

Infant and Young Child Feeding Practices in Urban Areas in the Haut Sassandra Region (Côte d'Ivoire): Description and Nutritional Consequences

Dago A. Gnahé, Abba P. Obouayeba*, Massé Diomandé, Koffi P. V. Niaba, Avit G. M. Beugré

Agrovalorisation Laboratory, Department of Biochemistry-Microbiology, Agroforestry Training and Research Unit, Université Jean Lorougnon Guédé, Daloa, Côte d'Ivoire

Abstract The malnutrition of children remains a health problem in Côte d'Ivoire. In this context, a nutritional survey by questionnaire and anthropometric measures was carried out in the urban area in the Upper Sassandra region to nearly 419 children with an age of between 0 and 36 months in the city of Daloa. Describe the feeding of the infant and the young child through a nutritional survey and evaluate the nutritional status of children through anthropometries were the goals pursued in this study. The results show the average prevalence of chronic growth or malnutrition (7.32%). The skinny that reflects acute malnutrition affects only 16.92 percent of the children and is specific to the poor. As a result, some results obtained in the Court of Inquiry revealed that an exclusive breastfeeding of the birth to 6 months, and then a suitable supplement diet, are major factors in the nutritional status of Infants.

Keywords Infants, Young child, Breastfeeding, Complementary feeding

1. Introduction

According to the WHO, among children under 5, 52 million are wasted, 17 million are severely wasted and 133 million are stunted, while 41 million are overweight or obese in Africa. Stunting or chronic malnutrition has spread in Côte d'Ivoire, among children under 5 years old. The prevalence of stunting is considered serious at the national level compared to an acceptability rate of 20%. From 34% [1] in 2006 according to NCHS standards, it rose to 29.8% [1] in 2012 according to WHO standards. Despite a downward trend in all regions, rates remain at the critical threshold of 40 % in the far north and west. At the level of children, this growth retardation is due to maternal undernutrition and an unsuitable feeding practice.

It is well recognized that the period between birth and the age of 2 years is a critical period for the promotion of optimal growth, health and development of the child [2]. Globally, 60% of infant and young child deaths occur due to inappropriate infant feeding practices and infectious diseases, two-thirds of which are attributable to inadequate breastfeeding practices [3]. Infants and young children are particularly very fragile and vulnerable during their feeding. Indeed, feeding practices are very important and should not

be neglected because it is at these times that the child can contract infectious diseases. Infant and young child feeding practices relate to a series of behaviors that the mother develops. These practices include the method and duration of breastfeeding, the choice of different types of complementary foods, the ages of introduction or cessation of various practices and the quantities served. These practices are of fundamental importance for the survival and harmonious development of children [4]. In several countries, nutritional problems in infants and young children are strongly linked to complementary feeding practices. In Côte d'Ivoire, 20.5% of the population in 2014 did not meet the minimum level of calorie intake and the diet remained undiversified in all age groups. The average calorie intake per capita is 2534 kcal / person / day compared to 2806 kcal / person / day recommended by WHO. The diet is generally not very diverse. In 2012, only 7% of children and infants received a diet of minimum quality both in terms of diversity and frequency of meals. This implies that IC supply practices are unsuitable [5].

However, it is clear that malnutrition was responsible for 60% of the 10.9 million annual deaths of children under five [6]. Well over two-thirds of these deaths often associated with inappropriate feeding practices. Also, no more than 35% of infants worldwide benefit from exclusive breastfeeding during the first four months. Complementary feeding often starts too early or too late, and foods are often nutritionally inadequate. In addition, malnourished children who survive are more often ill and suffer the consequences of

* Corresponding author:

obouapac@gmail.com (Abba P. Obouayeba)

Received: May 21, 2021; Accepted: Jun. 5, 2021; Published: Jun. 26, 2021

Published online at <http://journal.sapub.org/fph>

disrupted development all their lives. Another source of serious concern is the growing incidence of overweight and obesity in children [6]. Improper feeding practices are among the most serious barriers preventing this age group from achieving and maintaining satisfactory health. As a result, many infants and young children suffer from malnutrition [7]. Faced with all these problems; awareness raising on exclusive breastfeeding of infants up to the age of 5 months is desired in order to eradicate this malnutrition. However, it is advisable to combine breastfeeding with complementary foods for children from 6 months of age [8]. However, this practice can cause nutritional problems. The general objective of our work is to describe the feeding of infants and young children in urban areas in the Haut-Sassandra region, and to identify the nutritional consequences. More specifically we will: describe the feeding practices of infants and young children through a nutritional survey and establish their nutritional status by means of anthropometry.

2. Materials and Methods

Target population (Child 0-36 months)

This study took place from July 8 to September 8, 2020 at the PMI (Protection Maternel et Infantile) in Daloa and focused on the anthropometric parameters of infants (0 to 12 months) and young children (12 to 36 months).

Technical material

The technical material used to carry out this study consists of: A survey sheet containing a multiple choice questionnaire a notebook for recording additional information not appearing on the survey sheet; writing boards (Bic and pencils) and eraser; a plastic tape measure to take the child's head circumference; a tape measure to take the child's MUAC.

The different instruments used to conduct this study are:



Figure 1. Photograph showing an instrument for measuring the cranial perimeter (tape measure)



Figure 2. Photograph showing an MUAC measuring instrument

Nutritional survey

Study zone

We conducted this study in the town of Daloa, which is located in the center-west of Cote d'Ivoire, West Africa. The capital of the Haut-Sassandra region, it is located 141km from Yamoussoukro, the political capital of the Ivory Coast and 383 km from Abidjan, the economic capital. The city is located between 6° 53 North latitude and 6° 27 West longitude. The population counted on May 15, 2014 was 591,633 inhabitants, including 320,974 men and 270,659 women [9]. This study was carried out in several different districts of Daloa including (Lobia, Soleil, Fadiga, Savonnerie ...) then at the PMI (Maternal and Child Protection) specifically in the vaccination service. It is located in the commercial district not far from the COOPEC and the Assembled of God church in the town of Daloa.

Investigation procedure

The survey was carried out among 419 mother-child couples from the locality of Daloa in Côte d'Ivoire in order to collect information on the ages of introduction of meats, fish, fruits, vegetables, potatoes, infant cereals (or flour), dairy products, desserts, cheeses, biscuits, eggs, fruit juices and cow's milk for each child in the said locality. Recruitment was anonymous. In addition, the women included in the study are recruited only after their prior consent. The information collected has been analyzed in strict confidence.

We also used the data collected in the questionnaire to obtain the method of food preparation (homemade foods, baby specific store-bought foods, regular store-bought foods).

These questions were taken from the KAP model questionnaire on the nutrition of young children published by FAO [10]. Foods given by mothers to their children were classified into 7 groups according to WHO recommendations [11]:

- Cereals, roots and tubers (group 1)

- Legumes and nuts (group 2)
- Dairy product (milk, yogurt, cheese) (group 3)
- Meat products (meat, poultry offal) and fish (group 4)
- Eggs (group 5)
- Fruit and vegetable rich in vitamin A (group 6)
- Other fruits and vegetables (group 7)

Properly managed food diversification is defined as the consumption of foods belonging to at least 4 distinct food groups [11]. According to the WHO, a food counts in each group regardless of the quantity consumed, that is to say that there is no minimum quantity, unless the food in question is used as a condiment. The threshold was set for at least 4 of the 7 food groups listed above because it is associated with a better diet, whether the child is (or not) breastfed [11].

Sampling

The study focused on children aged 0-36 months in a few neighborhoods in the town of Daloa. Four hundred (400) couples - mothers and children whose age is between 0 and 36 months were enrolled during the survey at the rate of one hundred couples (100) mother and children per neighborhood. The choice of neighborhoods was made at random. In each household, a child is surveyed. The eligibility criteria of the children retained in the sample were those to belong to the age group of 0-36 months during the survey and to receive and receive.

Data collection tools and ethical considerations

The survey was conducted on the basis of a multiple-choice questionnaire which allowed data to be collected at home. The questionnaire for our survey was composed of socioeconomic, demographic and dietary characteristics of the study population. Gender, relationship with the child, type of dwelling, level of education, nutrition education, prenatal consultation, age of dietary diversification, complementary food, food budget and household size were the parameters retained for the parents of the children. The socio-demographic characteristics of the children were gender, age in months, weight in kg, height in cm, MUAC and head circumference. The nutritional status of the children was assessed using anthropometric parameters such as weight and height. The weight was measured using a baby scale. The height was measured in centimeters by a horizontal measuring rod (13-month-old child). The anthropometric indices of height / age (H/A), weight/age (W/A) and weight/height (W/T) were used.

Anthropometric parameters measurement protocol

Cranial perimeter

Head circumference is measured on an infant held or seated in the lap of the mother or another person. Objects such as bobby pins and hair bands are removed from the hair. The tape measure is placed just above the eyebrows above the ears and around the widest part of the back of the skull, so that the perimeter is maximum. The tape measure should be tight enough to compress the hair and give a measurement that approximates the head circumference. The measurement

is noted to the nearest 0.1 cm.

MUAC

A special tape measure is used, which is placed around the arm. The reading is taken in the window of the meter, tightening the meter moderately. The measurement is recorded with an accuracy of 0.1 cm.

Age

To determine the age, official documents (administrative, health and other) were used to obtain the date of birth. Also, the age was often given by the mother who was based on the date of birth known and declared by the mother or a relative.

Threshold values

Nutritional status indicators in order to know the prevalence of malnutrition and allow comparisons, it is recommended and commonly accepted for children to use the lower reference limit of the three indices as a cut-off point: weight for height, height for age and weight for age. But weight for height and height for age can be used as the only indices [12].

Table 1. Nutritional status of children according to MUAC index

MUAC	Nutritional status
> 135 mm	Satisfactory condition
> 125 et < 135 mm	Moderate risk of malnutrition
>120 et < 125 mm	Significant risk of malnutrition
>110 et < 120 mm	Moderate malnutrition
< 110 mm	Severe malnutrition
Total	143

Table 2. Nutritional status according to the PB/PC ratio

PB/PC ratio	Statut nutritionnel
> 0.31	Normal nutrition
0.28 – 0.31	Mild undernutrition
0.25 - 0.31	Moderate undernutrition
< 0.25	Severe undernutrition

Data analysis

The various data collected were entered and analyzed using the EXCEL software. The analysis and interpretation used the calculation of the proportion, of the mean.

3. Results

3.1. Results of the Nutritional Survey

3.1.1. Characteristic of the Studied Population

The population of children surveyed was made up of 179 girls, or 42.72% against 240 boys, or 57.27% (Figure 3). During the survey, of the parents surveyed 21.72% were single versus 24.58% married and 15.99% widowed (Figure 4). Also with the age groups obtained, the age group [0-5] months included 50% of children with 19% of girls and 31% of boys; [6-11] months was composed of 21.24% children

with 11% girls and 10% boys and the age group [12-36] months included 28.16% children with 13% of girls and 16% boys (Figure 5) and (Figure 6).

3.1.2. Categories of Foods Consumed by Children

The study showed that 47% of children consume milk and dairy products; 16.95% consume cereals and 36.04% of children consume roots and tubers (Table 3).

Table 3. Distribution of children according to the categories of food they consume

Food categories	Effective	Percentage %
Milk and dairy products	197	47
Cereals	71	16.95
Roots and tubers	151	36.04

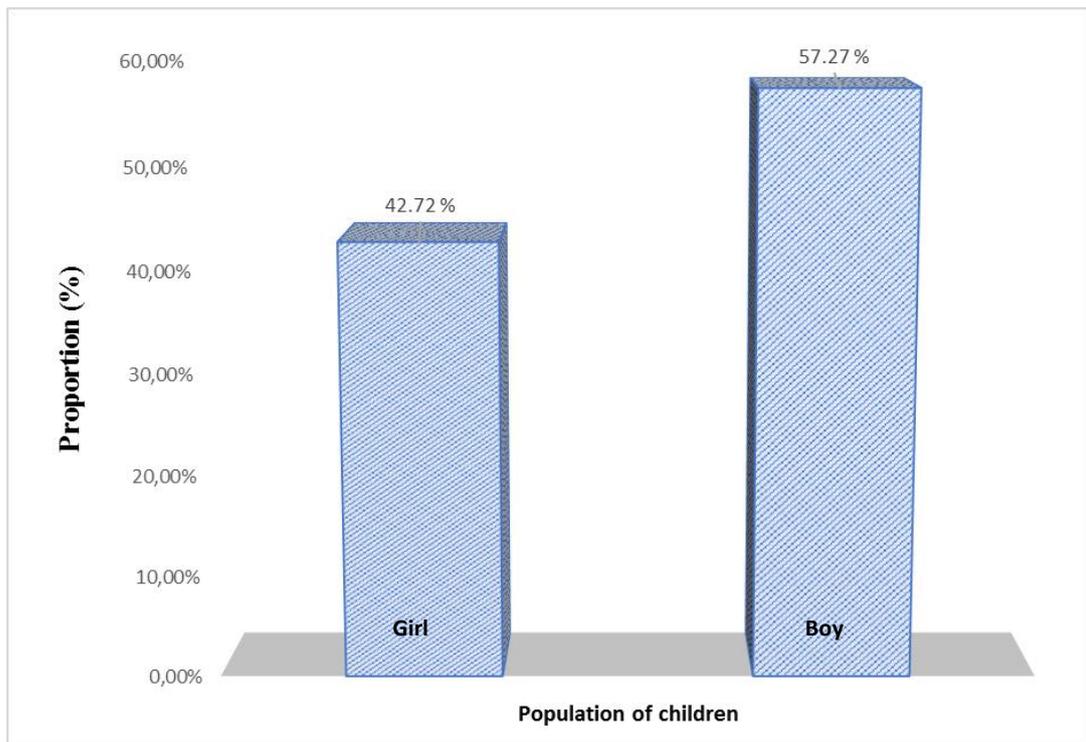


Figure 1. Distribution of children by sex



Figure 2. Breakdown of parents surveyed according to their marital status



Figure 3. Distribution of children by age group

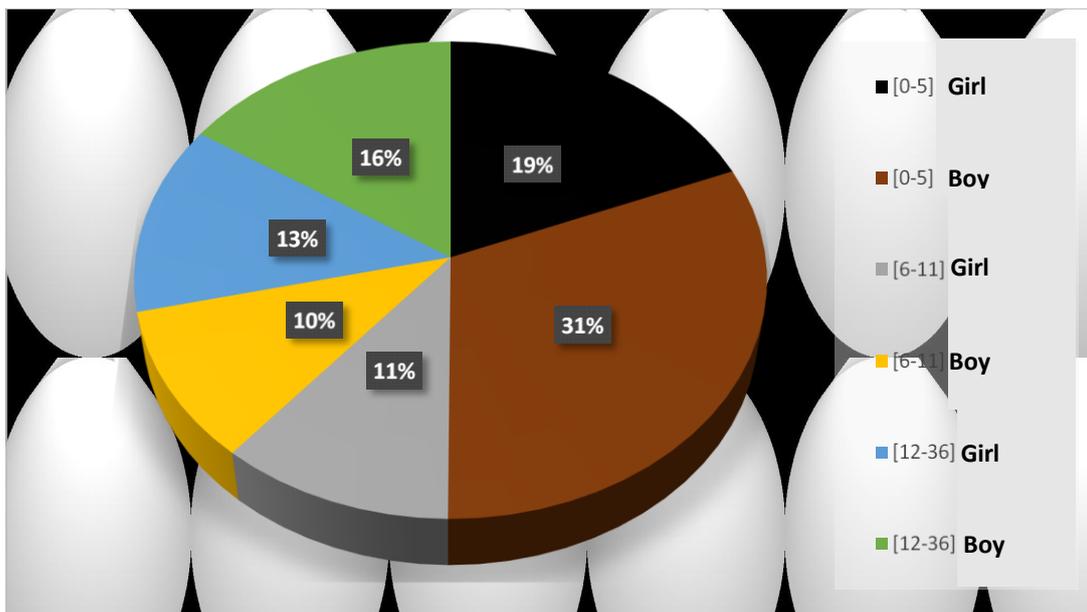


Figure 4. Distribution of children by sex according to their age group

Table 4. Distribution of children according to the types of food they eat

Types of food	Effective	Proportion (%)
Breastmilk	80	19.09
Pharmacy milk	35	8.35
Rice	55	13.13
Cassava	2	0.47
Yam	17	4.05
Potato	130	31.03
Other	42	10.02
But	30	7.16
Mil	28	6.68

3.1.3. Types of Foods Eaten by Children

The study showed that 19.09% of children consume breast milk; 8.35% consume drugstore milk; 13.13% consume rice; 0.47% consume cassava; 4.05% eat the sweet potato; 31.03% consume sweet potato; 10.02% consume others; 7.16% consume maize and 6.68% for millet (Table 4).

3.1.4. Diet of Children According to Their Age

The survey showed that in the age group [0-5] months, 80% of children consume the predominant breast against 18% for the exclusive breast, 2% for the porridge alone and

10% for the complementary food (AC) other than porridge. In the age group [6-11] months 45% of the children took the predominant breast compared to 5% for the exclusive breast, 30% for the porridge alone and 20% for the non-porridge CA. In the age group [12-36] months 5% of the infants took the predominantly breast versus 70% not breastfed, 20% consumed CA other than porridge and 5% took the porridge alone (Figure 7).

3.1.5. Types of Complementary Foods Consumed by Children

The study showed that 13.84% of children consumed pharmacy milk (cow's milk) against 46.30% who consumed porridge, also 24.34% who consumed mash and 15.5% of other foods (Figure 8).

3.1.6. Age of Food Diversification

The study showed that 55.34% of mothers think that the specific age for food diversification is less than 6 months against 32.22% who think that 6 months is the perfect age and 12.41% think the opposite (Figure 9).

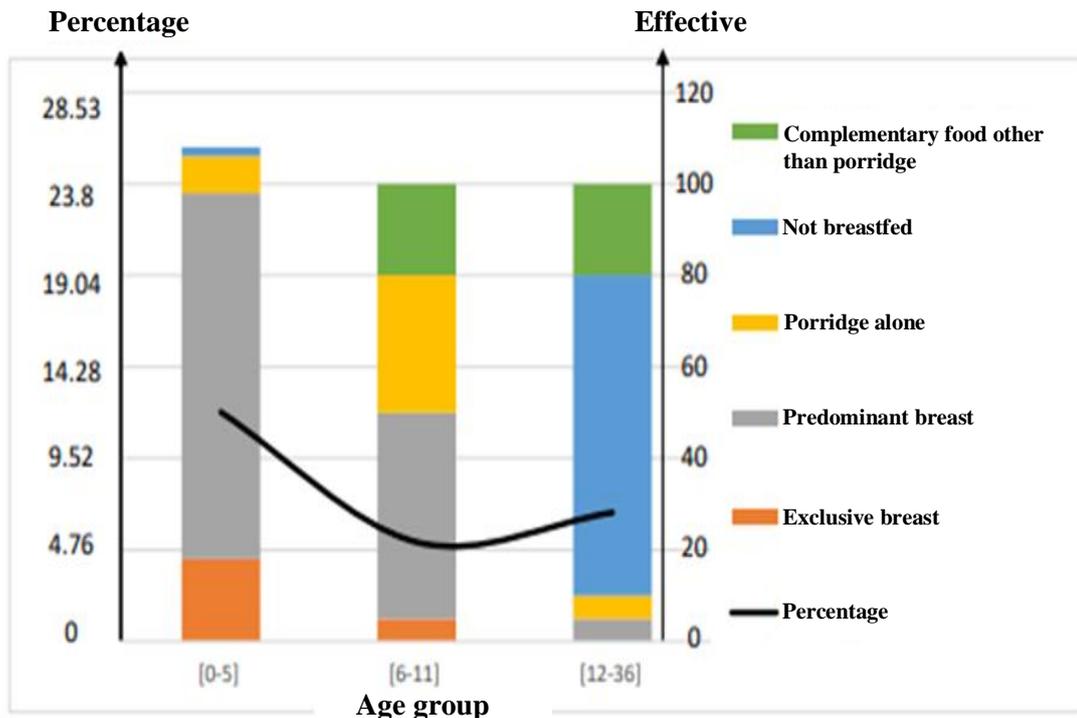


Figure 5. Feeding method of children according to their age [0-36] months

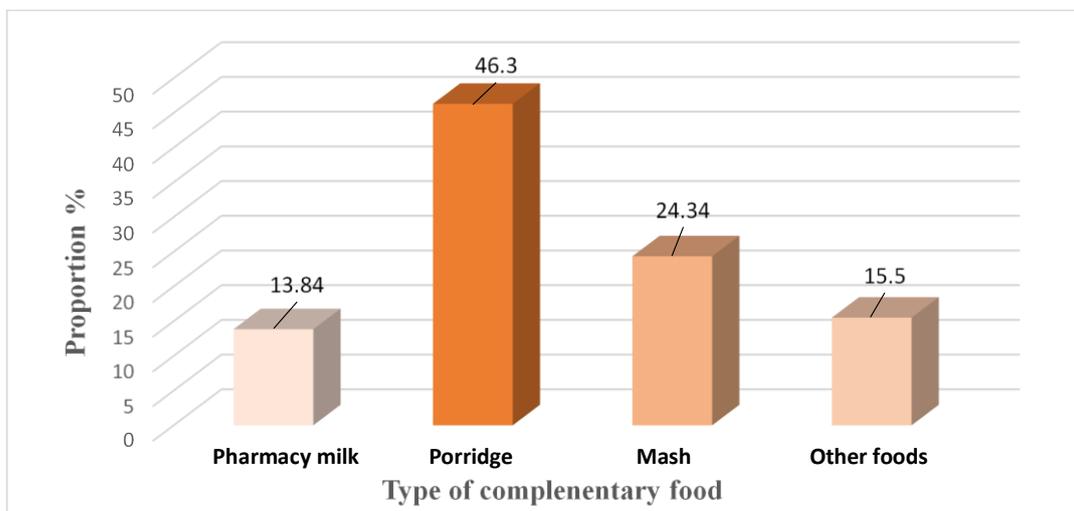


Figure 6. Supplementary foods consumed by children

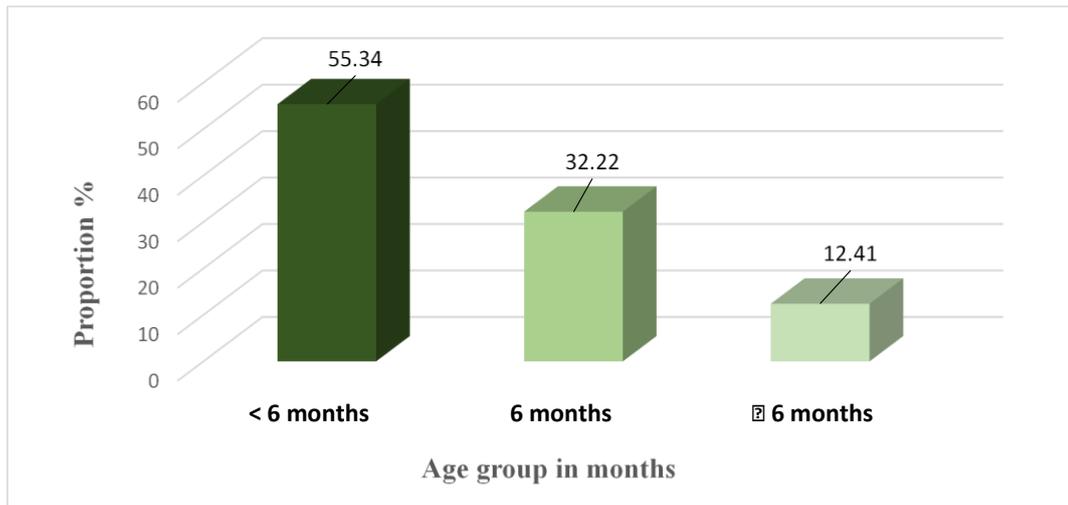


Figure 7. Age of introduction of supplement foods

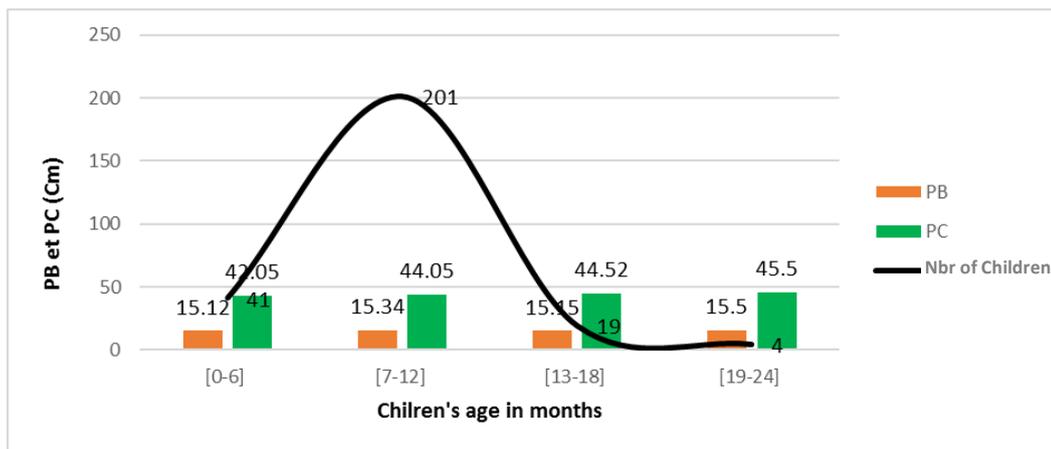


Figure 8. Evolution of MUAC and CP in children according to their age

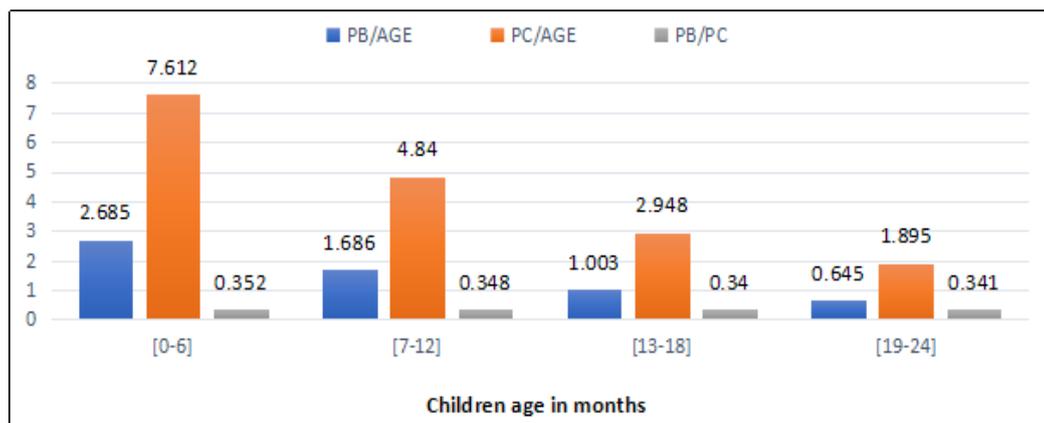


Figure 11. Evolution of BP/A, PC/A depending on the age of the children

3.2. Results of the Anthropometric Survey

3.2.1. Evolution of the Anthropometric Parameters of the Children Surveyed

The survey showed that anthropometric parameters like MUAC and CP change in the same way in children from 0 to 36 months. In fact, MUAC and CP in children [0-6]

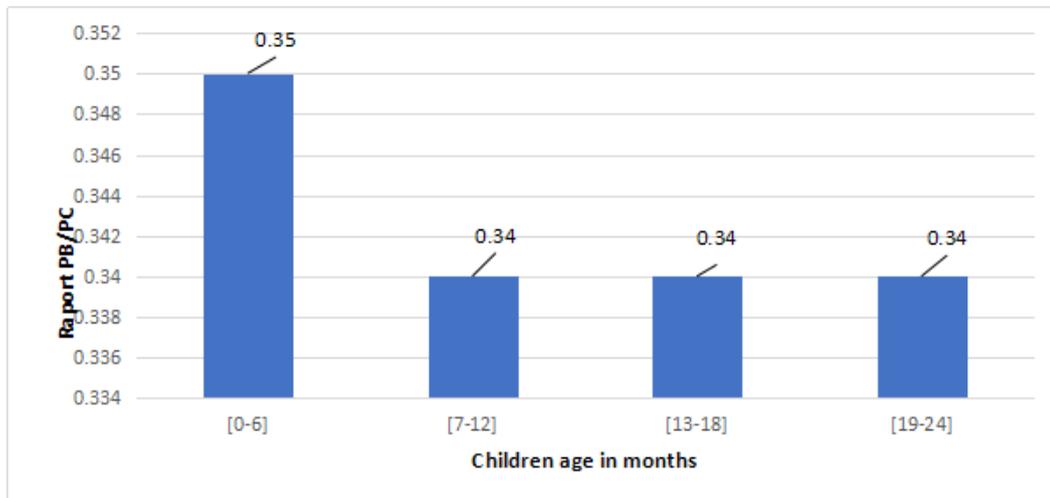
months old is practically the same as MUAC and PC in children [7-12] months up to 36 months (Figure 10).

3.2.2. Evolution of the Anthropometric Indices of the Children Surveyed According to Their Age

The study conducted showed that PB/A, PC/A change with the age of the child (Figure 11).

Table 5. Distribution of children according to their nutritional status

Nutritional status	Normal condition		Moderate condition		Severe condition		Total	
	Effective	Proportion (%)	Effective	Proportion (%)	Effective	Proportion (%)	Effective	Proportion (%)
Acute malnutrition	182	56 %	88	27.08 %	55	16.92 %	325	100 %
Chronic malnutrition	228	70.15 %	73	22.46 %	24	7.32 %	325	100 %

**Figure 12.** Percentage of PB/PC of children surveyed

3.2.2.1. Evolution of the MUAC/CP of the Children Surveyed

The survey showed that the MUAC/CP of children 0-6 months was 0.35% compared to 0.34% for children 7-24 months (Figure 12).

3.2.2.2. Assessment of the Nutritional Status of the Children Surveyed

This study revealed that acute malnutrition affects 44% of children aged 0 to 36 months living in the Haut Sassandra region with 16.92% being in severe condition. Indeed, 29.78% of children from 0 to 36 months suffer from chronic malnutrition with 7.38% being in a severe state (Table 5).

4. Discussion

This study was carried out to describe the diet of children from 0 to 36 months in urban areas in the Haut Sassandra region, by identifying the nutritional problems associated with it in order to fight against malnutrition.

The study showed that the number of boys was higher than that of girls with a sex ratio of 1.34. On the other hand, a study carried out in 2016 on the nutritional situation of the country indicated that the number of boys was higher than that of girls with a sex ratio greater than 1. In addition, boys would be more affected than girls, with respectively lower

rates. prevalence of stunting of 33% and 27% [13]. Regarding the marital status of the parents questioned during the survey, the study showed that the mothers at greater risk who do not comply with the recommendations on feeding practices for infants and young children are single mothers, widows and those who have a low level of education. These mothers generally have financial problems that prevent them from adequately meeting the needs of their children but also have little information on good feeding practices for their children. This analysis joins that of Health Canada, [14] on the principles and recommendations for infant feeding from birth to six months. On the other hand, women who respect the recommendations of good dietary practices are those who are married, who are of a high intellectual level [15] and a stable socio-economic situation [16]. Indeed, the diet of the children surveyed was based on three (3) main food categories and among these foods, milk and dairy product were the most consumed by children with a percentage of 47%, followed by roots and tubers (36.04%) and cereals were consumed with a percentage of 16.95% of the children surveyed. The results of a survey carried out in 2004 showed that meals generally consist of a very simple base (cereals, tubers or plantains) accompanied by a sauce [17]. Regarding the types of food consumed by children, potatoes, breast milk and rice were the most consumed with a respective rate of 31.03%; 19.09 % and 13.13% because it is these types of foods that are more available in urban areas,

so they are appreciated by children. This was refuted by a study which had shown that across the country, the cereals consumed are mainly maize (consumed by 71% of children in urban areas and 79% of children in rural areas), rice, sorghum, and millet [18]. With regard to the feeding method of the children surveyed, we note with satisfaction that breastfeeding in general is in the first month with a percentage of 50.11% and which continues until the age of 1 or even 2 years. The average duration of breastfeeding in our sample is greater than that observed nationally [19]. However, it is not known whether this long duration is a positive element, as some people have observed in Burkina Faso, where prolonged breastfeeding was associated with better nutritional status [20], or whether it is This is a phenomenon of reverse causality, breastfeeding being prolonged by mothers, children are malnourished [21]. Before the age of 6 months, exclusive breastfeeding is weakly practiced in Daloa. This rate is nevertheless higher than that observed in Sub-Saharan Africa in general [22]. It is also 4 times higher than that recorded nationally. In all of the children surveyed, complementary foods are often introduced after the recommended age and later than in other parts of Africa in general [22]. Porridge is not always offered to children and, in view of their composition, they can be judged of poor nutritional quality. It is well recognized that more often in developing countries, porridges lack protein, fat, micronutrient sources and are low in energy densities compared to recommendations [23]. With such a density it would be necessary for a young boy of 6 months to consume 4 porridges per day to supplement the energy contributions of the mother's milk [24].

The description of the feeding practices of children from 0 to 36 months in the Haut Sassandra region revealed that 46.30% of children consume porridge as a complementary food to breast milk against 24.34% who consume mash. The others used at 15.5% and 13.84%. Of these supplement foods, porridge was the most common food consumed by children, the survey noted. Several foods were introduced into their diet before the age of 6 months: water, porridge and fruit juices [25-26]. It is true that porridge is the most consumed food, but its frequency of daily consumption is low because most of the children surveyed did not consume it more than 2 to 3 times a day, but this frequency of daily consumption cannot therefore be covering the nutritional needs of young children. These results are in agreement with those of [27] and [28] who found that local porridge is used at 64%, with a low frequency of daily consumption. This practice is due to mothers who lack information on good complementary feeding practices. Regarding the age of introduction of supplement foods 55.34% of mothers report that supplement foods can be introduced before six months. This knowledge is not in line with WHO recommendations that complementary foods should not be introduced into the diet of young children until 6 months of age [29]. This high proportion of mothers with inadequate knowledge about the age of introduction of complementary foods could be explained by a lack of nutrition education. It

clearly appears that such a situation cannot help the proper management of complementary feeding.

Regarding the anthropometric survey, the nutritional status of the children surveyed was assessed through anthropometric parameters (MUAC and head circumference). The study showed that the MUAC of most of the children surveyed (325) of the different age groups [0-24] months had a stable state of health (satisfactory nutritional status), since the measurement of their MUAC was greater than 135 mm or 13.5 cm which meets the standard. As for the cranial perimeter, the different age groups met the standards [29]. Indeed, the measurement of the cranial perimeter of children between 0 and 2 years old oscillated between 43 and 48 cm, which is recommended for children of this age group and which shows that their state of health is satisfactory. Indeed, the assessment of the nutritional status of children from 0 to 2 years old shows that the majority of children had a normal nutritional status since the MUAC to cranial perimeter (MUAC/PC) ratio was in the majority of cases greater than 0.31 cm [30]. Also The measurement of MUAC on age (MUAC / A) was consistent with the standard prescribed by [30], the standard having shown that children in normal nutritional status were those whose MUAC was equal to or greater 115mm or 11.5cm. Measurement of head circumference for age (PC/A) showed that the children did not suffer from microcephaly or macrocephaly because the head circumference observed in these children was between prescribed ($2 > \text{Normal} < 98$) in according to [30]. The anthropometric parameters studied clearly showed that only a small part of these children had problems of acute malnutrition and severe chronic malnutrition. Severe chronic malnutrition. Malnutrition therefore exists, but in low prevalence and spreads especially in poor socio-economic and marital conditions. This analysis is joined to that carried out by [31] on the assessment of the nutritional status of children in the town of Sati, which showed using anthropometric parameters that the prevalence of malnutrition in the town of Safi was weak but grew up with the poor living conditions of the families.

5. Conclusions

The general objective of this study is to provide a description of infant and young child feeding in urban areas in the Haut Sassandra region and to identify the problems that are potentially associated with it. Through a nutritional survey, we showed that children's feeding practices were more based on the consumption of predominant and exclusive breast milk. Food diversification took place gradually from 6 months and was marked by the presence of complementary food such as porridge (46.3%); puree (24.34%); cow's milk (13.84%) and others (OPV, fruits and vegetables, fruit juice). Also, the study of anthropometric parameters showed that the majority of children observed had a good nutritional status even if the malnutrition was mainly due to the poor socio-economic and marital status of the parents. In short, it emerges from this work that feeding

practices are functions of age groups and that the nutritional status of infants and young children is influenced by the different feeding practices of children which are themselves functions of socio-economic and educational conditions, and marital status of the parents. It is therefore up to children's institutions such as the PMI to conduct awareness campaigns to encourage parents to adopt good dietary practices for their children, but above all to explain to them the risks associated with bad practice.

REFERENCES

- [1] Anonymous 1, RCI, 2015, Analyse de la situation nutritionnelle en Côte d'Ivoire, 20 p.
- [2] Ouattara, H.B., Estelle, B., Solal-Céline, A., Maylis, R., Dop, M.C., 2009. Profil nutritionnel du Niger, FAO, Rapport, 70 p.
- [3] UNICEF, 2009, Suivre les progrès dans le domaine de la nutrition de l'enfant et de la mère: une priorité en matière de survie de développement, Rapport, 125 p.
- [4] Dewey, K.G., and Adu-Afarwuah, S., 2008, Systematic Review of the Efficacy and Effectiveness of Complementary Feeding Interventions in Developing Countries, *Maternal & Child Nutrition* 4, 24-85.
- [5] Gnahé, D.A., Obouayeba, A.P., Koffi, N.P.V., Diomandé, M., Beugré, A.M., Microbiological Quality and Amylase Activity of Weaning Flour Formulated from Taro (*Colocasia Esculenta* (L) Schott), Pigeon Pea (*Cajanus Cajan*) and Malted Maize (*Zea Mays*): Physicochemical and Organoleptic Characteristics of Weaning Mush, *International Journal of Food Science and Nutrition Engineering* 2021, 11(1), 27-33.
- [6] WHO, 2002, Global Strategy for Infant and Young Child Feeding. Doc A55/15. World Health Organization, Geneva, Switzerland.
- [7] Aguayo, V.M. Adou, P., 2002, "La Malnutrition En Côte d'Ivoire: Un Appel à l'action." *African Journal of Food and Nutritional Sciences*, 2(2), 86-91.
- [8] Chouraqui, J.P., Dupont, C., Bocquet, A., Bresson, J.L., Briend, A., Darmaun, D., 2008, Alimentation des premiers mois de vie et prévention de l'allergie. *Archives de Pédiatrie*, 15(4), 431-442.
- [9] INS, 2014, Recensement Général de la Population et de l'Habitat (RGPH) de Côte d'Ivoire.
- [10] FAO, 2016, La situation mondiale de l'alimentation et de l'agriculture, changement climatique, agriculture et sécurité alimentaire, 214 p.
- [11] WHO 2009, World Health Statistics.
- [12] Kurzmarski R. J., Ogden C. L., Guo S. L., 2000. CDC Growth Charts for the United States: Methods and Development. National Center for Health Statistics. *Vital Health Statistics*, 11(246), 203 p.
- [13] ANSES, 2016, Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail. Table CIQUAL 2016: Composition nutritionnelle des aliments - Alimentation infantile [Internet]. [cité 28 sept 2020]. Disponible sur: <https://pro.anses.fr/tableciqual/>.
- [14] Anonymous 2, 2012, Santé Canada, Modules Expérience maternelles – Allaitement (MEX).
- [15] Bocquet, A., Bresson, J.L., Briend, A., Chouraqui, J.P., Darmaun, D., Dupont, C., 2003, Feeding of infants based on age. Practice guidelines. *Archives de Pédiatrie*, 10(1), 76-81.
- [16] Harris, G. 2008, Development of taste and food preferences in children, *Current Opinion Clinical Nutritional Metabolism Care* 2008; 11(3): 315-9.
- [17] UNICEF, 2004, The state of the world's children, www.unicef.org.
- [18] Camara, F., Gnakri, D., 2000, Stratégie de lutte contre la carence en fer en Côte d'Ivoire: Enquêtes nutritionnelles en milieu rural et urbain chez les enfants de 4 à 24 mois et essai de formulation d'un aliment de complément, Centre Suisse de Recherche Scientifique en Côte d'Ivoire.
- [19] WHO, 1998, [WHO/NUT/98.1] Institut National de la Statistique et de la Démographie (INSD). Enquête Démographique et de Santé en Afrique de l'Ouest. Ouagadougou, Burkina Faso: INSD, 2000.
- [20] Cousens, S., Nacro, B., Curtis, V., 1993, Prolonged breast-feeding: no association with increased risk of clinical malnutrition in young children in Burkina Faso. *Bull World Health Organization*, 71(6), 713-22.
- [21] Simondon, K.B., Simondon, F., 1998, Mothers prolong breastfeeding of undernourished children in rural Senegal. *International Journal Epidemiology*, 27(3), 490-494.
- [22] UNICEF, 2003, Stratégie mondiale pour l'alimentation du nourrisson et du jeune enfant, Genève, Suisse, 37 p.
- [23] Dewey, K.G., and Brown, K.H., 2003, Undated on technical issues concerning complementary feeding of young children developing countries and applications for intervention programs, *Food Nutrition Bulletin*, 24(1), 5-28.
- [24] Trèche S., 1995, Analyse des expériences de production de farines infantiles en Afrique, In: Benoist B. de (ed.), Benbouzid D. (ed.), Delpeuch Francis (ed.). *L'alimentation de complément du jeune enfant*. Paris: ORSTOM, p. 225-235, (Colloques et Séminaires), *L'Alimentation de Complément du Jeune Enfant: Atelier*, Alexandrie (EGY), 1994/11/20-24. ISBN 2-7099-1289-9. ISSN 0767-2896.
- [25] Gbogouri, G.A., Bamba, M.S., Digbeu, D.Y., and Brou K., 2019, Elaboration d'une Farine infantile composée à base d'ingrédients locaux de Côte d'Ivoire: quelles stratégies d'enrichissement en acides gras polyinsaturés oméga 3? *International Journal of Biological and Chemical Sciences*, 13(1), 63-75.
- [26] Kouassi K.A.A., Adouko, A.E., Gnahé, D.A., Grodji, G.A., Kouakou B.D., Gnakri, D., 2015, Comparaison des caractéristiques nutritionnelles et rhéologiques des bouillies infantiles préparées par les techniques de germination et de fermentation. *International Journal of Biological and Chemical Sciences*, 9(2), 944-953.
- [27] El-Tou, H., Mouquet, C., Trèche, S., Guyot, J-P., Traoré, A.S., 2002, Caractérisation des procédés traditionnels de fabrication des bouillies de petit mil fermenté dans 24

- micro-ateliers de production à Ouagadougou, In: Recherche scientifique et technologique et stratégies de lutte contre la pauvreté. Ouagadougou: Université de Ouagadougou, 10 p, multigr. FRSIT. Forum National de la Recherche Scientifique et des Innovations Technologiques, 5., Ouagadougou (BKF), 2002/05/11-18.
- [28] Kasole, T.L., Mulangu, A.M., Muganza, A.N., Ilunga, P.M., Wakam, G.K., Kitengewa, F.M., 2013, Allaitement les nourrissons Burkinabè vivant en milieu naturel. *Appetite*: 2-5.
- [29] OMS, 2003, Principes directeurs pour l'alimentation complémentaire de l'enfant allaité au sein, 36 p.
- [30] WHO, 2009, AnthroPlus for Personal Computers Manual Software for assessing growth of the world's children and adolescents. Geneva, Switzerland: World Health Organization 2009, 9 p.
- [31] Poel, E.V., Hosseinpoor, A.R., Speybroeck, N., Ourti, T.V., Vega J., 2008, Socioeconomic inequality in malnutrition in developing countries, *Bulletin of the World Health Organization*, 86(4), 282-291.