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Minimum Acceptable Diet in Infants Aged 6 - 18 Months Exposed to HIV and Followed-Up through the Elimination Program of Mother to Child Transmission in Ouagadougou

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Abstract

Introduction: The minimum acceptable diet is a feeding indicator of infants and young children that improves children's nutrition, growth and survival. The seropositive mothers are facing several challenges that could influence the feeding state of their infants exposed to HIV. This study aims to determine the associated factors of minimum acceptable diet in infants aged 6 to 18 months and exposed to HIV in the health facilities within the city of Ouagadougou. **Methodology:** A cross-sectional study was conducted from October 1, 2019 to July 10, 2020 and involved 255 consenting seropositive mothers bearing infants aged 6 to 18 months and followed up through the elimination program of Mother to Child Transmission (eMTCT). A recall of 24-hour feeding was used to assess feeding indicators for infants and young children. The minimum acceptable diet is a composite indicator that englobes the minimum dietary diversity and the minimum daily meal frequency. The logistic regression through Stata 14 software helped identify the associated factors of minimal acceptable diet. **Results:** In our study, 20.78% of infants exposed to HIV had received a minimum acceptable diet; the infants exposed to HIV had respectively received a minimum dietary diversity and a minimum daily meal frequency in 27.54% and 77.25% of cases. The factors associated with a minimum acceptable diet were represented by infant age between 12 and 18 months (adjusted OR = 4.21; p = 0.002) and severe or mild/moderate food insecurity (adjusted OR = 0.06; p = 0.000 and adjusted OR = 0.23; p = 0.000). **Conclusion:** It is important to develop specific interventions targeting seropositive mothers and aiming at reinforcing their nutritional education and helping them fight

against food insecurity.

Keywords

Minimum Acceptable Diet, Infants Exposed to HIV, Associated Factors, Ouagadougou

1. Introduction

Malnutrition remains a leading cause of morbidity and mortality in children worldwide. The WHO estimates at 2.7 million the number of child death imputable to undernutrition, which accounts for 45% of all child mortality [1]. The specific nutritional state of children below 5 years remains troublesome, especially in a number of regions where it remains 10% above the threshold of severity, as defined by the WHO. In Sub-Saharan Africa, malnutrition remains an important burden despite much progress in addressing the situation. Consequently, the prevalence only went down from 38.3 % to 30.3 % between 2000 and 2017 [2]. In Burkina Faso, prevalence rate from several surveys on acute and chronic malnutrition went from 8.1% and 25.4% to 9.1% and 24.9% between 2019 and 2020 [3].

The time length from pregnancy to year 2 of child life is considered as a "critical window of opportunity" to help prevent growth disorders. Recent anthropometric data in low-income countries confirmed the fact that malnutrition levels increased from 3 months up to 18 - 24 years [4]. Therefore, several appropriate interventions on Infant and Young Child Feeding (IYCF) during this period of time could help reduce the infant and juvenile mortality by 19% while preventing acute and chronic malnutrition [5]. The World Health Organization has established guidelines for infant and young child feeding practices for children between 6 and 23 months and considers the minimum acceptable diet as one of the eight main indicators for complementary feeding [6]. It has been demonstrated that minimum acceptable diet, among complementary feeding practices, improves nutritional state and consequently children's growth and survival [7].

According to the 2018 worldwide report on nutrition, infant and young child feeding practices were not optimal. In fact, among children aged 6 to 23 months, more than half (53.1%) received the recommended minimum number of meals, while only one-third of children (29.3%) benefited from minimum dietary diversity. This meant that less than one-fifth of infants (18.9%) were fed according to the minimum acceptable diet criteria [2]. Similarly, the 2018 national survey on nutrition (SMART) in Burkina Faso revealed a minimum dietary diversity and a minimum acceptable diet, respectively at 24.6% and 18% in infants below 24 months of age [8].

What should we say about the nutrition of infants exposed to HIV in a context where the use of diet supplements in children is not optimal? In fact, HIV does weaken food security and nutrition by reducing the mothers' productivity and ca-

pacity to work, while compromising the means of existence in families [8].

The plan B in Burkina Faso recommended stopping breastfeeding at 12 months only if the mothers were able to offer an adequate diet to their infants without any nutritional danger and without breast milk [9] [10].

There are few available data on IYCF in specific groups such as infants exposed to HIV. Thus, our study aimed to determine the prevalence of minimum acceptable diet in infants aged 6 to 18 months exposed to HIV while identifying the associated factors to such prevalence.

2. Material and Methods

Type and Period of Study

A cross-sectional and descriptive study was conducted from October 1, 2019 to July 10, 2020 in five health facilities of the Central Region.

Study Population

Our study population was made up of all infants from 6 to 18 months exposed to HIV who attended their follow-up visit according to the eMTCT program and whose mothers gave informed consent.

Sampling

The list of all health facilities in the five health districts within the city of Ouagadougou was the basis for our sampling. We included all facilities that had at least 10 infants followed up according to the eMTCT program. We enrolled participants from these health facilities up to the target sample size. The sample size was calculated using the formula of unique proportion with the following elements: $n = (Z_a)^2 * p\ (1 - p)/e^2$.

Z_a = confidence level. For an alpha risk of 0.05 of being wrong, we have $Z_{0.95} = 1.96$.

P = proportion of minimum acceptable diet: 18% of infants aged 6 - 23 months (SMART) [8].

N = 226 infants; a non-response rate of 12.5%; adjusted sample = 255 infants.

Data collection tools and procedures, and operational definitions.

A structured questionnaire was used to collect information from seropositive mothers who gave informed consent.

The 24-hour recall method was used to gather information on infant diet. The nutritional state in mothers was evaluated through the BMI (weight/height^2) with the following classification: underweight for a BMI < 18.5 kg/m^2, normal nutritional state for a BMI between 18.5 kg/m^2 and 24.99 kg/m^2, overweight state for a BMI between 25 and 30 kg/m^2 and obesity for a BMI > 30 kg/m^2.

The dietary diversification consists of the introduction of other aliments besides maternal milk. According to the WHO recommendations, such diversification should start at 6 months of age. The acceptable dietary diversity is defined as a 6 - 18-month-old breastfed infant who received at least 4 groups of distinct aliments among the 7 groups of required aliments during the previous day, or a 6 - 18-month-old non-breastfed infant who received four groups of aliments besides

dairy products. The minimum acceptable meal frequency in infants aged 6 to 18 months, no matter their breastfeeding status, is defined as the serving of two meals or more, made of solid semi-solids and soft meals for infant 6 to 8 months, three meals or more for infants 9 to 18 months and breastfed, and four meals for infants of the same age but not breastfed. Non-breastfed infants are those who have never been breastfed since birth. The minimum acceptable food intake or minimum diet is a composite variable of the minimum dietary diversity and the minimum meal frequency according to the WHO guidelines on feeding practices for infants aged 6 to 23 months. The term acceptable is used when criteria for the minimum dietary diversity and the meal frequency are met. The infant exposed to HIV is one born to a mother living with HIV until it is possible to firmly exclude that the child is infected with HIV. The wealth index is coded in three groups: "poor", "middle", and "rich". In order to obtain this variable, we gathered and coded the data related to the household belongings. The food security: "food security", "mild/moderate food insecurity", "severe food insecurity" was assessed by using the Household Food Insecurity Access Scale (HFIAS) that comprises nine questions, with each of those questions assuming a recall period of 30 days. First, a question is asked about occurrence, looking at whether an event occurred during the previous 30 days (Yes or No). If the person answered "Yes" to the question on occurrence, then the question on the frequency of event was asked to determine if it happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) during the previous 30 days.

The satisfying exposure to media is a composite indicator that comprises three variables: listening to radio/watching television/reading journals at least once a week [11] [12].

Data Entry and Analysis

We used several software such as EpiData version 3.1 for data entry, Microsoft Excel for tables and Stata version 14 for data cleaning, treatment, and analysis. The chi-square test was used to evaluate the association between two qualitative variables. In order to determine the factors associated with infant growth delay, we used a modeling process from a logistic regression model. The gross and adjusted Odds-Ratio (OR) and the Confidence Intervals (CI) at 95% were calculated with a threshold for significance set at 5%. The modeling strategy included a univariate analysis that allowed a first selection of variables at risk 0.20, followed by the step-by-step descending modeling process. Several validation tests, including Hosmer-Lemeshow goodness-of-fit tests, the link test, graphical tests of model sensitivity and specificity, and the ROC (Receiver Operating Characteristic) curve, were used for model specification, in order to diagnose the simple logistic regression model.

Ethics and Deontological Considerations

The study protocol was approved by the committee in charge of Ethics at the Health Sciences Research Institute. The clearance for data gathering was obtained from the director of the central health region and the directors of the identified health facilities (Yalgado Ouédraogo University Hospital, Bogodogo University Hospital,

Saint Camille Hospital, Paul VI Hospital). All the mothers involved in the study signed an informed consent attesting to their agreement to participate in the study. The survey forms were coded in a way that guaranteed anonymous participation and avoided writing the participants' names.

3. Results

3.1. Characteristics of Study Participants

Table 1 presents the characteristics of the study participants.

Table 1. Characteristics of study participants (n = 255).

Variables	Frequency (%)
Age of mothers	
17 - 24 years	22 (8.63)
24 - 34 years	124 (48.63)
≥35	109 (42.74)
Mothers' level of education	
Unschooled	90 (35.29)
Schooled	165 (64.71)
Fathers' level of education	
unschooled	72 (29.39)
Schooled	173 (70.61)
Occupation of mothers	
Employed/on wages	29 (11.37)
Business/independent	85 (33.33)
Household wives/others	141 (55.29)
Occupation of fathers	
On wages	99 (38.82)
Business/independent/farmer	131 (51.38)
Unemployed	15 (5.88)
Others	10 (3.92)
Marital status	
Single	31 (12.16)
In couple	224 (87.84)
Family size	
Two to three	48 (18.82)
Four to five	83 (32.55)
6 and above	124 (48.63)
Number of children below 5 years	
One	148 (58.04)
Two and more	107 (41.96)

Continued

Wealth index	
Poor	120 (47.06)
Middle	111 (43.53)
Rich	24 (9.41)
Level of food security	
Food security	60 (23.53)
Mild/moderate food insecurity	119 (46.67)
Severe food insecurity	76 (29.80)
Infant's age	
6 - 8 months	82 (32.16)
9 - 11 months	53 (20.78)
12 - 18 months	120 (47.06)
Gender of infants	
Male	132 (51.76)
Female	123 (48.24)
Birth weight	
Low birth weight	55 (21.57)
Normal birth weight	200 (78.43)
Rank among siblings	
First born	63 (24.71)
Second to fourth	165 (64.71)
Fifth or more	27 (10.59)
Intergenesic interval	
No prior birth	63 (24.71)
Less than two years	13 (5.10)
Two years and above	179 (70.20)
Initiation of ARV treatment in infants	
Yes	255 (100)

3.2. Variables Related to the Mother or Behavior

Table 2 presents the characteristics related to the mother.

Table 2. Characteristics related to the mother.

Variables	Frequency (%)
Number of prenatal visits	
One to three	66 (25.88)
Four and more	189 (74.12)
Place of delivery	
Home	3 (1.18)
Health facility	252 (98.82)

Continued

Nutritional state of the mother	
Underweight	23 (9.02)
Normal	150 (58.82)
Overweight/obesity	82 (32.16)
Mother's adherence to antiretroviral treatment	
Yes	253 (99.22)
No	2 (00.78)
Access to media once a week at least	
No	64 (25.10)
Yes	191 (74.90)
Household main provider	
Mother solely	54 (21.18)
2 Parents	106 (41.57)
Father solely	95 (37.25)

3.3. Prevalence of Complimentary Feeding Indicators

The minimum acceptable diet is a composite indicator that combines minimum dietary diversity and minimum meal frequency. In our study, the rate of minimum acceptable diet in 6 - 18-month-old infants exposed to HIV was 20.78%. The infants 6 - 18 months who were not breastfed met the requirement for minimum acceptable diet as compared to those who were breastfed.

The dietary diversity and the minimum meal frequency in infants 6 to 18 months were respectively estimated at 27.54% and 77.25% of cases. The two indicators performed better among the infants who were not breastfed (Table 3).

Table 3. Prevalence of complimentary feeding indicators.

Indicators	Frequency (%)
Minimum dietary diversity in infants 6 to 18 months	
Breastfed infants	
No	111 (77.62)
Yes	32 (22.38)
Non-breastfed infants	
No	60 (64.52)
Yes	33 (35.48)
Gross minimum dietary diversity	
No	171 (72.46)
Yes	65 (27.54)
Minimum meal frequency in infants 6 to 18 months	
Breastfed infants 6 to 8 months	
No	11 (15.28)
Yes	61 (84.72)

Continued	
Breastfed infants 9 to 18 months	
No	27 (30.34)
Yes	62 (69.66)
Breastfed infants 6 to 18 months (total)	
No	38 (23.60)
Yes	123 (76.40)
Non-breastfed infants 6 to 18 months (total)	
No	20 (21.28)
Yes	74 (78.72)
Overall minimum meal frequency	
No	58 (22.75)
Yes	197 (77.25)
Minimum acceptable diet in infants 6 to 18 months	
Breastfed infants 6 to 18 months	
No	132 (81.99)
Yes	29 (18.01)
Non-breastfed infants 6 to 18 months	
No	70 (74.47)
Yes	24 (25.53)
Overall minimum acceptable diet	
No	202 (79.22)
Yes	53 (20.78)

3.4. Factors Associated with Minimum Acceptable Diet in 6 - 18-Month-Old Infants Exposed to HIV

In a multivariate analysis, the factors associated with a minimum acceptable diet were represented by infant age between 12 and 18 months (adjusted OR = 4.21; p = 0.002) and severe or mild/moderate food insecurity (adjusted OR = 0.06; p = 0.000 and adjusted OR = 0.23; p = 0.000 (Table 4).

Table 4. Factors associated with minimum acceptable diet in 6 - 18-month-old infants exposed to HIV.

Variables	Minimum acceptable diet		Gross OR CI 95%	P	Adjusted OR CI 95%	P
	Yes	No				
Mothers' level of education						
Unschooled	90	76	1 (base)		1 (base)	
Primary school	75	61	1.24 (0.55 - 2.81)	0.596		
Secondary school/university	90	65	2.08 (1 - 4.34)	**0.049**		
Occupation of fathers						
On wages	28	71	1 (base)			
Business/independent	25	121	0.52 (0.28 - 0.96)	**0.039**		

Continued

Wealth index						
Poor	16	104	1 (base)			
Middle/rich	37	98	2.45 (1.28 - 4.69)	**0.007**		
Food security						
Food security	29	31	1 (base)			
Mild/moderate food insecurity	20	99	0.21 (0.10 - 0.43)	**0.000**	**0.23 (0.11 - 0.50)**	**0.000**
Severe food insecurity	4	72	0.05 (0.01 - 0.18)	**0.000**	**0.06 (0.019 - 0.19)**	**0.000**
Household main provider						
Mother solely	6	48	1 (base)			
The two parents	27	79	2.73 (1.05 - 7.10)	**0.039**		
Father solely	20	75	2.13 (0.79 - 5.69)	0.130		
Age of infants						
6 - 8 months	8	74	1 (base)			
9 - 11 months	11	42	2.42 (0.90 - 6.49)	0.079	2.49 (0.86 - 7.19)	0.079
12 - 18 months	34	86	3.65 (1.59 - 8.39)	**0.002**	**4.21 (1.71 - 10.37)**	**0.002**
Gender of infants						
Male	34	98	1 (base)			
Female	19	104	0.52 (0.28 - 0.98)	**0.044**		

4. Discussion

The dietary diversity in developing countries was weak in 6 to 18-month-old infants exposed to HIV (27.54%) as compared to the results respectively reported by Esubalew *et al*., Haile *et al*. and Yisak *et al*. in Ethiopia among infants exposed to HIV (44%, 34.4% and 58.2%) [9] [13] [14].

These differences could be explained by the economic status of the two countries and the adopted strategies for nutrition. In fact, Ethiopia has implemented several policies and strategies focused on food security and nutrition in order to sustain its development objectives; it is among the seven countries that reached the millennium development goals [15]. Burkina Faso is a developing country in which the dietary deficiency appears as a major challenge that is worsened by the security challenge. In developing countries with a major challenge of food deficiency, households give great value to the amount of available food but pay less attention to dietary diversity [16].

In our study, the minimal frequency criteria were met among infants exposed to HIV in 77.25% of cases. These results are similar to the ones from Esubalew *et al*. and Yisak *et al*., who respectively reported 70.7% and 76% [9] [13].

It is an indicator that can be easily recommended to mothers during their follow-up visits: in fact, the majority of mothers had frequent contacts with health practitioners, giving them an opportunity to reinforce their education on nutrition.

This high frequency could be explained by the fact that the majority of women interviewed in this study were household wives who were available to feed their

children several times in a day, even if the quality was lacking.

Our study revealed a low rate of minimum acceptable diet in infants of 6 to 18 months exposed to HIV in the city of Ouagadougou, with a rate of 20.78%. These results are more reliable than those reported by Esubalew *et al*. and Yisak *et al*. in 2018 and 2020, which respectively showed a minimum acceptable diet at 36.9% and 34.8% in infants exposed to HIV [9] [13].

Therefore, it is not surprising that the rate for minimum acceptable diet is low, knowing that it is a composite indicator that combines the minimum dietary diversity and the minimum meal frequency.

The explanation of these low rates could be related to the vulnerability of seropositive mothers who face psycho-social and economic challenges that could compromise the feeding of their children. The mothers infected by HIV could be more sensitive to learn better feeding practices since HIV infection is associated with a higher risk of food insecurity that could alter the feeding practices in infants [17].

The minimum acceptable diet was put in practice mostly among the non-breastfed infants than among those who were breastfed (25.53 and 18.01%), this can be explained by the fact that breastfeeding women think of breastmilk as being sufficient to meet the needs of their infants, not knowing that after 6 months, the breastmilk is not sufficient to meet the nutritional needs and the increasing nutritional demands that infants and children may have [6]. The majority of seropositive mothers in our study were household wives (55.29%), thus they could have more time to breastfeed their infants without thinking of giving them complementary aliments [18]. Even with an optimal feeding practice, the children would suffer growth delay if they don't receive a dietary diversity and sufficient meal frequency starting from 6 months of age [19].

The factors related to minimum acceptable diet in infants exposed to HIV were represented by the level of food security and infant age on a multivariate analysis.

Food insecurity was a risk factor for not meeting the requirement for minimum acceptable diet in infants exposed to HIV: the parents with severe food insecurity had 94% more risk of not meeting the requirement for minimum acceptable diet. Alemu and Coll in Ethiopia noticed that the households affected by HIV/AIDS had more reliable consumption as compared with the households that were not affected and had adopted negative adaptation strategies regarding consumption, such as skipping meals [17] [20].

The infants whose age was between 12 and 18 months had 4.21-fold more chances of benefiting from a minimum acceptable diet as compared to those between 6 and 8 months. Other authors also reported the fact that younger infants (6 - 11 months) had a higher risk of not meeting the requirements for minimum acceptable diet [21]-[24]. The minimum acceptable diet rate significantly increased with age increase, which is in conformity with a study conducted in West Africa by Issaka *et al*. [19].

In fact, mothers often perceive their younger infants as having a poor intestinal capacity to digest several aliments. However, the late introduction of complemen-

tary food could lead to a lack of interest from infants towards proper feeding [21]. The lack of appetite during dental growth and the weight loss due to the increase in infections could explain the changes in dietary practices in infants from 6 to 8 months [25].

Study Limits

This study had been flawed by a few elements related to the punctual character of the minimum acceptable diet rate based on a 24-hour dietary recall, the sensitivity of the studied population and the clustering by healthcare facility that was not taken into account in the regression model. Moreover, potential bias from memory loss or social desirability could not be excluded.

5. Conclusion

In our study, 20.78% of infants exposed to HIV had benefited from minimum acceptable diet. The factors associated with appropriate minimum diet after being adjusted were represented by the infant age between 12 to 18 months and the existence of food insecurity in the household. Therefore, several specific interventions targeting seropositive mothers should be suggested in order to reinforce their education on nutrition and allow them to be self-dependent with regard to nutritional aspects.

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Conflicts of Interest

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

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