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Evaluation of Infant Feeding Practices from 0 to 9 Months: A Case Study of General Hospitals in Bonoua and Dabou, Côte d'Ivoire

Gnelle Assita COULIBALY[1*], Audrey Herbert YÉPIÉ[1], Naty Tadiogo KONÉ[2], Anin L. ANIN-ATCHIBRI[1] and Adjehi DADIÉ[2]

[1]*Department of Food Sciences and Technology, Laboratory of Nutrition and Food Safety, Nangui Abrogoua University, 02 B.P. 801 Abidjan 02, Côte d'Ivoire.*

[2]*Department of Food Sciences and Technology, Laboratory of Microbiology and Biotechnology of Food, Nangui Abrogoua University, 02 B.P. 801 Abidjan 02, Côte d'Ivoire.*

[*] *Corresponding author ; E-mail: coulibalyassitagnelle@gmail.com*

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ABSTRACT

The dietary regimen of infants during their first nine months is crucial for their growth and development, yet it often reveals suboptimal practices. A prospective descriptive study was conducted to evaluate the feeding practices of 120 infants aged 0 to 9 months. This study took place over a 7-month period in the general hospitals of Bonoua and Dabou. Socio-demographic characteristics, breastfeeding practices, and infant dietary diversification were determined using a questionnaire. The results indicated that the majority of infants were male 50.8%, delivered vaginally, and had a normal birth weight. Early breastfeeding initiation was observed in only 13.3% of infants, attributed to factors like mother-infant separation and cleaning 32.5%, infant sleepiness 27.5%, and maternal milk absence 15.8%. Moreover, over half of the mothers 55% were unaware of the importance of colostrum. Exclusive breastfeeding was practiced by merely 24.2% of mothers. Introduction of complementary foods began before 6 months in 65.8% of cases, with 44.1% starting before 4 months. Foods introduced early included water, fruits, industrial cereals, and "Anagobaka." Foods introduced later comprised vegetables, fruits, potatoes, starches, fish, eggs, meat, dairy products, and fats. In conclusion, awareness campaigns are essential to improve infant feeding practices in the cities of Dabou and Bonoua.

Keywords: Dietary diversification, breastfeeding, colostrum, breastfeeding mothers, early breastfeeding initiation, infants.

INTRODUCTION

The feeding of infants during their first nine months of life is a crucial stage for their growth and development. This period is characterized by a phase of breastfeeding followed by a gradual transition to foods other than milk, known as the complementary feeding period (Aisha, 2013). This transition is essential to meet the constantly evolving nutritional needs of infants and to establish healthy eating habits from an early age. In Côte d'Ivoire, infant feeding, particularly breastfeeding, remains a national concern. The prevalence of exclusive breastfeeding has increased by 16.6% in recent years, rising from 23.5% in 2017 to 40.1% in 2021 (PNMN and INS, 2021). However, it still falls below the government's set targets (50%). Furthermore,

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the early introduction of complementary foods is common (Ayoya et al., 2017), and less than half of children aged 6 to 23 months (36.7%) have a varied diet (SE-CONNAPE and INS, 2021). Urgently needed information on infant feeding practices is essential to prioritize, design, and launch intervention programs aimed at improving infant nutrition. However, to our knowledge, no study has been documented on infant feeding practices in inland cities (outside Abidjan), such as Dabou and Bonoua. Therefore, the objective of this study was to assess infant feeding practices in the study area. In this work, we explored the various stages of infant feeding, with a focus on recommendations to ensure optimal nutrition and healthy development during these crucial first nine months of life.

MATERIALS AND METHODS

Study type and area

This study was a cross-sectional, descriptive, and analytical study. It was conducted in two inland cities outside of Abidjan: Bonoua and Dabou. The specific sites involved were the general hospitals of Bonoua and Dabou.

Period and study population

The study lasted for 7 months, from mid-November 2021 to mid-June 2022. It included a total of 120 infants.

Sampling and subject selection

Sampling was based on the database of a comprehensive study registered with the National Ethics Committee under No. 107-22/MSHPCMU/CNESVS-kp, with a sample size of 300 mother-infant pairs, 60 per site. The subjects selected were all breastfeeding women who attended the general hospitals of Bonoua and Dabou during the study period and agreed to participate.

Nutritional survey

This study required a cross-sectional survey. Data collection involved face-to-face administration of questionnaires. The collected information included sociodemographic factors and infant feeding practices.

Variable selection

Infant sociodemographic variables included gender, gestational age, mode of delivery, and birth weight. Data on infant feeding practices covered early breastfeeding initiation, breastfeeding mode, age of starting complementary feeding, and age of introduction of different food groups.

Statistical analysis

The questionnaire was developed using IBM SPSS Statistics 20, designed for surveys, and the data was processed before being converted into an Excel file for figure creation. Results were expressed as percentages.

RESULTS

Sociodemographic characteristics

The table indicates that the majority of infants were male (50.8%), born vaginally (80.8%), at full term (93.4%), and had a normal birth weight (74.2%) (Table 1).

Infant Feeding Practices

Early Breastfeeding and Colostrum

Early breastfeeding

The results indicated that only 13.3% of infants were breastfed with in the first hour after delivery. More than half benefited from early breastfeeding between 2 and 24 hours after delivery. Additionally, 29.2% of infants were not breastfed in the first 3 days after delivery. Reasons for delayed early breastfeeding included the separation and cleaning of the mother/infant pair (32.5%), the newborn's sleepiness (27.5%), no milk from the mother (15.8%), mother/infant health issues (10.8%), and due to the cesarean section (9.2%) (Figures 1 and 2).

Mothers' opinions on the usefulness of colostrum

The results indicated that 32% of the surveyed mothers were not familiar with colostrum, and 23% found it to be useless. Only 45% of mothers believed that colostrum is useful (Figures3).

Type of Breastfeeding

Only 24.2% of infants benefited from exclusively breastfeeding for the first six

months. Predominant breastfeeding and mixed feeding (breast milk + formula) were practiced by 36.7% and 30% of mothers, respectively. However, 9.2% opted for artificial feeding (formula). (Figures 4).

Complementary Feeding

Age of Starting Complementary Feeding

Dietary diversification was initiated by the majority of mothers (65.8%) when their infants were less than 6 months old. Among these, (44.1%), (21.7%), and (21.7%) respectively began between 0 and 4 months, and between 4 and 5 months. Only 32.5% initiated diversification at the age of 6 months. (Figure 5).

Introduction of Foods

Water was introduced before the age of 6 months by just over half of the mothers (57.4%). Among them, 43.3% introduced it between 0 and 4 months. At 6 months, the introduction of water was done in 40% of cases (Figure 6). Regarding cereals and "anangobaka", before the age of 6 months, industrial cereals and "anangobaka" were introduced in 18.3% and 11.7% of cases, respectively. At 6 months, 34.2% and 45.8% of mothers introduced local and industrial cereals, respectively, unlike "anangobaka" (11.7%) (Figure 7).

As for fruits and vegetables, before the age of 6 months, 20% of mothers introduced fruits, with 10% between 0 and 4 months. At 6 months, only 24.2% and 14.2% introduced fruits and vegetables, respectively. The majority of mothers, 81.7% and 55.8%, respectively introduced vegetables and fruits after 6 months (Figure 8). Starches and potatoes were introduced after the age of 6 months by the majority of mothers, with respective rates of 82.5% and 84.2%. Only 15% and 14.2% introduced them at 6 months (Figure 9).

As for fish, eggs, and meat, they were introduced after the age of 6 months at respective rates of 81.7%, 88.4%, and 100% (Figure 10). At 6 months, dairy products and fats were introduced in 32.5% and 17.5% of cases. After 6 months, 79.2% and 58.4% of mothers introduced fat and dairy products, respectively (Figure 11).

Table 1: Sociodemographic Characteristics of the Study Population.

Caractéristiques sociodémographiques		**Number**	**Percentage**
Gender	Male	61	50.8
	Female	59	49.2
Birth Term	Preterm	4	3.3
	Full Term	112	93.4
	Post-term	4	3.3
Birth Weight	Less than 2500g	17	14.2
	2500-3500g	89	74.2
	More than 3500g	14	11.6
Mode of Delivery	Vaginal	97	80.8
	Cesarean	23	19.2

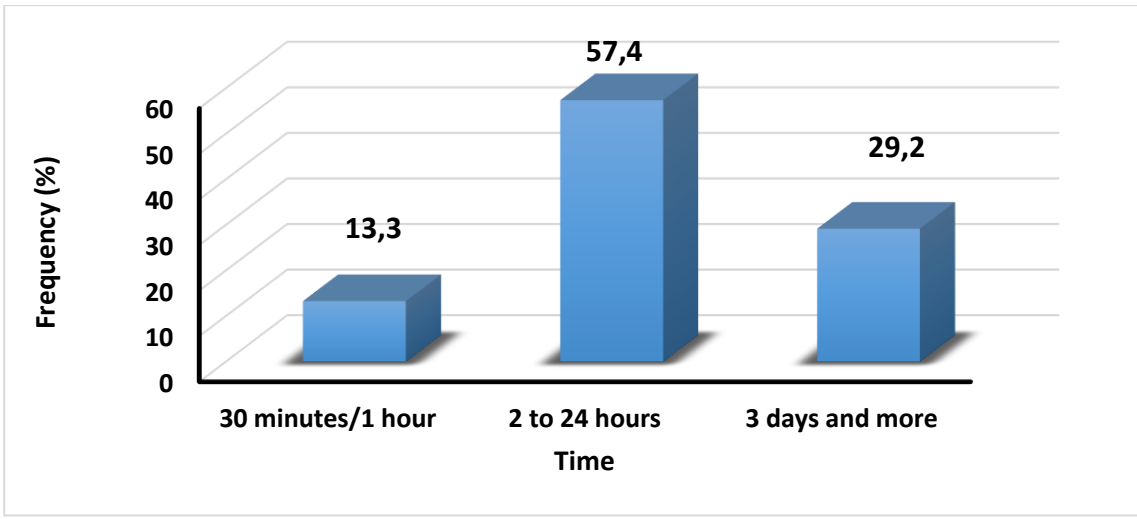

Figure 1: Distribution of mothers based on the timing of early breastfeeding.

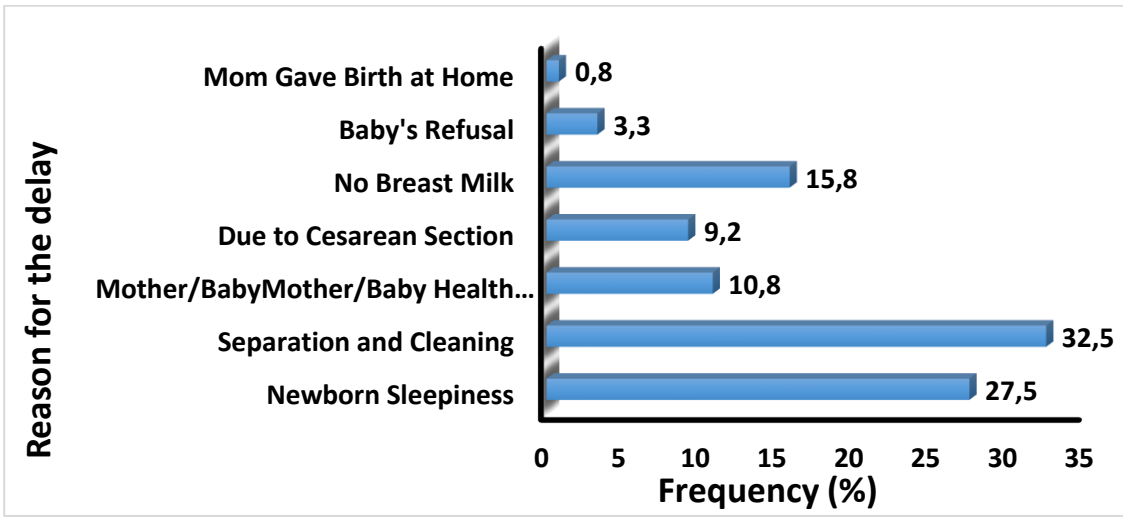

Figure 2: Distribution of mothers based on reasons for delayed early breastfeeding.

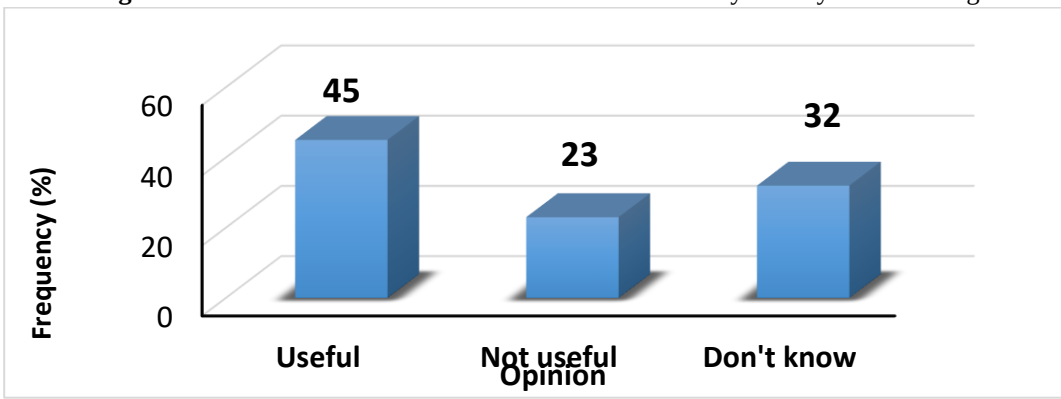

Figure 3: Distribution of mothers based on mothers' opinions on the usefulness of colostrum.

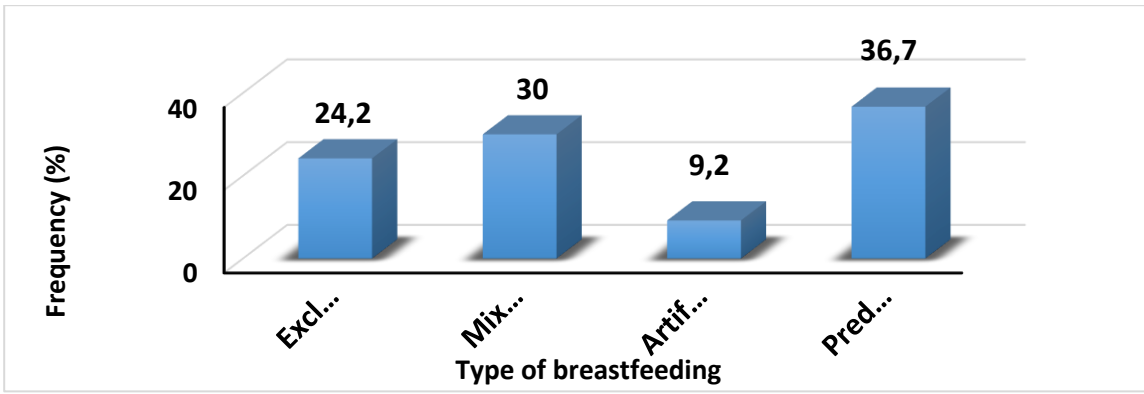

Figure 4: Distribution of infants based on the type of breastfeeding.

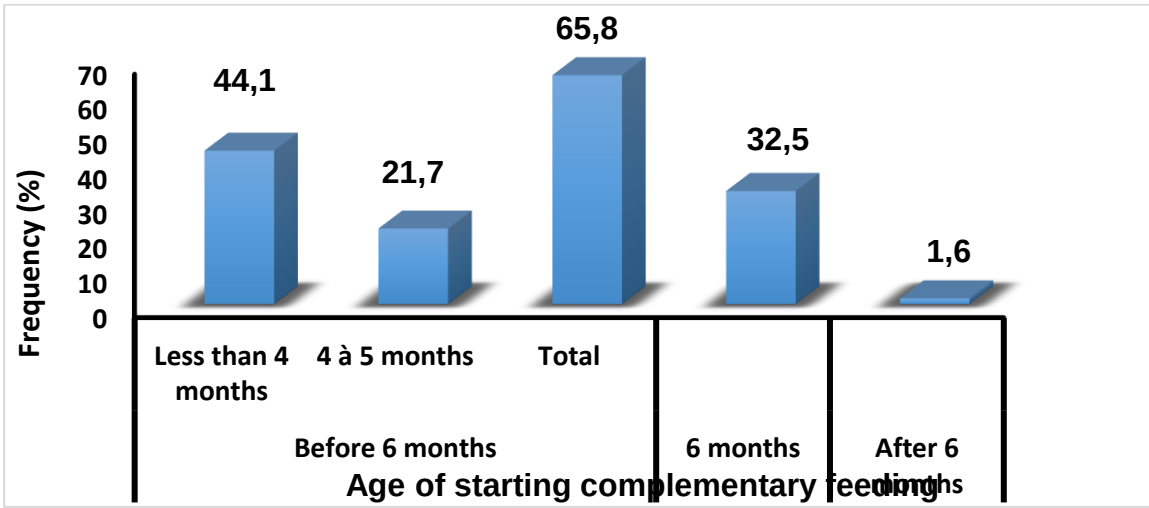

Figure 5: Distribution of infants based on the age of starting complementary feeding.

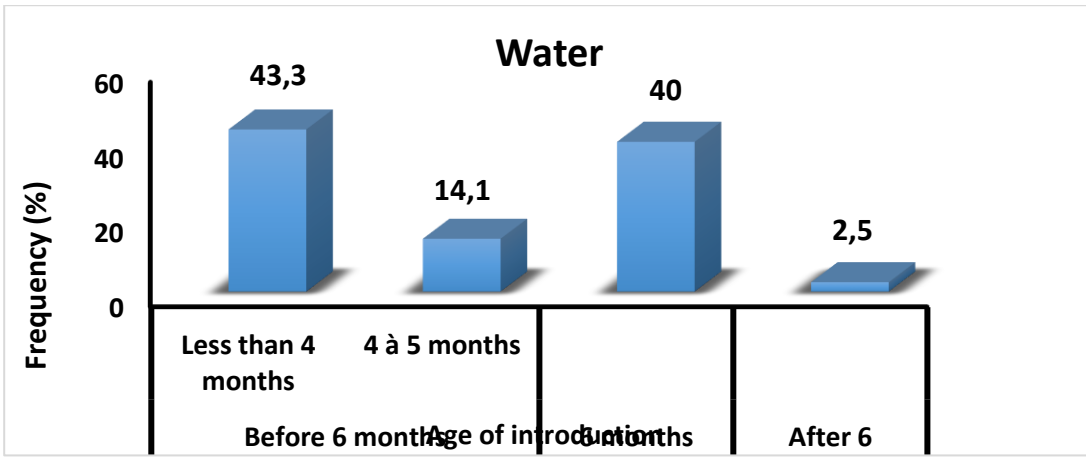

Figure 6: Distribution of infants based on the age of starting complementary feeding.

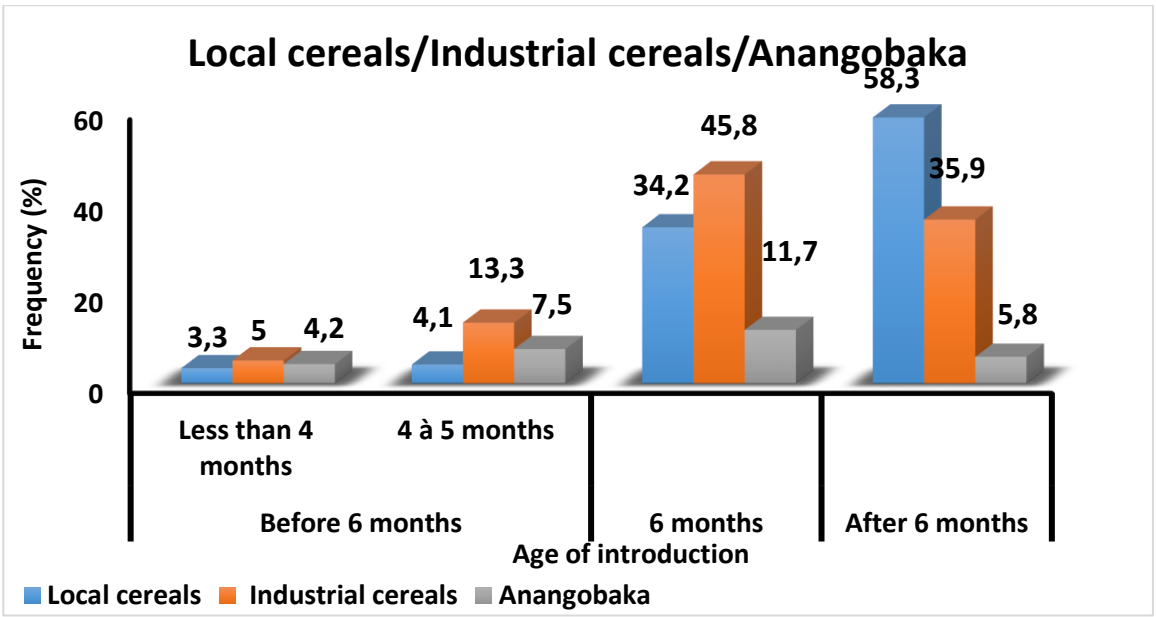

Figure 7: Distribution of infants based on the age of introduction of cereals and "Anangobaka".

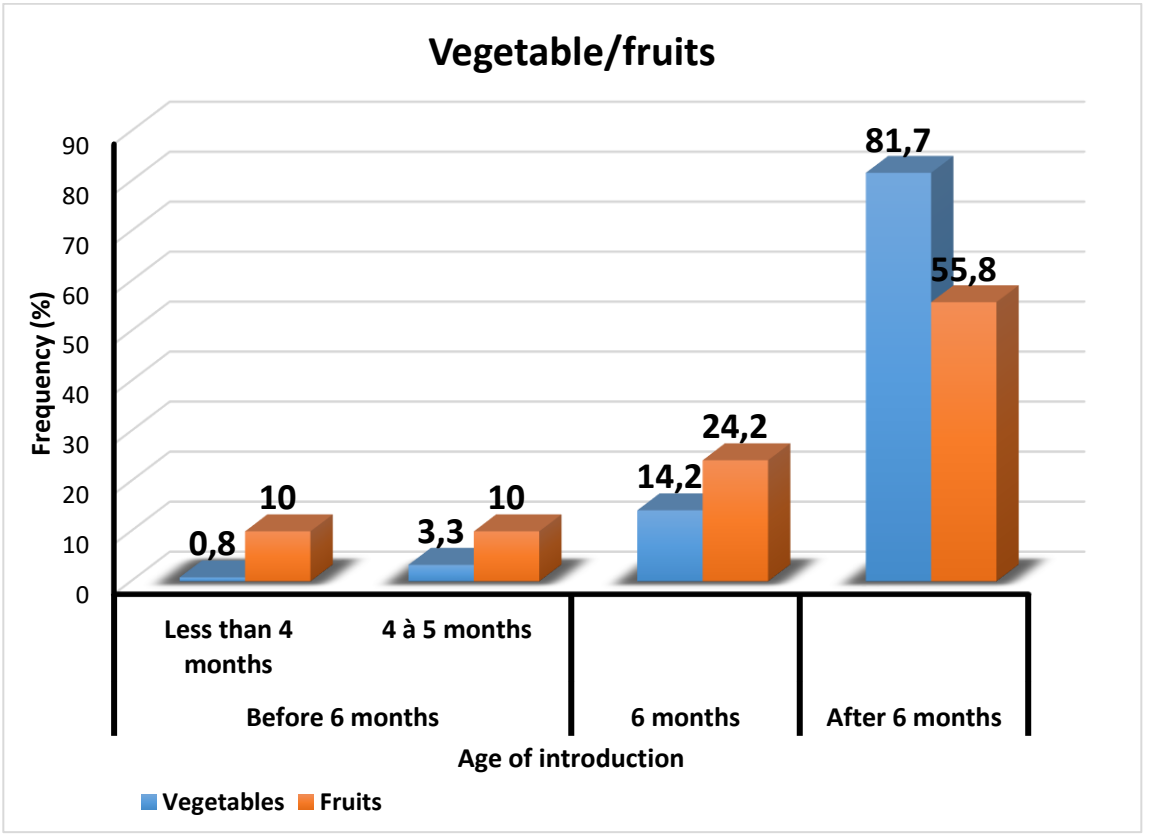

Figure 8: Distribution of infants based on the age of introduction of vegetables and fruits.

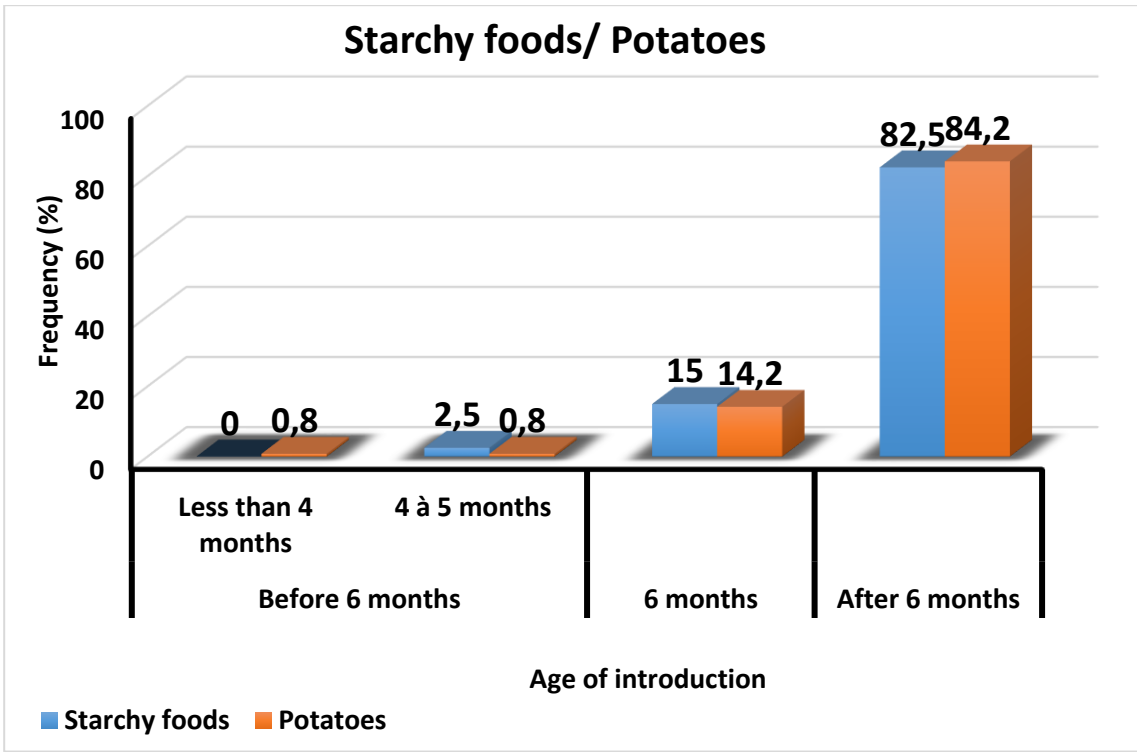

Figure 9: Distribution of infants based on the age of introduction of starchy foods and potatoes.

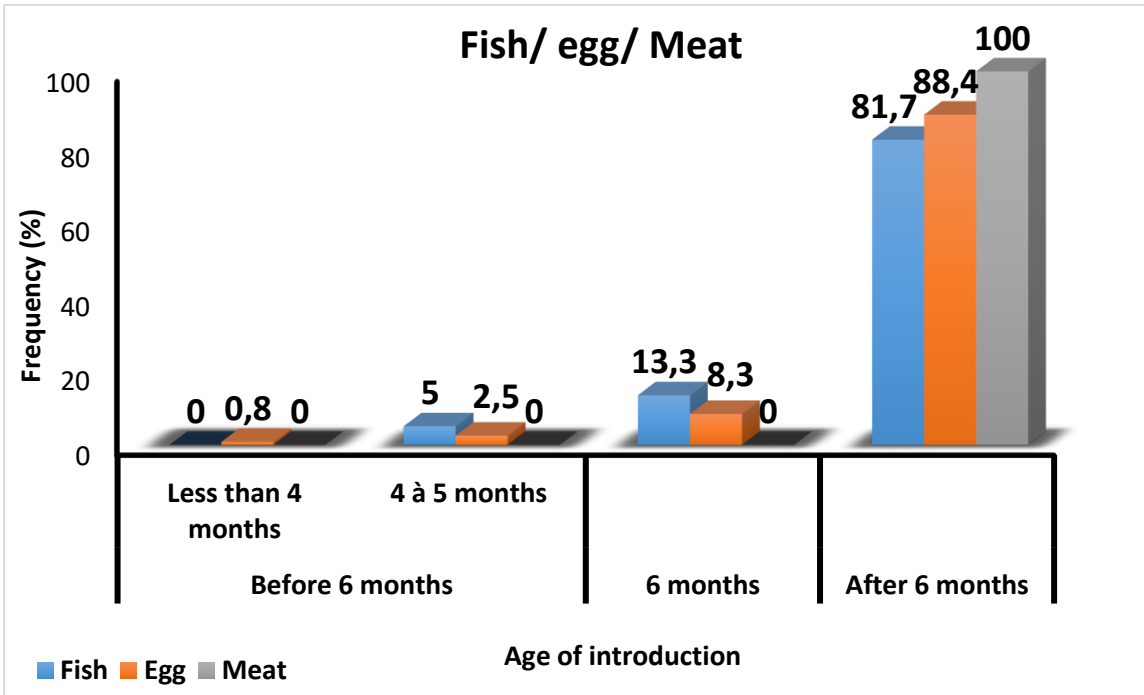

Figure 10: Distribution of infants based on the age of introduction of meats, fish, and eggs.

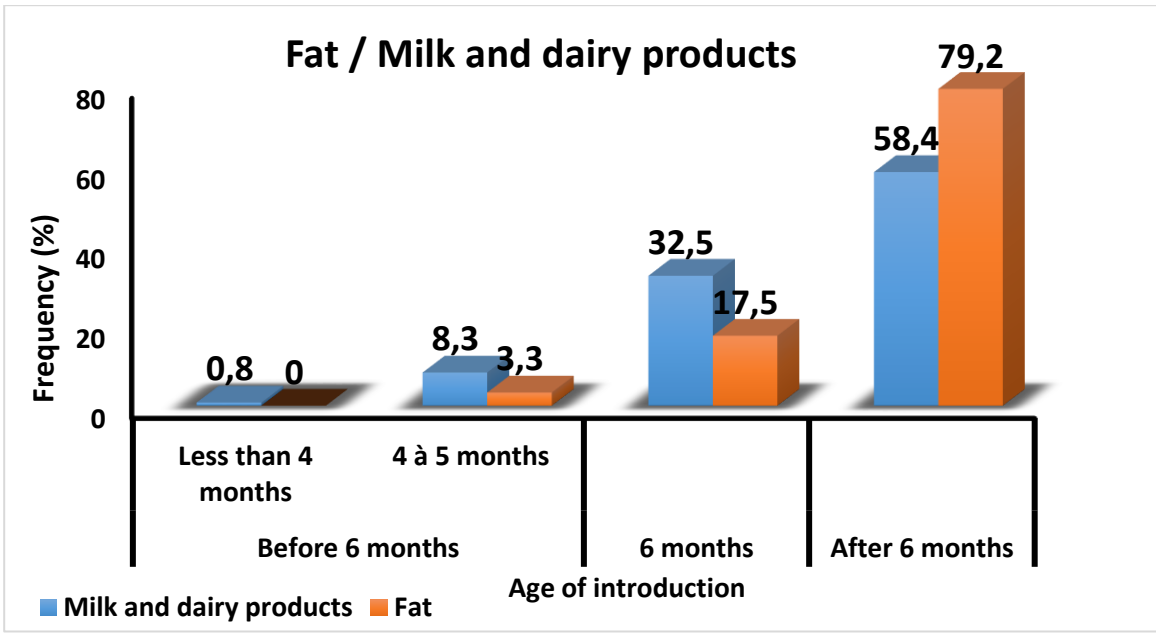

Figure 11: Distribution of infants based on the age of introduction of fats and dairy products.

DISCUSSION

The objective of this study was to assess the feeding practices of infants in the cities of Dabou and Bonoua.

The results revealed that early breastfeeding initiation was effective in only 13.3% of infants. This low rate of early breastfeeding could be attributed to reasons mentioned by mothers, such as the separation and cleaning of the mother/infant pair (32.5%), the newborn's sleepiness (27.5%), the absence of breast milk in the mother (15.8%), and cesarean section (9.2%). On a national level, the prevalence of early initiation of breastfeeding within the first hour after delivery is (36.89%) (SE-CONNAPE and INS, 2021). The present results are higher than those of Aké-Tano et al. (2014) in Abidjan, Côte d'Ivoire (3.6%), but significantly lower than those of Adama in Mali, who found an early breastfeeding rate of 78.1% among mothers (Adama, 2020).

According to the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), infants should be breastfed within the first hour after birth (WHO and UNICEF, 2018). Early breastfeeding allows the newborn to benefit from colostrum, which contributes to the child's immunization against diseases due to its richness in immunoglobulins (ANAES, 2002). On the contrary, infants breastfed between 2 to 23 hours after birth have a 33% higher risk of mortality compared to those breastfed within the first hour. For newborns whose breastfeeding begins a day or more after birth, the risk is at least twice as high as the previous group (WHO and UNICEF, 2018). In our study, 29.2% of infants did not receive colostrum because their first feeding occurred more than 3 days after delivery. More than half (55%) of the monitored mothers had no information on the usefulness (23%) or even the existence (32%) of colostrum.

Exclusive breastfeeding was practiced by 24.2% of mothers, with variations between the two Regions of Dabou (16.67%) and Bonoua (7.53%). However, the national practice of exclusive breastfeeding is 40.1%, with variations in the Grand Pont Region (headquarters in Dabou) at 14% and the Sud-Comoé Region (Bonoua) at 60.6% (SE-

CONNAPE and INS, 2021). The present results are attributed to the limited sampling of mother/infant pairs. They differ from those reported by Diadie Oumarou and Balla in Niger, who found an exclusive breastfeeding rate of 33.5% (Diadie Oumarou and Balla, 2021). Despite the benefits of exclusive breastfeeding and the recommendation by the World Health Organization, its practice by the mothers in the present study remains insufficient. However, several studies have shown that breast milk is the only food an infant receives until the introduction of complementary foods (Schlienger, 2017). A very low rate of exclusive breastfeeding and a high rate of bottle feeding are significant determinants of malnutrition, with a negative impact on nutritional status (Abla et al., 2016). In a study conducted by Brou-Tano et al. (2014) in Abidjan, Côte d'Ivoire, the rate of exclusive breastfeeding was 39.6%.

Regarding complementary feeding, the results indicate that 65.8% of mothers opted for early introduction of complementary foods (before 6 months), while 1.6% practiced it late (after 6 months). Only 32.5% of infants benefited from optimal complementary feeding at 6 months. The timing at which the majority of mothers initiated complementary feeding is not in line with the recommendations of the World Health Organization (WHO), which suggests introducing complementary foods starting at 6 months (WHO, 2003). Furthermore, it does not align with the guidelines of the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN), which recommends introducing complementary foods between the 17th and 26th weeks (between 4 and 6 months) (ESPGHAN, 2017). In the present study, 44.1% of mothers began complementary feeding before 4 months. An excessively early introduction of complementary foods is not only inappropriate for the physiology of the young infant but also exposes them to nutritional deficiencies and may increase the risk of later onset of allergies (Tounian and Sarrio, 2011). Diagne et al. (2011) in Senegal reported in their study that they observed early complementary feeding in one-third of cases (34%), starting at the age of 3 months. Brou-Tanoh et al. (2010) in Côte d'Ivoire noted that 93% of children aged 6 to 24 months in their study began drinking or ingesting complementary foods before the age of 6 months.

Taking into account the standards of the World Health Organization (WHO) and ESPGHAN, this study indicates that the introduction of foods by mothers was inappropriate. Some foods were introduced early, while the majority were introduced late. The first foods introduced by mothers were water, fruits, cereals, and Anangobaka. This early introduction by mothers was influenced by certain beliefs. According to them, infants were thirsty, hence the introduction of water before 4 months (43.3%). This early introduction of water can interfere with the normal frequency of breastfeeding by suppressing the infant's appetite. It can also lead to poor absorption of consumed milk and introduce contaminants or allergens. Since the infant's kidneys are immature to filter water, water intoxication could occur (Hélène, 2018).

As for fruits, they were introduced early (before 4 months) by mothers to address constipation observed in their infants. Regarding cereals and Anangobaka, they were introduced to satisfy the hunger of the infants. These results are similar to those of Nancy et al. (2007) in Niger, who pointed out that mothers gave lemon juice for "stomach cleansing" and to prevent infant "constipation." To address the perceived insufficient milk supply, they supplemented breast milk with animal milk, fura, porridge, and other items (Nancy et al., 2007). The food groups that were introduced late (between 7 and 9 months) included vegetables (81.7%), fruits (55.8%), potatoes (84.2%), starchy foods (82.5%), fish (81.7%), eggs (88.4%), meat (100%), milk and dairy products (58.4%), and fats (79.2%). According to recommendations, the introduction of these food groups should begin between 4 and 6 months (ESPGHAN, 2017) and at 6 months according to WHO (WHO, 2003) because the nutritional needs of the infant, especially energy, protein, and micronutrient (iron, vitamin A, C and D,

essential fatty acids, etc.) requirements, become limited with breast milk only. Introducing food groups in accordance with these recommendations helps fulfill these needs, with each food group playing a specific role.

Fruits and vegetables are rich in micronutrients and fiber. They facilitate the absorption of iron and promote the presence of good bacteria in the child's intestine (Stéphanie, 2019). The main role of meats, fish, and eggs is to provide proteins. With the decrease in milk intake during complementary feeding, it is essential to continue this protein intake in small quantities (Arsan et al., 2011). As for dairy products, they contain proteins of high biological value, along with varying amounts of calcium and vitamin A (Arsan et al., 2011). These proteins are crucial for the baby's growth and serve as antibodies. Starchy foods and potatoes provide a sustained energy supply over time, supporting proper muscular and cerebral function (Gottrand and Turck, 2006). They regulate the infant's satiety.

Conclusion

In summary, the feeding practices of infants in the cities of Dabou and Bonoua do not align with the recommended guidelines. These poor feeding practices could have a negative impact on the establishment of the infants' intestinal microbiota. In light of these results, it would be important, on one hand, to conduct awareness campaigns to improve infant feeding practices and, on the other hand, to conduct studies on the impact of these feeding practices on the development of infants' intestinal microbiota.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

GAC conceived the project, performed data collection, and drafted the manuscript. AHY and NTK assisted in project conception and manuscript revision. ALAA and AD mentored the project and supervised it. All authors have read and approved the final version of the manuscript.

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