

Original Research Article

Overview of the Feeding Practices and Their Influence on the Nutritional Status of Infants Aged 6 to 23 Months in Guera Province, Tchad

Dounia Prudence^{1,2}, Bougma Sanogo¹, Kabré Wendmintiri Jeanne d'Arc¹, Cissé Hama¹, Sanou Aminata¹, Moucthar Roumane³, Tidjani Abdelsalam², Savadogo Aly^{1*}

¹Laboratoire de Biochimie et Immunologie Appliquées (LaBIA)/Université Joseph KI-ZERBO, 03 BP 7021, Ouagadougou, Burkina Faso

²Laboratoire de Recherche en Sciences des Aliments et Nutrition (LARSAN)/Université de N'Djamena, BP 1117, N'Djamena, Tchad

³Centre Hospitalier Universitaire d'Abeché, Tchad

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Abstract: Malnutrition affects many infants in Chad, impairing their general health. Infant feeding practices therefore require special monitoring. This study aimed to assess feeding practices and their influence on the nutritional status of infants aged 6 to 23 months in the Guera province in Tchad. Data were collected through a cross-sectional survey using a structured questionnaire. Participants were selected using random sampling, and statistical data were processed using SPSS and XLstat 2016 software. Results showed that 86.5% of the children received mixed breastfeeding and colostrum, respectively, at birth. Exclusive breastfeeding was low, at 12.5%. Meal frequency was low overall, with only 3% of children receiving three meals a day. Evaluation of the impact of Infant and Young Child Feeding (IYCF) practices showed that bottle-fed infants were generally in a poor nutritional state, with 50% severely malnourished and 50% moderately malnourished, while only 12% of exclusively breastfed children were in severely malnourished state. The high frequency of meal was also favorable to normal state, and no child receiving three meals was sick more than once in the last three months. What's more, only 44% of breastfed children and 52% of colostrum-fed children had fallen ill more than once in the previous three months. In general, malaria and diarrhea were the most frequently contracted by children. This study identified the factors that hurt the normal nutritional status of infants in this part of the Tchad.

Keywords: Feeding Practices, Malnutrition, Infant Diseases, Guera Province.

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INTRODUCTION

Early malnutrition has repercussions on the child's physical growth and mental development but seriously compromises their chances of learning. It can lead to psychological and behavioral disorders, resulting in failing in school and, later, difficulties in adapting (Cravioto *et al.*, 1975). According to authors, poor feeding practices are the main factors leading to malnutrition, which adversely affects children's physical growth and intellectual development (Black *et al.*, 2017; Mukuku *et al.*, 2015). The risk of mortality due to malnutrition is twice as high in infants who are not put to the breast within one hour of birth (Smith *et al.*, 2017). This risk is three to four times higher in children who are not exclusively breastfed for the first six months of life compared with those exclusively breastfed in low-income households (Smith *et al.*, 2017). Due to the weakness of the developing digestive system and new

patterns of child feeding, the period of complementary feeding represents a rather delicate period of dietary transition (Black *et al.*, 2013; OMS, 2021). In the United Nations Secretary-General's report on the final assessment of the 2015 Millennium Development Goals, more than 800 million people suffer from extreme poverty and hunger in the world despite the notable progress recorded (Nations Unies, 2015). The number of children affected by stunting was reduced in most of the world's countries between 1990 and 2013 (Nations Unies, 2014). However, it is regrettable to note that in the Saharan Region, there has been an increase of more than 6 million children at risk of acute malnutrition (UNICEF, 2022). Around 159 million children under the age of five are affected by chronic malnutrition worldwide, and three-quarters of these children are in Africa and Asia (UNICEF/OMS/Banque Mondiale, 2015). Although Asia has a higher prevalence than Africa, the fact

remains that prevalences in Africa are still quite worrying. Indeed, the number of children suffering from wasting (33.2%) in Asia is higher than in Africa (UNICEF/OMS/Banque Mondiale, 2020). Malnutrition has consequences for the child's normal development, as even children, once cured of wasting, are more likely to have physical and neurocognitive development disorders (Black *et al.*, 2013).

In Tchad, despite the multiple actions of the United Nations nutrition agenda, malnutrition is still a major public health problem, as the national prevalence of global malnutrition is high, with a worrying nutritional situation. Indeed, 40% of children suffer from stunted growth, with potential and lasting consequences on their cognitive development (MSPP/MPEPI, 2022). Tchad's current infant mortality rates are among the highest in the world. Recent publications from the National Institute of Statistics, Economic and Demographic Studies of Tchad Republic (INSEED) have shown that around one in eight child in Tchad die before the age of five (INSEED, 2016). According to IPC projections, more than 479,900 children will suffer from severe acute malnutrition during the period from 2023 to 2024 (IPC, 2024). Specific data on feeding practices and the nutritional situation of children in transitional regions such as Central Tchad are virtually non-existent in the literature, hence the need for this study. Therefore, the present study aimed to assess the feeding practices, feeding frequencies and diet-related illnesses of children aged 6 to 23 months in the Guera province.

MATERIALS AND METHODS

Study Site and Period

This study was carried out in the Guera province in Central Tchad. According to the population count, the province of Guera had a total of 662,050 residents in over 110,342 households in 2021 (INSEED, 2021b). This province was chosen because of its cosmopolitan character. The province is a transitional region toward the other regions of Tchad, bringing together numerous populations with different dietary practices. The study took place between November and December 2021.

Target Population and Inclusion Criteria

The study population consisted of pairs parent-child aged 6 to 23 months. The inclusion criteria were parental relationship with the child, the child's age, residence at the study site, and voluntary acceptance. Only immediate relatives caring for infants aged 6 to 23 months were included.

Sampling and Data Collection

After enumerating households in Guera province, a random selection was made using ENA software to select 200 households for the study. In each of these households, one parent-child couple was included taking into account the inclusion criteria, for a total of 200 parent-children aged 6 to 23 months interviewed. The individual face-to-face interview method was used to collect data from participants. Data collection was carried out using a structured questionnaire based on indicators of infant and young child feeding practices (WHO/UNICEF, 2008). Data collected included parents' and children's socio-demographic characteristics, breastfeeding and infant feeding patterns, meal frequency and frequency of most frequent childhood illnesses.

Consent to Participate

Participants were included with the informed consent of the head of household and the parent being surveyed. The objectives and procedure for processing personal data were explained to the participants, who then gave their verbal consent.

Data Processing and Statistical Analysis

The survey forms were firstly sorted to eliminate incorrectly filled-in forms and those with erroneous information. The correct forms were then entered into Sphinx V5 software and transferred to IBM SPSS statistics 20 for the generation of headcounts and frequencies. Graphs were produced on Microsoft Excel 2016. XLSTAT 2016 software was used to perform the Student's t and z tests and generate P-values. The threshold of statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Sociodemographic Characteristics of Participants

The results of the evaluation of the socio-demographic profiles of parent-child couples showed strong variations (Table 1). The results showed a strong predominance of women as heads of household with a rate of 79.5% against 20.5% of men. However, comparisons showed no significant difference ($p = 0.090$). Primary school was the most abundant level of education among household heads, with a rate of 52% with a significant variation, and only 3% had obtained university-level education ($p = 0.014$). The number of children per household was significantly high, with 64% of households having more than 4 children ($p = 0.001$). The majority of infants were aged over 9 months, with a rate of 79.5%, but not significantly different from other age groups ($p = 0.09$). In terms of gender, the results showed that girls were significantly more important, with a rate of 51.5% compared with boys ($p < 0.0001$).

Table 1: Sociodemographic characteristics of the population

Characteristics	Modalities	Number	Frequency	P-value*
Gender of the head of household	Male	41	20.5	0.090
	Female	159	79.5	
Level of education of the head of household	Non-literate	50	25	0.014
	Primary	104	52	
	Secondary	40	20	
	University	6	3	
Number of children per household	1 to 3	92	46	0.001
	4 to 6	80	40	
	7 and over	28	14	
Age of infants	6 to 8 months	41	20.5	0.090
	9 to 23 months	159	79.5	
Gender of infants	Girls	103	51.5	< 0.0001
	Boys	97	48.5	

*z-test/bilateral test

Mode of Breastfeeding and Infant Feeding

In the present study, the results reported in Figure 2 showed that mixed breastfeeding and the consumption of colostrum at birth were strongly practiced by the children's mothers. Indeed, 86.5% of parents surveyed had practiced mixed breastfeeding with

their children before their sixth month and had given colostrum at birth. Mixed breastfeeding generally involves combining breast milk with water from birth. Exclusive breastfeeding and formula feeding were practiced to a lesser extent, with 12.5% for exclusive breastfeeding and only 1% for formula feeding.

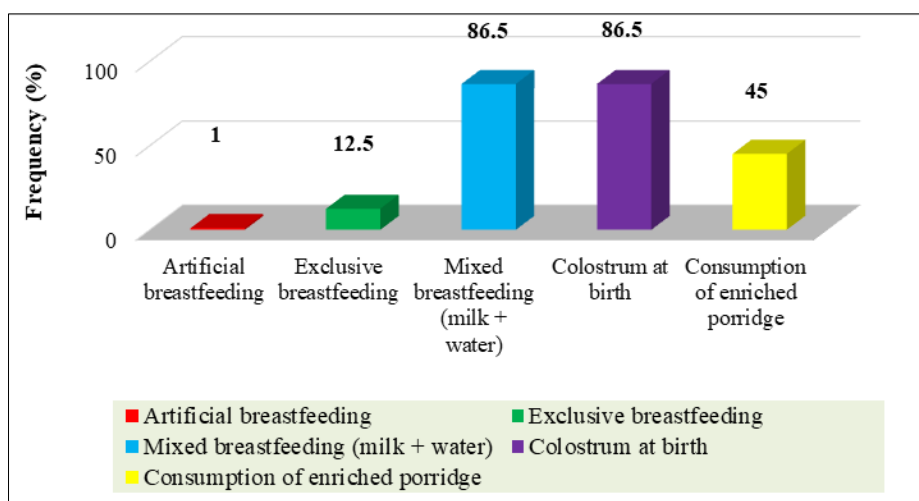


Figure 1: Breastfeeding and infant feeding patterns

Children's Meal Frequency

The results on meal frequencies presented in Table 2 showed that the majority of infants had low meal frequencies. Indeed, 65.5% of infants had a frequency of one meal a day, 16% had a frequency of two meals a day and only 3% of children had a frequency of three meals a day. For children aged 6 to 8 months, the most common frequency was one meal a day (46.34%), and no child

received three meals a day. The age group of 9 to 23-month had the highest frequency of one meal a day, with a rate of 70.44%. Overall, the results showed that the highest frequency was one meal a day, with a rate of 65%, and only 3% of children reached the frequency of three meals a day. Comparison between averages showed no significant difference (p = 0.071).

Table 2: Meal frequency

Meal frequency	6 to 8 months (N=41)	9 to 23 months (N=159)	Totals	P-value*
No meal N (%)	17 (41.46)	14 (8.81)	31 (15.5)	0.071
One meal N (%)	19 (46.34)	112 (70.44)	131 (65.5)	
Two meals N (%)	5 (12.20)	27 (16.98)	32 (16)	
Three meals N (%)	0	6 (3.77)	6 (3)	

N: Number; (%): Frequency; *z-test/bilateral test

Effect of Feeding Practices on Nutritional Status

The impact of infant and young child feeding practices was recorded in Table 3. Concerning the type of breastfeeding, the results showed that bottle-fed infants were either severely malnourished (50%) or moderately malnourished (50%). No infants were found to be normal. Exclusively breast-fed children were predominantly moderately malnourished (76%), with only 12% in a normal nutritional state. Mixed-feeding children were mostly moderately malnourished (67.05%) and 2.31% were severely malnourished. In addition, 30.64% were in a normal nutritional state. Comparison between means showed no significant difference ($p = 0.088$). Regarding colostrum consumption at birth, the results showed that infants who did not receive colostrum at birth were predominantly severely malnourished (70.37%) and only 3.70% were in a normal nutritional state. However, infants who received colostrum at birth were predominantly

moderately malnourished (67.63%) and around 28.32% were in a normal nutritional state. The comparison showed no significant difference ($p = 0.066$). Regarding the consumption of the different types of porridge, the results showed that the consumption of enriched porridge was conducive to good growth. The majority of children who received enriched porridges were in a normal nutritional state (73.33%), with a significant difference, whereas those who received the other types of porridges were moderately malnourished, with a rate of 63.64% ($p = 0.005$). The results also showed that children who received high meal frequencies were less likely to contract malnutrition. Indeed, children who had only one meal a day were mostly moderately malnourished (67.33%), and only 28% of children were in a normal nutritional state. Children who received two meals and three meals were in good nutritional condition, with rates of 65.71% and 100% respectively. However, no significant difference was obtained ($p = 0.062$).

Table 3: Impact of feeding mode on children's nutritional status

Brachial circumference interval*	Type of breastfeeding			Colostrum at birth (N=200)		Type of porridge consumed (N=200)		Feeding frequency (N=200)		
	Bottle-feeding (N=2)	Exclusive breast-feeding (N=25)	Mixed breast-feeding (N=173)	No	Yes	Enriched	Other	One meal	Two meals	Three meals
BP < 11,5 (MAS) N (%)	1 (50)	3 (12)	4 (2.31)	19 (70.37)	7 (4.05)	3 (3.33)	5 (4.55)	7 (4.67)	1 (2.86)	0
11,5 ≤ BP < 12,5 (MAM) N (%)	1 (50)	19 (76)	116 (67.05)	7 (25.93)	117 (67.63)	21 (23.33)	70 (63.64)	101 (67.33)	11 (31.43)	0
BP ≥ 12,5 (Normal state) N (%)	0	3 (12)	53 (30.64)	1 (3.70)	49 (28.32)	66 (73.33)	35 (31.82)	42 (28)	23 (65.71)	1 (100)
P-value**	0.088			0.066		0.005		0.062		

*(MSHP, 2017); **z-test/bilateral test; **BP** = brachial perimeter, **SAM** = severe acute malnutrition, **MAM** = moderate acute malnutrition; **N** = number of employees; (%) = frequencies

Effect of Feeding Habits on the Occurrence of the Most Frequent Childhood Illnesses

The results in Table 4 show the effect of feeding mode on the occurrence of the most frequent childhood illnesses. Regarding the type of breastfeeding, the results showed that breastfeeding was the most favorable for maintaining the child's health. Children who were exclusively breastfed and those who received mixed breastfeeding had fewer illnesses in the last three months. All bottle-fed children were sick at least three times in the last three months, and over 78% of mixed-feeding children were sick at least once in the last three months. On the other hand, 28% of breast-fed children had not been ill in the last three months, compared with mixed-feeding children with a rate of 12.71%. Comparisons between means showed significant variations ($p = 0.012$). Consumption of colostrum at birth was also positively associated to health maintenance, as children who received colostrum at birth fell less ill. The results showed significantly that at least 26% of children

who received colostrum at birth were not sick during the last three months, and 22% were sick only once during the last three months. Comparison between the means showed significant difference ($p = 0.013$). As for the children who had received the enriched porridges, over 83.5% had fallen ill more than twice in the last three months, compared with the only 6% who had had no illness at all, with a significant difference ($p = 0.01$). Regarding meal frequency, the higher the frequency of meals, the less frequent the occurrence of illness. Children who received just one meal a day fell ill more often than children who received two or three meals a day. The results showed that over 70.67% of children who received one meal a day had fallen ill at least twice in the previous three months, while only 45.71% of children who received two meals a day had fallen ill at least twice in the previous three months. No child receiving three meals had fallen ill more than once in the previous three months. The various comparisons showed a significant difference ($p = 0.006$).

Table 4: Impact of feeding habits on the occurrence of childhood illnesses

Frequency of illnesses in the last 3 months	Type of breastfeeding			Colostrum at birth (N=200)	Consumption of enriched porridge (N=200)	Frequency of meals (N=200)		
	Bottle-feeding (N=2)	Breast-feeding (N=25)	Mixed feeding (N=173)			One meal	Two meals	Three meals
None N (%)	0	7 (28)	22 (12.71)	52 (26)	12 (6)	21 (14)	12 (34.29)	0
One time N (%)	0	7 (28)	48 (27.75)	44 (22)	21 (10.5)	23 (15.33)	7 (20)	1 (100)
Two times N (%)	0	5 (20)	55 (31.79)	25 (12.5)	26 (13)	33 (22)	6 (17.14)	0
Three times N (%)	2 (100)	4 (16)	23 (13.29)	24 (12)	15 (12.5)	48 (32)	4 (11.43)	0
Four times N (%)	0	2 (8)	18 (10.4)	23 (11.5)	13 (11.5)	22 (14.67)	3 (8.57)	0
Five times N (%)	0	0	1 (0.58)	4 (2)	1 (0.5)	1 (0.67)	3 (8.57)	0
Six times N (%)	0	0	6 (3)	1 (0.5)	2 (1)	2 (1.33)	0	0
P-value*	0.012			0.013	0.010	0.006		

N: Number; (%): Frequency; *t-test/bilateral test

Evaluation of the Frequency of Occurrence of Certain Childhood Illnesses as a Function of Dietary Habits

Table 5 presents the results of the evaluation of the frequency of illnesses contracted by children over the last six months, according to food consumption. Of a set of six frequent childhood illnesses assessed, malaria and diarrhea were the diseases most frequently contracted by children in the last six months. As for other illnesses, the overall results showed that acute respiratory infections, parasitosis and measles were the diseases least contracted by children in the last six months. Regarding the type of breastfeeding, the results showed that malaria was the disease most contracted by bottle-fed children (100%). As for exclusively breastfed children, diarrhea was the most frequent illness, with a rate of 40%, followed by parasitosis (12%) and the common cold (12%). Malaria was also the main infection in mixed breastfeeding, with a rate of 51.45%, followed by diarrhea (15.03%) and colds (10.98%). The comparisons

showed significant differences (p = 0.04). Children who received colostrum at birth also suffered more from malaria (39.5%), followed by diarrhea (17.5%), with a significant difference (p = 0.046). For children who consumed the enriched porridges, malaria (19%) and diarrhea (10%) were the main infections contracted, with a significant difference (p = 0.033). With regard to meal frequency, the results showed that eating at least three meals reduced the incidence of illness. Indeed, children who ate only one meal a day contracted more illnesses than children who ate three meals a day. Malaria (42.67%) and diarrhea (22%) were the most common illnesses contracted by children receiving one meal a day. Similarly, malaria (60%) and diarrhea (11.43%) were the most frequent illnesses among children receiving two meals a day. On the other hand, for children receiving three meals a day, the only illness encountered was the common cold. Comparisons of the different averages revealed a significant difference (p = 0.015).

Table 5: Frequency of occurrence of some illnesses in children according to feeding mode

Illness contracted by children in last 6 months	Type of breastfeeding			Colostrum at birth (N=200)	Consumption of enriched porridge (N=200)	Frequency of meals (N=200)		
	Bottle-feeding (N=2)	Breast-feeding (N=25)	Mixed feeding (N=173)			One meal	Two meals	Three meals
Diarrhea N (%)	0	10 (40)	27 (15.61)	35 (17.5)	20 (10)	33 (22)	4 (11.43)	0
Acute respiratory infection N (%)	0	2 (8)	4 (2.31)	6 (3)	5 (2.5)	6 (4)	0	0
Malaria N (%)	2 (100)	1 (4)	90 (52.02)	79 (39.5)	38 (19)	64 (42.67)	21 (60)	0
Parasitosis N (%)	0	3 (12)	9 (5.2)	10 (5)	4 (2)	8 (5.33)	2 (5.71)	0
Cold N (%)	0	3 (12)	19 (10.98)	20 (10)	9 (4.5)	17 (11.33)	2 (5.71)	1 (100)
Measles N (%)	0	0	8 (4.62)	5 (2.5)	5 (2.5)	7 (4.67)	0	0
Other N (%)	0	6 (24)	16 (9.25)	18 (9)	9 (4.5)	15 (10)	6 (17.14)	0
P-value	0.040			0.046	0.033	0.015		

N: Number; (%): Frequency; *z-test/bilateral test

DISCUSSION

The results of the socio-demographic survey showed a strong predominance of female heads of

household (79.5%), a predominance that could be explained by the massive departure of male immigration candidates. These results differ from those reported by Ouédraogo et al., (2013), who obtained 98.8% of male-

headed households in western Burkina-Faso (Ouédraogo *et al.*, 2013). Contrary to the results of Sanou *et al.*, (2018) with only 16.7% of household heads with no level of schooling (Sanou *et al.*, 2018), the results of this study showed that at least 52% of household heads had at least primary school education, but only 3% reached higher education. This low rate of higher education could be explained by the low level of supply and poverty in Guera province, where the agricultural sector predominates. According to information reported by parents surveyed, young people prefer to devote themselves to farming rather than pursue long and costly studies in the country's major capitals. Large family size is an aggravating factor in household poverty in Africa, as the more children there are, the less people can eat to their hearts' content in overcrowded families of modest means. These observations corroborate those of Edoun and Mongbo (2020), who also found that malnutrition levels were lower in smaller households and higher in larger ones (Edoun & Mongbo, 2020).

Regarding the breastfeeding mode, the majority of mothers practiced mixed breastfeeding, essentially consisting of breast milk and drinking water. The results obtained in this study, with 86.5% mixed breastfeeding, were higher than those reported by Diawara *et al.* (2018) in Mali, with a rate of 25% of mixed breastfeeding (Diawara *et al.*, 2018), and those reported in the SMART survey in 2021, with a rate of 43.1% of mixed breastfeeding in Tchad (INSEED, 2021a). This high practice of mixed breastfeeding could be linked to socio-cultural practices, abundant heat in the province and insufficient breast milk secretions as reported by some authors (Bichard, 2018; Fanny *et al.*, 2020). Similarly, the practice of artificial breastfeeding was strongly influenced by disease and socio-cultural factors. Indeed, during the survey, some communities reported that, according to their beliefs, the milk of certain mothers was considered of poor quality and could affect the child's health and even lead to death. On the other hand, exclusive breastfeeding was not widely practiced. The rate of exclusive breastfeeding for the first six months is lower than that reported by Chiabi *et al.*, (2020), who obtained 14.3% in Cameroon (Chiabi *et al.*, 2020). Breast milk contains all the protective nutrients (proteins, fats, lactose, water, minerals, vitamins, immunoglobulins and leukocytes) infants need for the first six months of life (Matib *et al.*, 2020).

Consumption of colostrum is widely practiced, as the results of the survey showed that nearly 86.5% of children received colostrum at birth. The reasons for this high rate lie in awareness-raising through health facilities. Indeed, according to Somé (2020), awareness-raising messages from health workers in health facilities strongly influence breastfeeding practices (Somé, 2020). During the survey, descriptions of the importance of colostrum, the presence of protective elements for the newborn and the presence of nutrients in colostrum by some parents showed the strong influence of awareness-

raising, particularly by nutritionists in health centers. Colostrum contains antibodies (defenses) that protect against disease (Houdebine, 1997). Taking colostrum from birth therefore has a beneficial effect on the infant, as it effectively helps to fight off certain infections.

Regarding the consumption of enriched porridges, the results obtained were higher than those reported by Kayodé (2012), with only 7% using compound flours as a complementary food in Benin (Kayodé *et al.*, 2012). This high rate could be explained by awareness-raising, the culinary demonstrations to some mothers through anti-malnutrition programs, and media advertising.

The results on meal frequency showed that, overall, children had low frequencies as only 3% reached three meals a day. This low rate could be explained by food insecurity in the household, aggravated by the high number of household components. This result is lower than those reported by Bougma *et al.*, (2023), who found that 76.21% of children in Burkina Faso received more than three meals a day (Bougma *et al.*, 2023). This situation remains alarming for infants, who need a consistent diet for their growth and psychomotor development. According to WHO recommendations, 2 meals a day are needed for breastfed infants aged 6 to 8 months, 3 meals for breastfed infants aged 9 to 23 months and 4 meals for non-breastfed infants aged 6 to 23 months (WHO/UNICEF, 2011). Compared to these WHO recommendations, the results of this study showed that overall, meal frequencies were very low and would require state intervention.

The results also showed that mixed breastfeeding was the most favorable for good nutritional status, with 30.64% of infants with a brachial perimeter (BP) greater than 125 mm. However, infants with a brachial perimeter below 115 mm were more numerous among bottle-fed infants, with a rate of 50%, and none of the bottle-fed infants had a brachial perimeter above 115 mm. According to the WHO, the risk of death is high for children with a brachial perimeter of less than 115 mm. Furthermore, some studies have shown that artificial milk is not suitable for infants of this age (Ghisolfi, 2010; Laurent, 2022). These inadequate feeding practices lead to malnutrition, with immediate and often long-term negative consequences for infant growth and development (USAID/AED, 1999). Similarly, Dembélé *et al.* (2019) also revealed that formula-fed infants were 2.34 times more likely to be underweight than those exclusively breastfed in Mali (Dembélé *et al.*, 2019). The results of the present study showed that the consumption of colostrum at birth had beneficial effects on the nutritional status of children. Other authors have also reported similar observations (Bougma *et al.*, 2019; Sibetcheu *et al.*, 2004). The results of the present study showed that children with normal brachial perimeter were more likely to be encountered among those who received colostrum at birth. On the other hand, children

with very low brachial perimeter (BP < 115 mm) were mostly encountered among children who did not receive colostrum at birth. In the same vein, the results showed that the consumption of enriched porridges was beneficial to children, as 73.33% of children who consumed the enriched porridge were in a normal state. The same trend was observed for meal frequency. Indeed, the higher the frequency of meal intake, the lower the brachial perimeter below 115 mm.

Results on the effect of feeding mode on the frequency of illness showed that formula-fed infants had a weak immune system, with 100% falling ill 3 times, while breast-fed infants had a low rate of 16%. These results could be explained by the fact that formula milk, being refined, is not sufficiently adapted to the infant's organism (Ghisolfi, 2010; Laurent, 2022), but there may also be a lack of hygiene during preparation, which can lead to infections in children. This finding corroborates the results obtained by Mabilia-Babela *et al.*, (2007), who reported that low birth weight, malnutrition and artificial breastfeeding were the factors most conducive to the hospitalization of infants (Mabilia-Babela *et al.*, 2007). Artificial and mixed breastfeeding tend to expose infants to various risks, as most of them are force-fed water, sometimes of poor quality, and do not take food rich in macronutrients and micronutrients.

The results of the assessment of the types of illness contracted by infants showed that malaria and diarrhea were the most commonly observed illnesses, corroborating the findings of other previous studies in Mali and Tchad (Doubia & Touré, 2012; Othingué *et al.*, 2005). Bottle-fed children were more vulnerable to various diseases than breast-fed children. There is therefore an impact of breastfeeding mode on the occurrence of infections, as reported by other authors (Davoise-Paturet, 2020; Melliez *et al.*, 2005). Macronutrient and micronutrient deficiencies are thought to weaken the child's immune system. Similar results have been reported by other authors, who have shown that malnutrition predisposes to infection through its negative effects on the skin and mucous membranes, the usual protective barriers against pathogens, on the one hand, and reduced immune defenses on the other (Black *et al.*, 2008; Katona & Katona-Apte, 2008). The results also showed that disease frequencies were significantly similar for mixed-feeding and fortified children. High meal frequency was also beneficial for the child's health. Indeed, eating several meals a day would provide the body with more adequate nutrients and calories. Overall, the results showed that breast-fed children were the most resistant to disease. Breastfeeding is therefore the best form of nutrition for young children.

CONCLUSION

Proper infant feeding practices are important for psychomotor and intellectual development. This study has shown that raising awareness among the Guera population had significant positive effects on infant

feeding practices. Breastfeeding and colostrum feeding at birth were practiced by a large majority of the population. However, mixed breastfeeding was still widely practiced. Meal frequency was also low overall.

The study also showed that breastfeeding was the best feeding method for infants. Indeed, the majority of children who received this form of nutrition were in good nutritional condition and suffered less from illness. The study also showed that colostrum was important for infant health. Artificial breastfeeding, on the other hand, showed very little benefit, as children with low brachial perimeter and those who suffered most from the disease were in this group. Despite efforts, malaria is still the most common disease among infants in Guera province. This study shows that enormous efforts still need to be made to raise awareness in this province to achieve adequate child-feeding practices.

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