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Factors Associated with Poor Complementary Feeding Practices in Infants Aged 0 - 24 Months at the Mother and Child University Hospital of N'Djamena

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Abstract

Introduction: Complementary feeding, a key stage during the first 1000 days of life, remains insufficiently practiced in Chad, exposing children to early nutritional risks. This study aimed to identify factors associated with poor complementary feeding practices among infants aged 0 - 24 months followed at the Mother and Child University Hospital of N'Djamena. **Patients and Methods:** A cross-sectional descriptive and analytical study was conducted from December 1, 2024, to April 31, 2025. All infants aged 0 - 24 months seen in consultation, vaccination, or hospitalization were included. Sociodemographic, medical, and nutritional data were collected using a standardized questionnaire. Complementary feeding practices were assessed using a score derived from Ruel and Menon (12 points), with poor practice defined as a score < 9. Associations were analyzed using Chi-square test and multivariate logistic regression ($p < 0.05$). **Results:** Among the 200 mother-child pairs included, 60% of infants exhibited poor complementary feeding practices. This was independently associated with low maternal education level (aOR = 2.5; 95% CI: 1.2 - 5.3; p = 0.01), absence of professional nutritional counseling (aOR = 2.8; 95% CI: 1.3 - 5.9; p = 0.007), family income < 100,000 FCFA (aOR = 2.2; 95% CI: 1.1 - 4.6; p = 0.03), and meal frequency < 3 meals/day (aOR = 3.9; 95% CI: 1.9 - 8.2; $p < 0.001$). **Conclusion:** Complementary feeding practices remain predominantly inappropriate and are closely linked to socioeconomic condi-

tions and access to information. Strengthening nutritional education and support for vulnerable households is a priority.

Keywords

Complementary Feeding, Infant, Associated Factors, Complementary Nutrition, N'Djamena

1. Introduction

Complementary feeding (CF), or complementary nutrition, refers to the introduction of foods other than breast milk when breast milk alone is no longer sufficient to meet the child's nutritional needs, generally around six months of age. According to international recommendations, it should not begin before four completed months nor be delayed beyond six months, to prevent infectious risks and nutritional deficiencies [1] [2]. This stage occurs during the critical period of the first 1000 days, which is determinant for growth, neurocognitive development, and immune maturation [3]. Inadequate nutrition during this phase can lead to growth retardation and lasting consequences on health and future productivity.

Globally, indicators remain concerning: less than one-third of children aged 6 - 23 months achieve minimum dietary diversity, and the proportion receiving an acceptable diet remains low [4] [5]. The lowest levels are observed in West and Central Africa, regions facing food insecurity, low availability of nutritious foods, and limited access to nutritional information [4] [6]. In sub-Saharan Africa, only a minority of children benefit from adequate complementary feeding practices, which are strongly influenced by maternal education level, economic resources, and access to nutritional counseling [7]-[9].

In Chad, the situation is no different: according to the national study on nutritional barriers, only 14.5% of children achieve minimum dietary diversity [10].

Given this situation, we hypothesized that at the Mother and Child University Hospital of N'Djamena, poor complementary feeding practices would be strongly determined by socioeconomic, educational, and informational factors. Thus, the objective of this study was to identify factors associated with poor complementary feeding practices among infants aged 0 - 24 months followed at this facility.

2. Patients and Methods

This was a cross-sectional descriptive and analytical study conducted from December 1, 2024, to April 31, 2025, at the pediatrics department of the Mother and Child University Hospital of N'Djamena (CHU-ME). All infants aged 0 - 24 months seen in consultation, vaccination sessions, or hospitalized during the study period, accompanied by a mother or guardian who agreed to participate, were included.

Children whose parents refused participation, those with major chronic conditions (oro-facial malformations, severe heart disease, cerebral palsy, polymalformative syndromes, metabolic diseases), as well as children in acute severe clinical situations were excluded.

Sampling was exhaustive, with 200 participants (sample size calculated using Schwartz's formula for exclusive breastfeeding prevalence of 7.3%) meeting the inclusion criteria during this period.

Variables studied included sociodemographic characteristics (child's age and sex, maternal age, education level, occupation, marital status, household income), medical variables (vaccination status, recent morbid episodes), and feeding practices (type and duration of breastfeeding, age of food introduction, diversity and meal frequency, food consistency, use of individual plate, and sources of nutritional information).

Complementary feeding practices were assessed using a score adapted from Ruel and Menon, totaling 12 points. Each appropriate component received one point. Components included: age of food introduction, consumption of cereals/roots/tubers, legumes/nuts, dairy products, animal-source foods (meat/fish/eggs), vitamin A-rich fruits and vegetables, other fruits and vegetables, total number of food groups consumed, daily meal frequency, age-appropriate food consistency, continuation of breastfeeding after six months, and use of an individual plate.

In accordance with the original work of Ruel and Menon and adaptations used in recent African studies, a score < 9 defined poor complementary feeding practice, while a score ≥ 9 reflected acceptable practice.

Data were collected using a pretested standardized questionnaire. Data were entered in Microsoft Excel and analyzed using SPSS version 21 software. Qualitative variables were expressed as frequencies and percentages, and quantitative variables as means ± standard deviation. Associations were analyzed using Chi-square test or Fisher's exact test, with calculation of Odds Ratios (OR) and their 95% confidence intervals. A significance threshold of $p < 0.05$ was adopted.

Institutional authorization was obtained from the Dean and the CHU-ME Administration. Informed verbal consent was obtained from mothers after explanation of study objectives. Anonymity and confidentiality of data were strictly respected.

3. Results

During the study, 200 mothers of children aged 6 - 24 months were included. The mean maternal age was 28.3 ± 6.4 years (range: 16 to 45 years), with a median of 28 years. Slightly more than half (52%, n = 104) were aged 25 - 34 years, 26% (n = 52) were under 25 years, and 22% (n = 44) were 35 years or older. Regarding education level, 22% (n = 44) of mothers had no formal education, 37% (n = 74) had primary level education, and 41% (n = 82) had secondary or higher education. More than half of the mothers, 56.3% (n = 113), were unemployed or homemakers, and 43.7% (n = 87) engaged in income-generating activities (commerce or

civil service). Almost all participants were married (96.5%, n = 193), while 3.5% (n = 7) were single, widowed, or divorced.

The vast majority resided in N'Djamena (90.5%, n = 181), compared to 9.5% (n = 19) in other peripheral localities. Economically, 73% (n = 146) of households reported monthly income below 100,000 FCFA, and 27% (n = 54) had income equal to or above this threshold. Mean household size was 7.6 ± 4.8 persons, with a median of 7, and 70% (n = 140) of families had more than 5 members. The mean number of children per mother was 2.3 ± 1.4, with a median birth order of 2.

Regarding child characteristics, the 200 children included in the study were aged 6 - 24 months, with a mean age of 12.8 ± 5.3 months and a median of 12 months. Nearly half (48.5%, n = 97) were between 6 and 11 months, 32% (n = 64) between 12 and 17 months, and 19.5% (n = 39) between 18 and 24 months. A slight male predominance was observed, with 54% boys (n = 108) versus 46% girls (n = 92). Mean birth weight was 2940 ± 460 g (range: 1700 - 4600 g). Most children (82%, n = 164) had birth weight ≥ 2500 g, while 18% (n = 36) were underweight (<2500 g). Regarding birth order, 29% (n = 58) were firstborns, 47% (n = 94) were second or third children, and 24% (n = 48) had birth order ≥ 4. The vast majority of children (86%, n = 172) were born at term, compared to 14% (n = 28) premature (<37 weeks GA). Finally, vaccination status was up-to-date for 90% (n = 180) of children, compared to 10% (n = 20) with incomplete vaccination (Table 1).

Table 1. Child characteristics.

Variables	n	%
Child's age (months)		
6 - 11	97	48.5
12 - 17	64	32
18 - 24	39	19.5
Sex		
Male	108	54
Female	92	46
Birth weight (g)		
<2500 (underweight)	36	18
≥2500	164	82
Birth order		
1st	58	29
2nd - 3rd	94	47
≥4th	48	24
Gestational age at birth		
At term (≥37 weeks)	172	86
Premature (<37 weeks)	28	14
Up-to-date vaccination status		
Yes	180	90
No/Incomplete	20	10

Regarding complementary feeding practices, the study focused on 200 children aged 6 - 24 months. The mean age of complementary food introduction was 5.2 ± 1.4 months, with a median of 6 months. Among them, 34% (n = 68) received foods before 6 months, 42% (n = 84) at 6 months, and 24% (n = 48) after 6 months. Thus, more than one-third of children were diversified too early, contradicting WHO recommendations.

Regarding meal frequency, 55% (n = 110) received at least three meals per day, while 45% (n = 90) had fewer than three daily meals. The recommended minimum frequency was therefore not met in nearly one in two children. Use of an individual plate remained limited: 38% of children (n = 76) had their own dish versus 62% (n = 124) who shared family food, which increases the risk of unequal consumption and digestive infections.

In terms of dietary diversity, only 41% (n = 82) consumed at least five different food groups during the previous 24 hours, while 59% (n = 118) had a monotonous diet dominated by local cereal porridges.

Finally, continuation of breastfeeding after 6 months was observed in 66% (n = 132) of mothers, while 34% (n = 68) had completely weaned their child before 1 year.

Overall, assessment of the Ruel and Menon complementary feeding score showed that 60% of children (n = 120) exhibited poor complementary feeding practices (score < 9), compared to 40% (n = 80) with acceptable practice (score ≥ 9) (Table 2).

Table 2. Complementary feeding practices.

Variables	n	%
Age of food introduction		
Before 6 months	68	34
At 6 months	84	42
After 6 months	48	24
Meal frequency/day		
<3 meals	90	45
≥3 meals	110	55
Use of individual plate		
Yes	76	38
No (collective meal)	124	62
Dietary diversity (≥ 5WHO groups)		
Yes	82	41
No	118	59
Continuation of breastfeeding after 6 months		
Yes	132	66
No	68	34

Regarding sources of information on complementary feeding, among the 200 mothers interviewed, the majority (64.0%, n = 128) reported having received information on complementary feeding from healthcare personnel (midwives, nurses, health agents). Family circle also constitutes an important source of information for 35.0% of respondents (n = 70).

Audiovisual media, particularly television, were cited by 29.0% of participants (n = 58), while radio was mentioned by only 21.0% (n = 42).

Social networks appear as an emerging source, although less frequent (12.5%, n = 25). Finally, 17.0% of mothers (n = 34) indicated having received no information on complementary feeding.

Regarding factors associated with poor complementary feeding practices, univariate analysis identified several factors significantly associated with poor complementary feeding practices. Mothers with no education or primary level showed a higher frequency of poor practice (74%) compared to those with secondary or higher education (48%, p = 0.002). Similarly, low financial availability (<100,000 FCFA/month) was linked to poor complementary feeding (69% versus 45%, p = 0.004). Mothers who had not received professional nutritional counseling (midwife, nutritionist) had inappropriate practices in 76% of cases, compared to 54% among those informed by healthcare personnel (p = 0.005). Discontinuous maternal presence with the child and meal frequency < 3/day were also associated with low scores (p = 0.049 and p < 0.001 respectively) (Table 3).

Table 3. Factors associated with poor complementary feeding practices (Univariate analysis).

Variables	Poor practice (%)	Crude OR (95% CI)	p
Mother's education level			
None/primary	74	1	—
Secondary or higher	48	0.36 (0.19 - 0.68)	0.002
Monthly household income			
<100,000 FCFA	69	1	—
≥100,000 FCFA	45	0.38 (0.21 - 0.71)	0.004
Professional counseling on complementary feeding received			
No	76	1	—
Yes	54	0.38 (0.20 - 0.74)	0.005
Mother's age (<25 years)	68	1	—
≥25 years	55	0.60 (0.32 - 1.13)	0.11
Permanent presence with child			
No	70	1	—
Yes	55	0.52 (0.27 - 1.00)	0.049
Number of meals ≥ 3/day			
No	82	1	—
Yes	41	0.21 (0.11 - 0.42)	<0.001

After adjustment of significant variables ($p < 0.20$), four factors remained independently associated with poor complementary feeding practices (**Table 4**).

Table 4. Factors associated with poor complementary feeding practices (Multivariate analysis).

Factors independently associated with poor practice	Adjusted OR (95% CI)	p
Low maternal education level	2.5 (1.2 - 5.3)	0.01
Absence of professional counseling on complementary feeding	2.8 (1.3 - 5.9)	0.007
Family income < 100,000 FCFA	2.2 (1.1 - 4.6)	0.03
Less than 3 meals/day	3.9 (1.9 - 8.2)	<0.001

4. Discussion

In this study of 200 mother-child dyads, the profile of participants (young mothers, married, with low socioeconomic status) is similar to that described in other sub-Saharan African countries such as Cameroon, Ethiopia, and Burkina Faso, where young and poorly educated women constitute the majority of those responsible for infant feeding [11]. The key role of maternal education observed in our study corroborates the findings of Mekonen *et al.* (2024), which show that a higher educational level significantly increases the probability of adequate complementary feeding practices [11].

Introduction of foods before six months concerned more than one-third of infants. This early introduction, contrary to WHO and ESPGHAN recommendations [12] [13], is also reported in several African studies (40% in Ethiopia, 43% in Burkina Faso) [11] [14]. The determinants of this premature introduction – family pressure, food beliefs, necessity for mothers to return to work – highlight the importance of strengthened support for families and nutritional authority figures within the household [12] [15].

Minimum dietary diversity was achieved in only 41% of children, a level comparable to regional data where only 13% of children benefit from adequate complementary feeding practices according to a meta-analysis of 19 sub-Saharan African countries [11]. Dietary monotony, dominated by cereal porridges poor in micronutrients, is widely documented in the literature. The work of Gatica-Domínguez *et al.* (2021) confirms that West and Central Africa have the lowest rates of dietary diversity [14]. Enrichment of porridges with legumes, animal products, and vitamin A-rich fruits or vegetables remains a priority recommendation [16] [17].

Continuation of breastfeeding after six months, observed in two-thirds of children, remains below international standards that recommend breastfeeding until 24 months or beyond [12] [13]. Limited use of an individual plate (38%) exposes children to unequal distribution and increased risk of contamination, a phenomenon already reported in Nigeria and Ethiopia [11] [18].

Multivariate analysis identified four independent determinants of poor complementary feeding practices: low maternal education level, absence of profes-

sional nutritional counseling, low family income, and insufficient meal frequency (<3 meals/day).

In our study, permanent maternal presence with the child was significantly associated with complementary feeding practices in univariate analysis (p = 0.049), suggesting a protective effect related to maternal availability. However, this variable did not maintain its significance in the multivariate model. This loss of significance can be explained by confounding and mediation phenomena with more structural determinants, particularly maternal education level, household income, and access to professional nutritional counseling. Indeed, maternal presence, although favorable, may not be sufficient to guarantee adequate feeding practices in the absence of appropriate nutritional knowledge and sufficient economic resources. In this context, maternal availability appears more as a facilitating or intermediate factor than as an independent determinant of complementary feeding quality, which is consistent with observations reported in other studies conducted in sub-Saharan Africa. These results align with those of Mekonen *et al.* (2024), which emphasize the weight of poverty, limited education, and lack of access to information in the quality of feeding practices [11]. Diversity inequalities according to wealth level, described by Gatica-Domínguez *et al.* (2021), confirm that an unfavorable economic environment constitutes a major obstacle to adequate nutrition [14].

5. Conclusion

This study shows that poor complementary feeding practices are very common among infants aged 6 - 24 months attending the Mother and Child University Hospital of N'Djamena, affecting six out of ten children. Low maternal education level, absence of professional nutritional counseling, low household income, and insufficient meal frequency were identified as the main independent determinants. These findings highlight the persistent vulnerability of infant feeding practices in this context and underscore the need for targeted interventions focused on maternal education and nutritional support.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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