

RESEARCH ARTICLE

Educational Needs on Infant Feeding Among Mothers Attending an Urban Integrated Health Centre in Ebolowa, Cameroon: A Cross-Sectional Study

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ABSTRACT

Infant feeding is critical for child growth and health, particularly during the transition from exclusive breastfeeding to complementary feeding. Inadequate maternal knowledge and suboptimal feeding practices, as defined by predefined criteria, may compromise infant health, while vaccination services offer a strategic opportunity for nutrition education. A descriptive cross-sectional study was conducted from May 26 to August 26, 2025, at CSI Urban No.2 in Ebolowa, Cameroon, among 120 mothers of children aged 0-24 months. Data were collected using structured questionnaires. Chi-square and ANOVA tests were performed, with statistical significance set at $p < 0.05$. The mean maternal age was 25.42 ± 6.07 years. Although 83.33% of mothers reported exclusive breastfeeding for 6 months, only 41.67% met the criteria for appropriate exclusive breastfeeding practice, indicating a gap between reported knowledge and actual practice. Among mothers reporting six months of exclusive breastfeeding, 50.83% had low knowledge scores and 32.5% had moderate scores. A statistically significant association was observed between reported exclusive breastfeeding duration and overall nutritional knowledge scores ($p = 0.0001$). Complementary feeding was introduced at six months by 65% of mothers, at nine months by 31.67%, and at four months by 2.5%. Knowledge of complementary feeding was low in 58.33% and moderate in 41.67%, with no significant association with the timing of introduction ($p > 0.05$). Foods considered appropriate for children aged 6-12 months included milk and dairy products with fruits and vegetables (43.33%), meat, fish, and eggs (30%), and cereals and tubers (26.67%). Sugar avoidance was correctly reported by 59.17% of mothers. Overall, maternal knowledge and infant feeding practices were predominantly suboptimal, underscoring the need for strengthened, behavior-focused nutrition education integrated into routine vaccination services

Keywords: *Cross-sectional study; Educational needs; Infant feeding; Mothers; Vaccination service; Ebolowa (Cameroon)*

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INTRODUCTION

Infant feeding is a critical stage in child development, and mothers play a central role in this process (Organisation Mondiale de la Santé [OMS], 2023). However, mothers often face challenges in providing adequate nutrition to their infants, particularly during the transition from exclusive breastfeeding to the introduction of solid foods (complementary feeding) (OMS, 2023). Vaccination services represent a strategic setting for raising mothers' awareness of appropriate infant feeding practices and addressing their educational needs (Centers for Disease Control and Prevention [CDC], 2022).

It is important to note that mothers' educational needs vary according to their socioeconomic context, prior experience, and existing knowledge, which directly influences their infant feeding practices (Bhandari & Chowdhury, 2016). In certain regions, infants are particularly exposed to nutritional diseases such as kwashiorkor, marasmus, and kwashiorkor-marasmic malnutrition. Kwashiorkor primarily results from protein deficiency, while marasmus is linked to an overall energy deficiency involving carbohydrates, fats, and proteins; kwashiorkor-marasmic malnutrition combines these severe deficiencies (OMS, 2023). These forms of malnutrition mostly affect children under five years old, with heightened vulnerability in those under three years of age (Muller & Krawinkel, 2005).

Understanding the specific educational needs of mothers is therefore essential to design effective programs, improve infant feeding practices, and prevent protein-energy malnutrition (PEM) (Black et al., 2013). Available data in Cameroon indicate that the rate of exclusive breastfeeding up to six months remains low ($\approx 40\%$), below the WHO targets, reflecting significant gaps in knowledge and practices regarding infant feeding (Cameroon DHS 2018; WHO 2020). Furthermore, specific information from Ebolowa on mothers' infant feeding practices and educational needs is scarce or non-existent, limiting the adaptation of public health interventions to this local context. This study aimed to identify the educational needs of mothers regarding infant feeding at the vaccination service of the Urban Integrated Health Centre No. 2 of Ebolowa (CSIU No. 2), in order to improve the health and well-being of children.

METHODS

Study Area

The study was conducted in the city of Ebolowa, located in the South Region of Cameroon, at the Urban Integrated Health Center Number 2 of

Ebolowa (CSIU No. 2), which is affiliated with the Ebolowa Regional Hospital. The center is part of the Ebolowa Health District and provides primary healthcare services, including vaccination, maternal and child health care, nutrition, and health education. The vaccination service was the main site for data collection.

Study Design and Period

This was a descriptive and analytical cross-sectional study conducted over a three-month period, from May 26 to August 26, 2025. The analytical aspect is justified by the use of statistical tests (chi-square) to assess associations between mothers' characteristics (age, education level, socioeconomic status, etc.) and their knowledge/practices regarding infant feeding.

Study Population and Selection Criteria

The target population consisted of mothers with children aged 0 to 24 months attending the CSIU N°2 vaccination service during the study period.

Inclusion criteria:

- Mothers with a child aged 0 to 24 months;
- Present at the vaccination service during the survey;
- Provided informed consent to participate.

Exclusion criteria:

- Mothers who refused to participate;
- Mothers unavailable or in emergencies;
- Mothers with comprehension difficulties.

Sample Size and Sampling Technique

The sample size was estimated using the formula proposed by Yamane (1967):

$n = N / (1 + e^2)$, $N = 120$ corresponds to the total number of mothers attending the vaccination service during the reference period and $e = 0.05$ is the margin of error (Oluigbo et al., 2024). This yielded a minimum sample size of 109 participants, which was increased to 120 mothers to account for potential non-response (Fortin & Gagnon, 2016).

The sampling technique used was a convenience sampling method. Mothers were progressively recruited according to their availability during visits to the vaccination service until the required sample size was reached, in accordance with methodological recommendations for descriptive studies in healthcare settings (Fortin & Gagnon, 2016).

Data Collection Tools

Data were collected using a structured questionnaire and an observation checklist to assess certain observable practices. The questionnaire was divided into three sections: sociodemographic data (age, education level, marital status, occupation, number of children); knowledge on infant feeding (duration of exclusive breastfeeding, age of complementary feeding, types of suitable foods, sources of information, participation in nutrition education sessions); and feeding practices (exclusive breastfeeding, age of introduction of complementary foods, number of meals per day, addition of sugar, person preparing meals). The questionnaire was administered in French during interviews with the participants. It was pretested among a group of women at another health facility in the city to ensure clarity and relevance before data collection.

Recruitment and Data Collection Procedure

Mothers were approached after their visit to the vaccination service. Individual interviews were conducted to explain the study objectives, obtain informed consent, and administer the questionnaire. Interviews were conducted in a private setting to ensure confidentiality. Clarifications were provided to participants who had difficulties understanding the questions. At the end of the interview, mothers were thanked for their participation.

Assessment of Knowledge and Feeding Practices

The assessment was slightly adapted from the one proposed by Ousmane (2020). One point (1) was awarded for each correct answer.

Knowledge Score:

One point was awarded for each correct answer regarding: the recommended duration of exclusive breastfeeding (6 months); the age of complementary feeding (6 months); avoiding sweetened juices before 6 months; knowing at least two suitable foods for infants; and identifying a correct source of information (health personnel). Scores were interpreted as follows: 0-2 = low knowledge; 3-4 = medium knowledge; 5 = good knowledge. These cut-off points were chosen to clearly differentiate knowledge levels based on the number of correct responses, with “good knowledge” only achieved when all answers were correct.

Practice Score:

One point was awarded for each correct practice: actually practicing exclusive breastfeeding; introducing complementary foods at 6 months; giving at least three meals per day; not adding

sugar to meals; and meals prepared by the mother. Scores were interpreted as follows: 0-2 = practices needing improvement; 3-4 = medium practices; 5 = good feeding practices. The cut-off points were selected to reflect a progression in practices: the highest score corresponds to full adherence to recommendations, while a low score indicates a significant need for education.

Exclusion criteria:

- Children whose caregivers reported having a genetic or autoimmune hematological disease (sickle cell disease, aplastic anaemia and hemolytic anaemia).
- Children who had been previously diagnosed with non-iron deficiency-related anaemia (megaloblastic and pernicious anaemia).
- Children who were unwell at the time of the study.

Data Analysis

Data was entered into Microsoft Excel and analyzed using SPSS version 25. Descriptive statistics were calculated. Associations between categorical variables were analyzed using the Chi-square test, with statistical significance set at $p < 0.05$. Associations between variables were analyzed using Chi-square tests with significance set at $p < 0.05$.

Ethical Considerations

Administrative authorization for data collection was obtained from the Head of the Urban Integrated Health Centre No. 2 of Ebolowa, following a formal request from the Director of École Privée La Grâce. The study protocol was reviewed and approved by the Ethics Committee of the Regional Delegation of the Ministry of Public Health, prior to the commencement of the survey. This authorization was registered under reference number N°0039/L/MINSANTE/SG/DRS/EPG/EBWA. Informed consent was obtained from all participants before their inclusion in the study. The anonymity and confidentiality of the information collected were strictly respected throughout the research process.

RESULTS

Sociodemographic Characteristics of Mothers

A total of 120 mothers attending the vaccination service at CSIU No. 2 in Ebolowa were included. The mean age was 25.42 ± 6.07 years, and the average number of children per mother was 2.18 ± 1.36 .

Maternal age increased progressively with parity, indicating a positive association between age and

number of children (Figure 1). Mothers with one child were younger on average, whereas those with five or more children were predominantly older, with less variability in age. One older mother in the group with three children constituted an outlier; this value was considered plausible and retained in the analysis.

Participation in infant feeding education sessions was generally low and varied by marital status (Figure 2), with noticeable differences across groups.

The distribution of occupation according to educational level showed clear patterns (Figure 3). Higher educational attainment was associated with employment in the civil service, whereas lower educational levels were more frequently associated with self-employment.

Figure 1:

Boxplot showing the distribution of mothers' age according to the total number of children.

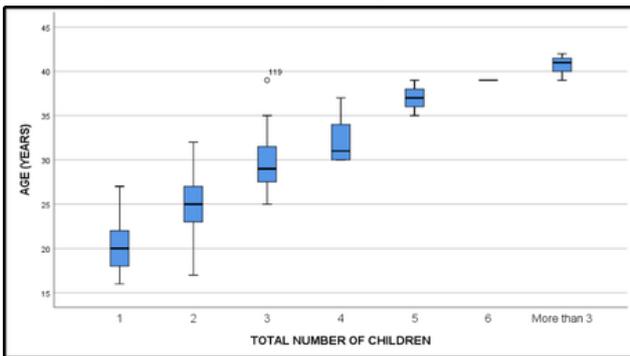


Figure 2:

Participation in infant feeding education sessions according to marital status.

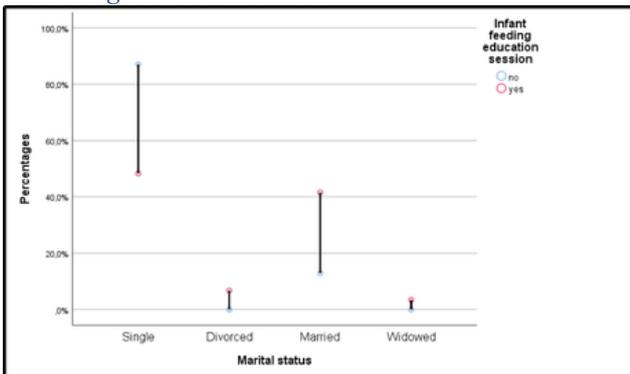
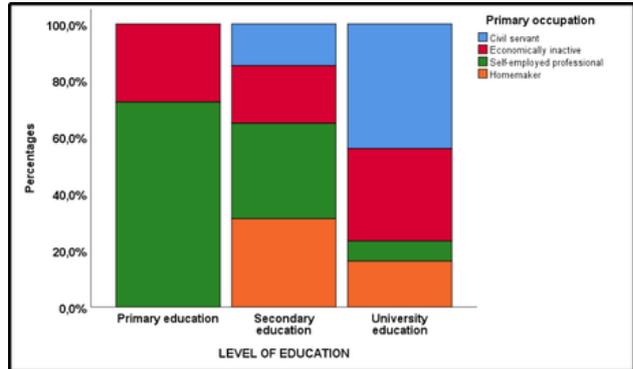


Figure 3:

Stacked bar chart showing primary occupation distribution according to mothers' educational level.



Infant Feeding Knowledge of Mothers

Overall, although most mothers were aware of selected infant feeding recommendations, none achieved a good overall knowledge score (Table 1).

Most mothers correctly identified six months as the recommended duration of exclusive breastfeeding; however, the majority still fell into the low or moderate knowledge categories. A statistically significant association was observed between reported duration of exclusive breastfeeding and overall knowledge score ($p < 0.001$).

Regarding complementary feeding, most mothers reported introducing foods at six months. No statistically significant association was found between age of complementary feeding introduction and overall knowledge score ($p = 0.126$). One extreme value (99 months) was identified and considered a reporting error; this value was excluded from inferential interpretation but retained descriptively in the table.

Although mothers were able to cite appropriate food groups for infants aged 6-12 months, no significant association was observed between the types of foods cited and overall knowledge score ($p = 0.540$). Similarly, no significant associations were found between knowledge scores and beliefs regarding sugar/salt introduction ($p = 0.174$) or sources of information ($p = 0.736$).

Overall, a predominance of low to moderate knowledge levels was observed across all knowledge domains assessed.

Table 1:*Association Between Mothers' Responses and Their Level of Knowledge on Infant Feeding*

	Knowledge Score				Total	p-value
		Low n (%)	Moderate n (%)	Good level of knowledge n (%)		
Exclusive breastfeeding (months)	3	7(5,83)	7(5,83)	0(0,0)	14(11,67)	0,0001
	6	61 (50,83)	39(32,5)	0(0,0)	100(83,33)	
	9	2(1,67)	4(3,33)	0(0,0)	6(5)	
Total	70 (58,33)	50(41,67)	0(0,0)	120(100)		
At what age can porridge or solid foods be introduced (months)?	4	2(1,67)	1(0,83)	0(0,0)	3(2,50)	0,126
	6	52(43,33)	26(21,67)	0(0,0)	78(65,00)	
	9	15(12,50)	23(19,17)	0(0,0)	38(31,67)	
	99	1(0,83)	0(0,0)	0(0,0)	1(0,83)	
Total	70 (58,33)	50(41,67)	0(0,0)	120(100)		
Name three foods suitable for a baby aged 6 to 12 months.	CerealTubers (e.g., sweet potato, yam)Drink (water)	15(12,50)	17(14,17)	0(0,0)	32(26,67)	0,540
	Milk, Dairy products, Vegetables and fruits	34(28,33)	18(15,00)	0(0,0)	52(43,33)	
	Meat, Fish, Egg	21(17,50)	15(12,50)	0(0,0)	36(30,00)	
Total	70 (58,33)	50(41,67)	0(0,0)	120(100)		
Is it recommended to give sugar or salt to an infant under 6 months ?	No	38(31,67)	33(27,50)	0(0,0)	71(59,17)	0,174
	Yes	32(26,67)	18(15,00)	0(0,0)	49(40,83)	
Total	70 (58,33)	50(41,67)	0(0,0)	120(100)		
What is your main source of information about infant feeding?	Healthcare workers	36(30)	28(23,33)	0(0,0)	53,33(0,83)	0,736
	Family	27(22,50)	20(16,67)	0(0,0)	47(39,17)	
	Social networks	7(5,83)	2(1,67)	0(0,0)	9(7,50)	
Total	70 (58,33)	50(41,67)	0(0,0)	120(100)		

Infant Feeding Practices

No mother achieved a good overall infant feeding practice score (Table 2).

Exclusive breastfeeding up to six months, introduction of complementary foods, meal frequency, caregiver responsible for food preparation, and sugar addition were not significantly associated with overall practice scores (all $p > 0.05$). Across all practice indicators, most mothers were classified as having practices requiring improvement or moderate practices.

These results indicate that individual appropriate practices did not translate into optimal overall feeding practices.

Table 2:*Association Between Mothers' Feeding Practices and Their Overall Infant Feeding Practice Score*

	Practice score				Total	p-value
		Practice to improve n(%)	Average practice n(%)	Good practice n (%)		
Did you exclusively breastfeed your baby up to 6 months?	No	35(29,17)	35(29,17)	0(0,0)	70(58,33)	0,174
	Yes	27(22,50)	23(19,19)	0(0,0)	50(41,67)	
Total		62(51,67)	58(41,67)	0(0,0)	120(100)	
At what age did you introduce foods other than milk?	No	9(7,50)	11(9,17)	0(0,0)	20(16,67)	0,174
	Yes	53(44,17)	47(39,17)	0(0,0)	100(83,33)	
Total		62(51,67)	58(41,67)	0(0,0)	120(100)	
How many meals do you give your baby per day?	3	17(14,17)	20(16,67)	0(0,0)	37(30,83)	0,402
	4	45(37,50)	38(31,67)	0(0,0)	83(69,17)	
Total		62(51,67)	58(41,67)	0(0,0)	120(100)	
Who prepares your baby's food?	Grandmother	13(10,83)	7(5,83)	0(0,0)	20(16,67)	0,411
	mother	32(26,67)	32(26,67)	0(0,0)	64(53,33)	
	Nanny/Caregiver	17(14,17)	19(15,83)	0(0,0)	36(30,00)	
Total		62(51,67)	58(41,67)	0(0,0)	120(100)	
Do you add sugar when preparing your baby's porridge?	Never	12(10,00)	11(9,17)	0(0,0)	23(19,17)	0,960
	Sometimes	29(24,17)	26(21,67)	0(0,0)	55(45,83)	
	Often	19(15,83)	18(15,00)		37(30,83)	
	Always	2(1,67)	3(2,50)	0(0,0)	5(4,17)	
Total		62(51,67)	58(41,67)	0(0,0)	120(100)	

DISCUSSION

The present study highlights important relationships between maternal characteristics, nutritional knowledge, and infant feeding practices, while revealing gaps between isolated knowledge and comprehensive understanding of optimal infant nutrition. A clear positive association was observed between maternal age and parity, with older women having a higher number of children, a pattern consistent with expected demographic trends in sub-Saharan Africa (Bongaarts, 2017; Fotso et al., 2012). Younger mothers showed greater age variability, whereas high-parity mothers were more homogeneous, reflecting longer reproductive exposure among older women. The presence of an outlier among mothers with three children underscores the importance of careful interpretation of extreme values in demographic analyses (Vetter, 2017).

Participation in nutrition education sessions varied according to marital status, with single mothers being more engaged than married, widowed, or divorced women. Similar disparities have been

reported elsewhere and are often linked to social, economic, and time constraints that disproportionately affect married and socially vulnerable women (Pratley, 2016). These findings emphasize the need for tailored nutrition education strategies that better reach marginalized groups.

Maternal education was strongly associated with professional status, with higher educational attainment corresponding to more stable employment. This relationship has been widely documented and is known to influence health literacy and access to health services (Psacharopoulos & Patrinos, 2018; Victora et al., 2010), potentially affecting infant feeding behaviors.

Although most mothers correctly identified six months as the recommended duration of exclusive breastfeeding, none achieved a good overall knowledge score. This suggests that knowledge of exclusive breastfeeding duration is often fragmented and not integrated into a broader understanding of infant feeding, a pattern previously described in similar contexts (Aguayo

et al., 2016; Kuchenbecker et al., 2017). Likewise, while 65% of mothers reported introducing complementary foods at six months, no significant association was found between this practice and overall knowledge, indicating that correct practices may be driven by external advice or social norms rather than solid nutritional understanding (Musheru et al., 2016).

Mothers were able to cite appropriate food groups for infants aged 6-12 months, yet this did not translate into higher knowledge scores, reflecting a superficial understanding limited to food identification. Effective complementary feeding requires consideration of dietary diversity, nutrient density, quantities, and feeding frequency, elements often insufficiently understood (Dewey & Adu-Afarwah, 2008). Similarly, although more than half of the mothers correctly reported that sugar or salt should not be given before six months, this isolated knowledge was not associated with better overall nutritional understanding, reinforcing evidence that single nutrition messages are insufficient to ensure comprehensive knowledge (Contento, 2016).

No significant association was observed between exclusive breastfeeding up to six months and overall feeding practice scores, consistent with findings from Zhang et al. (2024), who reported that exclusive breastfeeding influences some behaviors without guaranteeing optimal overall feeding practices. According to WHO (2023), while exclusive breastfeeding offers major biological benefits, sustained guidance is required to ensure appropriate complementary feeding. Likewise, meal frequency, caregiver responsible for food preparation, and sugar addition to porridge were not associated with better practice scores, suggesting that isolated behaviors do not adequately capture feeding quality. These findings support previous evidence showing that dietary quality and diversity are more important than meal frequency alone (Tuji et Wake., 2021; WHO, 2023).

Overall, the study reveals generalized deficiencies in maternal nutritional knowledge and infant feeding practices, characterized by fragmented understanding and practices shaped by habit or partial advice. These results underscore the need for comprehensive, repeated, and context-specific nutrition education interventions, integrated into vaccination services and postnatal care, to promote sustained improvements in infant feeding practices and child health outcomes (UNICEF & WHO, 2021).

Conclusion

This study conducted at CSI Urban No. 2 in Ebolowa shows that mothers' knowledge and practices regarding infant feeding remain generally insufficient. Although most mothers are aware of the recommended duration of exclusive breastfeeding and the introduction of complementary foods at six months, this knowledge is often fragmented and does not translate into optimal practices. Errors persist, particularly in food choices and the early addition of sugar. More than half of the mothers display practices that need improvement, and none reach an optimal level. These findings highlight the need to strengthen nutrition education, particularly during vaccination services, to sustainably improve infant feeding and prevent malnutrition.

Recommendations

Policy-level (Short to Medium Term)

- i. Integrate infant nutrition education into local public health programs, particularly within vaccination and postnatal services.
- ii. Develop targeted awareness campaigns for mothers and caregivers on exclusive breastfeeding, timely introduction of complementary foods, and healthy feeding practices.
- iii. Promote collaboration between health authorities, community leaders, and families to support optimal infant feeding practices.

Clinical-level (Medium Term)

- i. Train health workers to provide systematic, context-specific nutrition counseling during prenatal, postnatal, and vaccination visits.
- ii. Ensure mothers have access to practical demonstrations on preparing age-appropriate, diverse, and safe complementary foods.

Research-level (Long Term)

- i. Conduct longitudinal studies to assess the impact of nutrition education on infant feeding knowledge and practices.
- ii. Evaluate the effectiveness of integrated interventions on improving dietary diversity, adherence to exclusive breastfeeding, and reduction of early introduction of sugar or inappropriate foods.

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Conflict of Interest

The authors declare no conflict of interest.

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