurred among children in the 12-24 month age group and the lowest among those aged 6-8 months ($p< 0.05$). Prevalence rates were 41.67% versus 10.64% for stunting, 14.28% versus 4.25% for wasting and 26.42% versus 10.64% for underweight.

Table 4. PREVALENCE of MALNUTRITION by AGE of CHILD

Forms of malnutrition	Age group			Significance level
	6-8 months	9-11 months	12-24 months	
Stunting	10.64 %[a]	24.52 %[b]	41.67 %[c]	0.001
Wasting	4.25 %[k]	11.32 %[l]	14.28 %[l]	0.04
Underweigt	10.04 %[d]	22.64 %[e]	26.42 %[e]	0.02
Percentage	19.53 %	22.08 %	58.33 %	

3.6. Nutritional Status of Children by Gender of Child

Regarding the gender of children, the results showed that of the 480 children, 52.70% were male compared to 47.3% female (Table 5). Furthermore, this study shows that only stunting and wasting are significantly correlated with the gender of children ($p < 0.05$). Boys are more affected by stunting and wasting than girls with rates of 37.38% versus 27.77% for stunting and 14.41% versus 8.58% for wasting.

Table 5. PREVALENCE of MALNUTRITION by GENDER of CHILD

Forms of malnutrition	Gender		Significance level
	Girls	Boys	
Stunting	27.77 % [a]	37.38 % [b]	0.018
Wasting	8.58 % [c]	14.41 % [d]	0.032
Underweigt	21.70 % [e]	22.69 % [e]	0.088
Percentage (%)	43.73 %	52.7 %	

3.7. Breastfeeding Mode

With regard to the mode of breastfeeding carried out by mothers, three types of breastfeeding were chosen in this study. These include breastfeeding, artificial breastfeeding and exclusive breastfeeding. The results presented in Table 6 indicate that of the 480 mothers surveyed 429 were breastfeeding, a rate of 89.37%. Among the 429 mothers who breastfed only 16 mothers gave exclusively breast milk to the child during the first six months of life, a percentage of 3.78% of exclusive breastfeeding. With regard to artificial breastfeeding, the results show a coverage rate of 10.62% overall (Table 6).

Table 6. PREVALENCE of DIFFERENT MODES of BREASTFEEDING

Prevalence	Breastfeeding mode		
	Breastfeeding	Exclusive breastfeeding	Artificial breastfeeding
	429 (89.37%)	16 (3.78 %)	51 (10.62 %)

3.8. Duration of Breastfeeding

The results for the duration of breastfeeding, that is, the age of definitive weaning, are shown in Table 7. The results showed that, of all breastfeeding mothers, the duration of breastfeeding was on average 16.3 months and varies significantly with the child's home environment ($p < 0.05$). The duration of breastfeeding is higher in rural areas than in urban areas. It is 17.21 months compared to 15.5 months.

Table 7. AVERAGE DURATION of BREASTFEEDING by PLACE of RESIDENCE

Average duration of breastfeeding	Place of residence		
	Rural	Urban	Italic
	17.21 ± 7.01 [a]	15.5 ± 4.51 [b]	16.3± 6.51

3.9. Age of Introduction of Complementary Food

Table 8 shows the age of introduction of supplements stratified into three classes: the appropriate age of introduction, the early age of introduction and the late age of introduction. Of all mothers who give supplemental foods to children, more than 60 % introduce supplemental foods at an early age, 13.77 % of mothers do so at a late age and 20.88% of mothers introduce supplemental foods at the appropriate age. On the other hand, the analysis of the results obtained shows that the age at which supplements are introduced is significantly correlated with the mother's home environment. Thus, the proportion of mothers who introduce supplemental foods at an appropriate age is lower in rural than in urban areas, with rates of 11.16% compared to 29.78% respectively. Contrary to the practice of introducing food supplements at an appropriate age, the age of introduction of foods of early supplements shows a higher rate in rural areas than in urban areas, with 79% against 52.76% respectively.

Table 8. AGE of INTRODUCTION of SUPPLEMENAL FOODS by PLACE of RESIDENCE

Age of introduction of supplemental foods	Place of residence		
	Rural	Urban	(Rural + Urban)
Convenient (6 months)	24 (11.16%[a])	70 (29.78%[b])	94 (20.88 %)
Premature (<6 months)	170 (79 %[c])	124 (52 %[d])	294 (65.77%)
Late (>6 months)	21 (9.7% [k])	41 (17.44%[l])	62(13.77%)

Table 9. COMPOSITION of PORRIDGE in INGREDIENTS other than RAW MATERIAL according to the PLACE of RESIDENCE

Additional ingredients	Rural area	Urban area	Set
Sweetened products	200 (93.02%[a])	223 (94.89 % [a])	423 (94%)
Fat materials	15 (6.97% [c])	20 (8.5% [c])	35 (7.77%)
Milk,milky products	10 (4.65% [k])	50 (21.27%[l])	60(13.77%)
Egg,fish, meat	8 (3.7% [e])	13 (5.53% [e])	21(4.7%)

Table 10. DAILY CONSUMPTION of WEANING PORRIDGE by AGE GROUP of CHILD

Average quantity of consumption (g/day)	Age group		
	6 – 8 months	6 – 8 months	12 – 24 months
	307.8 ± 20.7[a]	390 ± 15.7[b]	416.6 ± 13.4 [c]

Table 11. BIOCHEMICAL COMPOSITION of WEANING PORRIDGES

Parameters	Porridges				
	Millet	Maize	Anang fm	Anang bf	Rice
Dry matter (g/100g of porridge)	12.56 ± 0.015[a]	13.01± 0.01[b]	11.13± 0.02[c]	10.05± 0.011[d]	14.01±0.03[e]
Lipids (g/100 g of DM)	1.25 ± 0.03[a]	1.18 ± 0.01[b]	1.07 ± 0.01[c]	7.25 ± 0.01[d]	0.98 ± 0.01[e]
Protein (g/100 g of DM)	7.1 ± 0.01[b]	6.03 ± 0.02[c]	6.05 ± 0.02[c]	4.45 ± 0.01[e]	6.33 ± 0.01[f]
Fibers (g/100g of DM)	1.06 ± 0.03[c]	1.01 ± 0.04[c]	1.04 ± 0.02[c]	0.05 ± 0.01[d]	0.56 ± 0.01[f]
Ash (g/100g of DM)	0.88 ± 0.05[b]	0.80 ± 0.025[ab]	0.78 ± 0.01[a]	0.02 ± 0.01[k]	0.45 ± 0,01[l]
Carbohydrate(g/100g of DM)	89.71± 0.03[b]	90.98± 0.01[k]	91.06 ± 0.03[l]	88.23 ± 0.03[m]	91.68 ± 0.01[g]
Energy value (Kcal/100g of DM)	398.4± 0.05[a]	398.6± 0.01[k]	398.0± 0.03[f]	435.9± 0.05[g]	400.8± 0.01[h]
Energy density (Kcal/100g of porridge)	50.08 ± 0.01[b]	51.86 ± 0.01[e]	44.30 ± 0.02[d]	43.81±0.03[g]	56.16± 0.01[k]

3.10. Age of Introduction of Complementary Food

With respect to the addition of ingredients to porridge, the results presented in Table 9 show that the majority of mothers introduce sweetened products into porridge (94%), but only 7.77% and 13.33% of mothers introduce fats and milk products respectively. However, only the rate of introduction of milk and milk product varies significantly with the mother's home environment, the rates are 21.27% for the urban environment compared to 4.65% for those in the rural area ($p < 0.05$).

3.11. Biochemical Characterization and Estimate of Daily Consumption of Porridge

3.11.1. Estimation of the Average Daily Consumption of Porridge

The average daily intake of weaning porridge obtained from the average daily consumption frequency and the quantity of consumption per meal is shown in Table 10. Analysis of the results obtained shows that the quantity of consumption by age group varies significantly ($p < 0.05$). The quantity of consumption increases with the age of the child. The lowest quantity of consumption is obtained with children from 6 to 8 months for an average value of 307.8 g of porridge per day while the highest consumption is obtained with the class from 12 to 24 months for an average quantity of 416.6 g per day. The 9 to 11 months - aged group consumes an average of 390 g per day.

3.11.2. Biochemical Characterization of the Most Commonly used Weaning Porridge

Table 11 shows the nutritional composition of porridge commonly consumed by children during weaning. Analysis of the results obtained shows a significant difference between the porridges for each parameter studied. In general, the dry matter content varied from 10.05 to 14.01 g per 100 g of porridge and the lowest value was obtained with the Anangobaka porridge from bolero flour. With regard to protein, Anangobaka porridge from bolero flour had the lowest value with 4.45 g per 100 g of dry matter compared to 6.03 to 7.1 g per 100 g of dry matter for other porridge. With regard to lipids, the lowest lipid content was obtained with rice porridge (0.98 g per 100 g of dry matter) while Anangobaka porridge from bolero flour had the highest content with 7.25 g per 100 g dry matter. The results showed that the level of ash, fiber, varies from 0.02 to 0.88 g per 100 g of dry matter and 0.05 to 1.06 per 100 g dry matter with a lower rate in Anangobaka porridge from bolero flour. The porridge generally showed an energy value ranging from 398.07 to 435.97 Kcal per 100 g of dry matter for an energy density between 43.81 and 56.16 Kcal per 100 g of porridge.

4. Discussion

This study was conducted to determine the nutritional status of children aged 6 to 24 months and to analyze the main determinants of these children's dietary practices. Analysis of the nutritional status of children in the commune of Man during the weaning period showed that children are more affected by stunting than by underweight and wasting. These results are similar to those obtained nationally in Côte d'Ivoire, which had a higher rate of stunting of 34% compared to 20.2% for underweight and 6.9% for wasting [2]. Moreover, although children are more affected by stunting than by wasting and underweight in this study, these three forms of malnutrition are considered serious by their prevalence according to the World Health Organization classification [2]. In terms of the nutritional status of children by home

environment, the results showed a predominance of stunting in rural versus urban children. These results are practically similar to the results obtained for the whole of the Ivorian territory with 35% growth retardation in rural areas compared to 21% in urban areas [3]. Vulnerability of rural versus urban children is believed to be due to higher rates of mothers introducing food supplements early in rural areas (79%) than in urban areas (52%). This precocious introduction of foods with more accentuated supplements in rural areas would lead to a decrease in the use of nutrients in breast milk and a decrease in the consumption of breast milk per child [9]. Compared to the national rate of introduction of supplemental foods at an appropriate age (6 months) of 64%, this study has a rate of introduction of supplemental foods at a lower timely age of 20.88% [3]. This food practice does not correspond to the one advocated by the World Health Organization, which recommends the introduction of complementary foods at six months [1]. Despite a relatively satisfactory rate of breastfeeding achieved (89%) compared to 97.5% nationally [3], the study found a low rate of exclusive breastfeeding of 3.78%. This low rate of exclusive breastfeeding could have a negative impact on the nutritional status of children by increasing the risk of contamination by drinking water that is often not drinkable [10]. In terms of the average duration of breastfeeding, the results showed that this duration is higher in rural versus urban settings. This result is similar to the results obtained in some studies carried out in Congo, which has an average duration of 16 months of breastfeeding in rural areas compared to 14 months in urban areas [11]. The higher duration of breastfeeding in rural areas compared to the urban environment obtained would make it possible to alleviate deficiencies of the monotonous diet and of poor biological value in relation to the urban area [12]. However, by comparing the average age at which all children stop breastfeeding (16.3 months) with the recommendations of the World Health Organization, which is 24 months [1], it appears that the average age of stopping breastfeeding obtained would be less close to that recommended by the World Health Organization. As far as age is concerned, the vulnerability of children in the 12-24 month age group compared to those in other age groups could be explained by an increase in the proportion of permanently weaned children in this group compared to those in other age groups age class, the average duration of breastfeeding being 16.3 months. The high prevalence of stunting and wasting among boys compared to girls obtained is consistent with the research of some authors with a rate of 25,2% of boys are malnourished compared to 23% of girls [13]. On the other hand, some studies conducted in the north of Côte d'Ivoire have shown that girls are more affected by malnutrition than boys [14]. The differences between these and ours would be due to the gender preference of different societies. In addition, the reason for the lower incidence of stunting and wasting in girls could be explained by the higher rate of immunoglobulin in girls compared to boys [15]. The study also showed that the prevalence of stunting and wasting decreases as educational attainment increases. This result is due to the favorable impact of education on the level of hygienic behavior accorded to children and in particular on good food practices [16]. With regard to the standard of living of households, this study showed that the standard of living of the household does not influence the occurrence of protein-energy malnutrition. This result is contrary to the studies carried out throughout the Ivorian territory which showed an increase in the three forms of protein-energy malnutrition in poor households compared to affluent households [3]. The results obtained at the end of the study would be explained by the fact that, being in the forest zone the majority of the products cultivated are those consumed, therefore the largest share of food is available and accessible. Fat and protein levels in slurry are below the standards of 10-25% on a dry matter basis and 15 g per 100 g dry matter basis, respectively [17]. These low levels of protein in these mushrooms could be explained by the fact that the majority of mothers do not introduce protein-source ingredients into these mushrooms to supplement the low protein value of cereals. In addition, the low fat and protein content of dietary supplements would be detrimental to the child's growth during weaning [18]. With regard to the energy density of slurry ranging from 41.85 Kcal to 55.18 Kcal per 100 g of slurry, it would be necessary to cover the daily energy needs of breastfed children in the 6-8 month class (362.45 to 477.89 g) of these porridge a day. Since the average daily consumption of boiled food is (307.8 g), these porridges can only provide (128.80 to 169.89 Kcal) of the 200 Kcal recommended for supplement food [19]. Also, taking into account the amount of consumption of the age class 9 to 11 months, the energy density of the slurry and the recommended daily intake for complementary foods (300 Kcal), these slurry could only cover (54.33% to 71.66% of the recommended intake) [19]. For the 12-24 month age group, consuming on average (416 g) porridge per day in this study, only (31.65-42.26%) of the recommended intakes (550 Kcal per day) for supplemental foods would be covered [19]. Comparing the energy coverage rates recommended by complementary foods for each age group, it follows that the energy intake of the 12-24 month age group would be the least covered. High prevalence of malnutrition in this age group (12-24 months) compared to the other age groups obtained is therefore justified by a lower rate of coverage of the energy intake recommended by dietary supplements in these children compared to other age groups.

5. Conclusions

This study carried out in the municipality of Man on children from 6 to 24 months and their mothers made it possible to establish the relationship between the nutritional status of children and to assess child feeding practices during weaning. At the end of this study, it emerges that children are vulnerable to different forms of protein-energy malnutrition during delimitation. Thus the nutritional status of children would depend on certain socio-economic characteristics such as the child's place of residence, the level of education of mothers, the child's gender and the age of the child. In fact, stunting and underweight rates are higher in rural areas than in urban areas, increase with age and are higher for boys than for girls. The prevalence of wasting decreases with increasing

educational attainment of mothers. As regards dietary practices, the results obtained showed an inadequacy between the dietary practices carried out and the one recommended for proper withdrawal behavior. The prevalence of exclusive breastfeeding is low and mothers generally introduce supplemental foods before 6 months. In addition, the duration of breastfeeding is much less than 24 months. With regard to commonly consumed porridges, it is clear from this study that all porridges do not meet nutritional recommendations with a low fat and protein content. Also the low energy density of the porridges obtained compared to the daily consumption of the porridges shows that the porridges cannot cover the energy needs of children. In view of these few results, we recommend that studies be carried out on the formulation of flour based on local raw materials for the preparation of porridge to meet the nutritional needs of children during weaning, also that an awareness-raising action on good pratices be carried out.

Acknowledgements

The authors thank the administrative authorities of the Municipality of Man, the households that participated in this study and the malnutrition treatment staff of the Man Regional Hospital Center, which formed the survey team.

References

[1] OMS, " Nutrition du nourrisson et du jeune enfant", Cinquante-troisième assemblée mondiale de la sante 53/7 Point 12.4 de l'ordre du jour provisoire, Organisation Mondiale de la Sante, 1-8.

[2] PNN, Formation en nutrition manuel du participant : module 1, Programme National de Nutrition, 2017, 1-36.

[3] Fond des nations unies pour l'enfance, Analyse de la situation de l'enfant en Côte d'Ivoire, DRAFT, 2014, 1-126.

[4] Robert, E.B., Maria, M., Ken, K.O., Complementary feeding: building the foundations for a healthy life, S. Karger AG, Basel, 2017, 1-45.

[5] Chessa, K.L., Lutter, K.G., Dewey, K., "Proposed nutrient composition for fortified complementary foods", The journal of nutrition, 133 (9). 3011S-3020S. Octobre 2017.

[6] Organisation Mondiale de la Santé, Normes de croissance OMS et identification de la malnutrition aiguë s évère chez l'enfant, Organisation Mondiale de la Santé, Genèse, 2009,1-11.

[7] AOAC, Official Methods of Analysis of the Association of Analytical Chemists International, Association of Officiating Analytical Chemists, Washington DC, 2005, 935-992.

[8] AOAC, Association of Official Analytical Chemists, Official Methods for Analysis, Arlington VA, 1995, 376-384.

[9] Sandrine, E.K., Waliou, A.H., Vénérande, Y.B., Jaurès, H.L., Mohamed, M.S.," Caractérisation de l'alimentation des jeunes enfants âgés de 6 à 36 mois en milieu rural et urbain du Sud–Bénin", Journal of Applied Biosciences, 110 (ISSN 1997-5902), 10831-10840, February 2017.

[10] Diouf, S., Diallo, A., Camara, B., Diagne, I., Tall, A., Signate, H.S., Moreira, C., Sall, M.G., Sarr, M., Fall, M., " La malnutrition proteino-calorique chez les enfants de moins de 5 ans en zone rurale senegalaise (khombole)", Médecine d'Afrique Noire, 47 (5), 225-228, 2000.

[11] Cornu, A., Trèche, S., Massamba, J., Delpeuch, F., "Alimentation de sevrage et interventions nutritionnelles au Congo", Santé : Cahiers d'Etudes et de Recherches Francophones, 3(3), 168-177, janvier 1993.

[12] Sawadogo, P.S., Martin, P.Y., Savy, M., Kameli, Y., Traoré, A.S., Food-based approaches for a healthy nutrition , Food-based approaches for a healthy nutrition, Ouagadougou, 2003, 317-328.

[13] Litte, N.E., Impact du niveau d'instruction de la femme sur l'état nutritionnel des enfants de moins de trois ans en Centrafrique, Mémoire de DESS: IFORD , Yaoundé, 2007, 1-92.

[14] Odile, A.T., Issaka, T., Yao, E.K., Philippe, D., N'cho, S.D., Kouamé, K., Alimata, J.D., Michèle, D., "Malnutrition chronique chez les enfants de moins de 5 ans au nord de la Côte d'Ivoire", Santé Publique, 22 (2), 213-220. février 2010.

[15] Adedzi, K.A., Milieu de vie et mortalité des enfants au togo, Les annales de l'IFORD, Togo, 2013, 125-143. Disponible: https://www.researchgate.net/publication/265905767.

[16] Hugues, A.M., Facteurs explicatifs de la malnutrition des enfants de moins de cinq ans au Gabon, IFORD, Yaoundé, 2010, 1-134.

[17] Commission du Codex Alimentarius, Lignes directrices pour la mise au point des préparations alimentaires complémentaires destinées aux nourrissons du deuxième âge et aux enfants en bas âge, FAO/OMS, 2013, 1-11. Disponible: https://www fao.org/input/download/standards/298/CXG_008e.pdf. (Accédé le 11 mai 2017).

[18] Zannou-Tchoko, V.J., Ahui-Bitty, L.B., Kouame, K., Bouaffou, K.G., Dally, T., " Utilisation de la farine de maïs germe source d'alpha amylases pour augmenter la densité énergétique de bouillies de sevrage à base de manioc et son dérivé l'attiéké", Journal of Applied Biosciences, 37(ISSN 1997–5902), 2477-2484, January 10, 2011.

[19] Allen, L., Gillespie, S., A review of the efficacy and effectiveness of nutrition interventions, Journal of International Public Health, Manila, (2001), 1-19.