







Food consumption and dietary diversity associated with breastfeeding mod of children aged 6-23 months in Ouagadougou, Burkina Faso

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ABSTRACT

Background. To provide the essential needs that the body requires, it is necessary to consume a variety of foods. In Burkina Faso, little information is available on the diversity of food consumed by children in major's urban centers. **Aim.** The objective of this study was to assess the dietary diversity of children aged from 6 to 23 months and the associated determinants. **Methods.** The study consisted in the analysis of food data through a cross-sectional survey. Sphinx V5, IBM SPSS Statistics 20.0 and XLSTAT 2016 software were used for data entry and processing. **Results.** The majority of mothers (50.16%) were between 26 and 35 years old and 95.31% lived with a partner. In total, 41.26% of women had secondary education levels while 44.66% were housewives. Breastfed children largely consumed cereals (95.31%), legumins (83.01%) and fruits (77.67%). Non-breastfed children also consumed mainly cereals (92.86%), legumins (85.71%) and fruits (75%). Minimum dietary diversity was achieved by 100% of non-breastfed children with a Mean Dietary Diversity Score (MDDS) of 5.75 groups versus 81.86% for breastfed children with MDDS of 4.45 food groups. The minimum acceptable diet was reached by 73.73% of breastfed children versus 92.85% for non-breastfed children. The analysis of factors associated with dietary diversity showed a correlation with the mothers' education levels, the mothers' occupation, the children's gender, the number of daily meals and the consumption of some food groups. **Conclusion.** The food diversity indicators were generally satisfactory.

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INTRODUCTION

Feeding aims to provide the essential nutrient that the body needs to grow and maintain good health [1, 2]. However, the essential nutrients to meet the nutritional needs of the body are not always all present in the same food [3]. It is therefore necessary to consume a wide variety of foods to cover all nutritional needs. Some authors believe that increasing the amount of food products consumed allows to improve the nutritional quality of the diet [4]. It was shown that a diverse diet has been associated with better nutritional status [5, 6].

In the literature, many classifications have been proposed based on the origin of food as well as tables of nutritional composition. Thus, that of the WHO proposes distributions ranging from 6 groups for infants to 17 groups for households [7, 8]. The WHO recommends the use of 7 food groups for assessing dietary diversity of children aged from 6 to 23 months [8]. The WHO indicators based on 7 groups have been validated basing on the density of micronutrients necessary for the complementary feeding of children from 6 to 23 months. The dietary diversity is more generally measured through the calculation of Dietary Diversity Scores (DDS), which is a simple count of the number of different food groups consumed during twenty-four hours [7]. Several researchers have already used and advised the use of dietary diversity scores in the context of research on feeding and nutrition of individuals or households [9, 10]. For children aged 6 to 23 months, the consumption of foods from 4 food groups including one food from the animal group (meat, fish), one food from the fruit and

vegetable (apple, banana, carrot, orange) group and one food from the cereal, root and tuber group (millet, corn, potato) has been shown to be sufficient to meet the nutritional requirements of children [7]. Some authors showed that an undiversified diet leads to malnutrition [11, 12] and compromises the good physical and intellectual growth of young children [13, 14]. According to some authors, a high dietary diversity leads to a significant reduction in the risk of mortality [15, 16]. Other authors have also shown that improving dietary diversity can allow improving the nutritional status of children [13, 17]. Dietary diversity must therefore be integrated and taken into account in planning and awareness-raising [18]. However, except a few specific studies conducted in certain regions of the country [19, 20], little information is available on the consumption and dietary diversity of infants and young children in Ouagadougou. The availability of data on the specific issue of dietary diversity of infants and young children would make it possible to better guide the actors of this field on their intervention strategies.

Thus, this investigation aimed to evaluate the food consumption of children as well as the essential factors associated with an acceptable dietary diversity of children from 6 to 23 months in Ouagadougou.

MATERIAL AND METHODS

Ethics committee approval

Before the study was carried out, an approval from Health Research Ethics Committee of the Ministry of Health of Burkina Faso was requested and obtained on January 5, 2022 with the following references (Deliberation No. 2022-01-013). All responding mothers were provided with the necessary information, study objectives, and survey methodology. Thus, each respondent mother gave informed consent to participate in the study before being included.

Site of the study

The study was carried out in the maternities of the city of Ouagadougou. On the health plan, the city is divided into five health districts with very different coverage sizes. All five health districts were concerned in the survey. The choice of the city of Ouagadougou is justified by the fact that it brings together almost all the social groups of the regions, making it possible to form an image of regional practices. In 2020, its child population was estimated at nearly 405,882 children aged from 0 to 4 [21]. Figure 1 illustrates the coverage of the five health districts of the city of Ouagadougou.

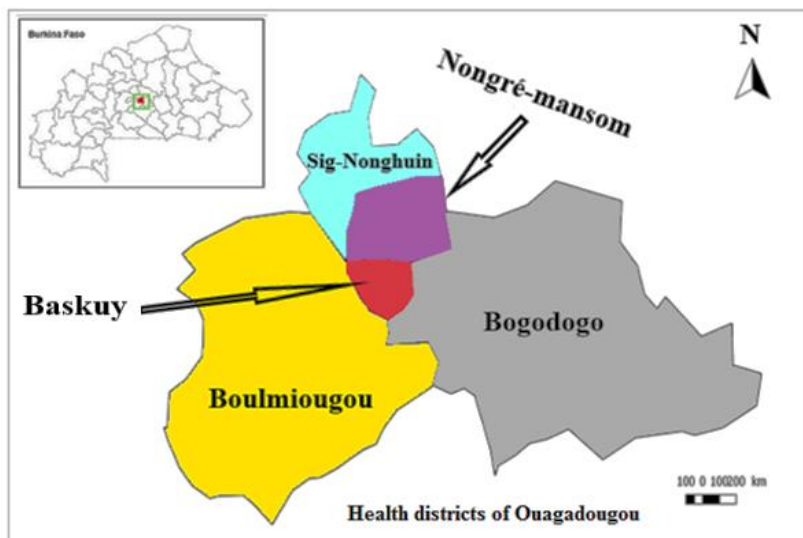


Figure 1: Health map of the city of Ouagadougou. (Adapted from Nikiéma et al. (2020) [22]).

Data collection methods

The data collection method for the survey was face-to-face interviews in children weighing and vaccination centers of maternities. A readapted questionnaire was designed basing on the WHO infant and young child feeding practice indicators [8]. The selection of mother-child pairs was carried out using the random sampling method and only mothers voluntarily agreed were interviewed. Information on civil status (surname, first name, date of birth, place of residence) was obtained from the children's weight books and from

the mother's identity cards. The remind of meals consumed in the last 24 hours was obtained by the declaration of the mother. During the survey, the data of 618 children were collected and registered in the collection forms. The agreed error rate was 5% while the confidence coefficient was 1.96 for a confidence interval of 95%. For this study, the prevalence rate used was 50%.

Target population

The population consisted of mother-child pairs whose children's age was from 6 to 23 months. The inclusion criteria for the mother-child pairs were the age of child (being from 6 to 23 months old), the child's state of health (being in good health), the attendance at a health center in the study area by the mother.

Data analysis

The data was entered on Sphinx V5 then transferred to IBM SPSS statistics 20.0 for the generation of numbers and frequencies. The frequencies were compared using XLSTAT 2016 software with the Student's test and the Kruskal-Wallis test for the generation of P-values. The statistical significance threshold was set at $p < 0.05$.

RESULTS

Sociodemographic characteristics of the population surveyed

The majority of mothers surveyed (50.16%) were 26 to 35 years ($p=0.09$) (Table 1). Regarding marital status, 95.31% of mothers lived with a partner while very few women were single (4.69%) ($p=0.46$). Regarding the health districts, Boulmiougou (32.04%) and Bogodogo (30.42%) had the most women surveyed while Nongré-Mansom (11.65%) had the fewest women surveyed ($P=0.01$). The majority of women had secondary education levels (41.26%) ($p=0.02$). For the occupation, housewives were the most numerous (44.66%) while employees were the least numerous with a rate of 21.36% ($p=0.03$). Regarding the characteristics of the children, 50.97% were male ($p=0.01$) and the majority of them were from 6 to 11 months (65.70%) ($p=0.18$). Table 1 presents the socio-demographic characteristics of the surveyed population.

Consumption of different food groups

The results reported in the table 2 present the consumption of the different food groups by breastfed and non-breastfed children. Overall, the cereal group was the most consumed with a rate of 95.31% of children while eggs were the least consumed with a rate of 5.83%. In detail, two trends were observed for both breastfed and non-breastfed children: the groups consumed by more than half of the children composed by cereal group (95.31%), legumin group (83.01%), meat products group (64.08%), fruits and vegetables rich in vitamin A group (53.56%) and other fruits and vegetables group (77.67%). The second trend is composed of dairy products group (47.25%) and eggs group (5.83%). Comparatively, consumption of dairy products by non-breastfed children was higher than that of breastfed children.

Dietary diversity score of children

The results presented in the table 3 showed that the majority of children had good dietary diversity scores. The overall results showed that all non-breastfed children (100%) achieved minimum dietary diversity while 81.86% of breastfed children achieved minimum dietary diversity. The detail of breastfed children showed that those aged from 6 to 11 months accounted for 52.03%, those aged from 12 to 17 months were 25.42% while those aged from 18 to 23 months corresponded to 4.41% of children who had reached the minimum dietary diversity. The average number of groups consumed was 4.45 food group for breastfed children and 5.75 food group for non-breastfed children.

Minimum acceptable dietary intake according to age

The results on the minimum acceptable dietary intake according to age are presented in the table 4. Concerning breastfed children, those aged from 18 to 23 months were the most numerous to have the minimum acceptable dietary intake with a rate 83.33% while those aged from 6 to 11 months were the least numerous to have the minimum acceptable dietary intake with a rate of 69.42%. The total of breastfed children who have reached the minimum acceptable dietary intake was 73.73%. Regarding non-breastfed children, 92.85% had the minimum acceptable dietary intake.

Table 1. Sociodemographic characteristics of the population

Modalities		N (%)	P-value
Age	From 17 to 25 years old	225 (36.41)	0.09
	From 26 to 35 years old	310 (50.16)	
	From 36 to 44 years old	83 (13.43)	
Marital status	Single	29 (4.69)	0.46
	Married	589 (95.31)	
Health district	Baskuy	79 (12.78)	0.01
	Bogodogo	188 (30.42)	
	Boulmiougou	198 (32.04)	
	Nongre-mansom	72 (11.65)	
	Sig-Nonghuin	81 (13.11)	
Mother's education levels	Note schooled	129 (20.87)	0.02
	Primary education levels	145 (23.46)	
	Secondary education levels	255 (41.26)	
	High education levels	89 (14.40)	
Mother's occupation	Housewife	276 (44.66)	0.03
	Employee	132 (21.36)	
	Informal sector	210 (33.98)	
Children's gender	Male	315 (50.97)	0.01
	Feminine	303 (49.03)	
Children's age	From 6 to 11 months	406 (65.70)	0.18
	From 12 to 17 months	170 (27.51)	
	From 18 to 24 months	42 (6.80)	
Total (N=618)		618 (100.00)	-

N: Number; %: Frequency

Table 2. Consumption of the different food groups from 6 to 23 months' children

Breastfeeding mod	Breastfed (N=590) N (%)	Non-breastfed (N=28) N (%)	Total (N=618) N (%)
Cereals, roots and tubers	563 (95.42)	26 (92.86)	589 (95.31)
Legumins and nuts	489 (82.88)	24 (85.71)	513 (83.01)
Milk and dairy products	273 (46.27)	19 (67.86)	292 (47.25)
Meat products	377 (63.90)	19 (67.86)	396 (64.08)
Eggs	36 (6.10)	0	36 (5.83)
Fruits and vegetables rich in vitamin A	311 (52.71)	20 (71.43)	331 (53.56)
Other fruits and vegetables	459 (77.80)	21 (75.00)	480 (77.67)

N: Number; %: Frequency

Table 3. Children's dietary diversity score

Number of group	Breastfed children (N=590) N (%)			Non-breastfed children (N=28)
	(6 to 11 months)	(12 to 17 months)	(18 to 23 months)	(6 to 23 months) N (%)
1	36 (6.1)	5 (0.85)	0	0
2	25 (4.24)	1 (0.17)	2 (0.34)	0
3	26 (4.41)	5 (0.85)	2 (0.34)	0
4	104 (17.63)	32 (5.42)	4 (0.68)	1 (3.57)
5	123 (20.85)	67 (11.36)	12 (2.03)	8 (28.57)
6	72 (12.2)	45 (7.63)	9 (1.53)	16 (57.14)
7	8 (1.36)	6 (1.02)	1 (0.17)	3 (10.71)
MDDS (food group)	4.45			5.75
Minimum Diversity	307 (52.03)	150 (25.42)	26 (4.41)	28 (100.00)
Recommended DDS	Minimum of 4 food groups			Minimum of 4 food groups

N: Number; %: Frequency; MDDS: Mean Dietary Diversity Score. Source: [7]

Table 4. Minimum acceptable dietary intake

Modalities		Minimum acceptable dietary intake, N (%)	Recommended minimum dietary intake*
Breastfed children	From 6 to 11 months (N=399)	277 (69.42)	2 meals a day with 4 food groups
	From 12 to 17 months (N=161)	133 (82.61)	3 meals a day with 4 food groups
	From 18 to 23 months (N=30)	25 (83.33)	3 meals a day with 4 food groups
	Total (N=590)	435 (73.73)	
Non-breastfed children	From 6 to 23 months (N=28)	26 (92.85)	4 meals a day with 4 food groups

N: Number; %: Frequency; Source: [7]

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Factors associated with dietary diversity scores

The results presented in the table 5 show a strong correlation between some factors and children's dietary diversity. No significant difference was observed concerning age and marital status but the results showed that the oldest women (13.47%) and the married women (95.51%) had more children with acceptable dietary diversity score (ADDS) versus respectively 13.20% and 94.34% of low dietary diversity score (LDDS). Concerning mother's education levels, significant difference was shown, women with primary education levels (23.63%), secondary education levels (42.38%) and high education levels (15.23%) had most children with ADDS against respectively 22.64%, 35.85% and 10.38% of LDDS. At mother's occupation level, employee women (23.24%) had significantly more children with ADDS against 12.26% for LDDS. Concerning the age of the children, significantly more children from 12 to 17 months (30.86%) and children from 18 to 23 months (7.42%) had reached ADDS against respectively 11.32% and 3.77% of LDDS. For the children's gender, more significantly male (51.56%) showed ADDS against 48.11% of LDDS. Referring to the number of daily meals, significantly more children who had frequencies of 3 meals (36.13%), 4 meals (17.77%) and 5 meals (20.51%) showed ADDS versus respectively 23.58%, 9.43% and 10.38% of LDDS. Concerning the consumption of different food groups, significantly more children who consumed foods from legumin, nuts and seeds groups (19.17%), milk and dairy products group (10.47%), meat products group (16.90%), eggs group (1.39%), fruits and vegetables rich in Vitamin A group (14.47%) and other fruits and vegetables group (18.13%) showed ADDS against respectively 14.29%, 10.20%, 12.24%, 0.00%, 10.71% and 7.65% of LDDS.

Table 5. Factors associated with dietary diversity scores

Modalities		LDDS		ADDS	
		N (%)	P-value	N (%)	P-value
Mother's age	From 17 to 25 years old	46 (43.39)	0.080	179 (34.96)	0.094
	From 26 to 35 years old	60 (43.40)		250 (51.56)	
	From 36 to 44 years old	14 (13.20)		69 (13.47)	
Marital status	Single	6 (5.56)	0.463	23 (4.49)	0.470
	Married	100 (94.34)		489 (95.51)	
Mother's education levels	Note schooled	33 (31.13)	0.021	96 (18.75)	0.026
	Primary education levels	24 (22.64)		121 (23.63)	
	Secondary education levels	38 (35.85)		217 (42.38)	
	High education levels	11 (10.38)		78 (15.23)	
Mother's occupation	Housewife	56 (52.83)	0.105	220 (42.97)	0.028
	Employee	13 (12.26)		119 (23.24)	
	Informal sector	37 (34.91)		173 (33.79)	
Children's age	From 6 to 11 months	92 (86.79)	0.329	314 (61.33)	0.167
	From 12 to 17 months	12 (11.32)		158 (30.86)	
	From 18 to 23 months	2 (3.77)		40 (7.42)	
Children's gender	Male	51 (48.11)	0.024	264 (51.56)	0.006
	Feminine	55 (51.89)		269 (52.53)	
Number of daily meals	One meal	22 (20.75)	0.011	15 (2.93)	0.026
	Two meals	34 (32.08)		76 (14.84)	
	Three meals	25 (23.58)		185 (36.13)	
	Four meals	10 (9.43)		91 (17.77)	
	Five meals	11 (10.38)		105 (20.51)	
Food group consumed	Cereals, roots and tubers	88 (44.90)	0.038	506 (19.48)	0.001
	Legumins, nuts and seeds	28 (14.29)		498 (19.17)	
	Milk and dairy products	20 (10.20)		272 (10.47)	
	Meat products	24 (12.24)		439 (16.90)	
	Eggs	0		36 (1.39)	
	Fruits and vegetables rich in vitamin A	21 (10.71)		376 (14.47)	
	Other fruits and vegetables	15 (7.65)		471 (18.13)	
Standard*		Less than 4 food groups		More than 4 food groups	

N: Number; %: Frequency; LDDS: Low Dietary Diversity Score; ADDS: Acceptable Dietary Diversity Score. Source: [7]

DISCUSSION

The majority of mothers surveyed were young, and 95.31% lived in union. This result is higher than those obtained in another study carried out in Ouagadougou which was 86.2% of women in union [23]. The significantly large number of mother-child pairs enrolled in the health districts of Boulmiougou (32.04%) and Bogodogo (30.42%) corroborate with data from the statistical yearbook of the Ministry of Health of Burkina Faso which indicated that 30.17% of the population resided in the district of Bogodogo and 33.49% for the district of Boulmiougou in 2019 [21]. Women with secondary education levels were significantly more numerous (41.26%) compared to those with high education levels (14.40%). The explanation lies in the policy of free education in Burkina Faso which would have contributed to increase the rate and level of schooling for girls (from 25.9% in 2013 to 39.1% in 2020) [24]. Housewives were significantly more numerous (44.66%) than employee women (21.36%). Another similar study found 16% of employees in Ouagadougou [23]. This significant difference could be explained by the low rate of employees in the general population [25]. Regarding the characteristics of the children, males were significantly more numerous (50.97%) compared to feminine (49.03%) and they mostly were from 6 to 11 months (65.70%). However, national data on the distribution of the population by gender showed the opposite, as there are more women than men in the general population in Burkina Faso [26]. The explanation for this situation probably was the slightly high infant and child mortality among male children [26].

Regarding food consumption, cereals were the most consumed with a rate of 95.31%. Other authors had found similar rates with consumption of 94.4% in Zimbabwe [27] and 96% in Burkina Faso [28]. The other groups such as legumins, nuts and seeds group (83.01%) and other fruits and vegetables group (77.67%) were also mostly consumed. The predominance of these foods in diets is similar to the results of the SMART survey which found that these three food groups (cereals group, legumin's group and fruits group) were the most consumed in Burkina Faso in 2020 [29]. Other authors have also reported high consumption of cereals group, legumins group, vegetables and fruits group by children in Nigeria and Burkina Faso [28, 30]. Meat products group (64.08%) and fruits and legumes rich in vitamin A group (53.56%) were also fairly consumed compared to the results of the SMART survey which reported the consumption of these food groups respectively at 47.2 % and 28.2% in the Central Region of Burkina Faso. Compared to the results obtained by other authors on the consumption of meat products in Burkina Faso and Sierra Leone [31, 32], the results of this study showed more satisfaction. This is probably related to the study area and the economic situation, Sanou et al. [32] carried out their studies in a rural area while the population of Blango et al. [31] consisted mainly of women with very low incomes (annual earnings of 50 Dollar maximum). The least consumed foods were dairy products group (47.25%) and more eggs group (5.83%). The consumption of dairy products was nevertheless higher than the 29% found in Uganda [33] and the rate of eggs consumption was higher than the 3% of eggs consumption reported in Burkina Faso in 2021 [28]. This situation could be explained by socio-cultural constraints. Indeed, some authors had reported that in Sudan and Ethiopia, the non-consumption of some food groups such as eggs was linked to socio-cultural considerations [34, 35]. Particularly for non-breastfed children, dairy products were heavily consumed. This situation could be explained by the absence of breastfeeding forcing mothers to find alternatives to replace breast milk. In Nigeria, a study showed that between 80% and 92% of mothers who are unable to breastfeed their children due to illness favored the choice of a milk formula as a substitute for breast milk [36].

The results observed concerning the minimum dietary diversity showed fairly satisfactory rates because the minimum diversity was reached by 100% of non-breastfed children and 81.86% of breastfed children. These rates are higher than those obtained by a study carried out in Senegal which gave (82.4%) for non-breastfed children and (49.5%) for breastfed children [37]. The results also showed that a significant number of children aged from 6 to 11 months (52.03%) had reached the minimum dietary diversity. This suggests that these children began food consumption rather than 6 months recommended by the WHO. Early feeding has also been reported by a study with introductions before the fifth month in Bangladesh [38]. The mean dietary diversity scores were 4.45 food groups for breastfed children and 5.75 food groups for non-breastfed children. These rates corroborate the results obtained by another study which reported that means dietary diversity scores ranged from 4.38 and 4.84 food groups for children from 6 to 23 months in the Center West of Burkina Faso [20]. The results of this study also showed that non-breastfed children had a higher mean dietary diversity score than breastfed children. In a recent study, the author had also noticed this trend [37]. These findings tend towards the existence of a correlation between the dietary diversity score and the method of breastfeeding of the child.

This could be explained by the search for a balanced diet by the mother due to the absence of breastfeeding. Concerning the minimum acceptable dietary intake, the results are in the same trend as for the minimum dietary diversity. The non-breastfed children (92.85%) were more numerous to have the minimum acceptable diet against 73.73% for the breastfed children, the average give 74.59%. These rates are higher than those of other authors who obtained an average of 33.9% in Ethiopia [39] and 35% in Nigeria [40]. The results concerning the influence of factors on diversity showed a correlation between some factors and the dietary diversity of children. Mother's education levels and mother's occupation were significantly associated with the dietary diversity score ($p < 0.05$). This could be explained by the favorable economic situation of some mothers offering more food options to their children. Indeed, the children of salaried women and those of women with high education levels who were supposed to have more stable incomes had more acceptable dietary diversity scores. These results corroborate those of another similar work in Ghana which had shown that children living in families with a better social situation were more likely to have optimal food frequency and dietary diversity [41]. The existence of a positive relationship between household economic status and high dietary diversity had also been demonstrated in Canada and Burkina Faso by other authors [28, 42]. Regarding the characteristics of the children, the gender aspect presented a significant variation ($p < 0.05$). The information reported by some mothers indicated that male children were more likely to accept all types of meals compared to girls. In this study, children's age was not significantly associated but other authors had reported a correlation between age and dietary diversity of children in Ethiopia and Uganda [33, 43]. The increase in dietary needs with age and the decrease in breastfeeding in favor of a solid diet could explain this situation. Referring to the number of daily meals, overall children with the highest food frequencies presented acceptable dietary diversity scores with a significant variation ($p < 0.05$). The consumption of several meals during the same day is therefore a favorable factor in achieving minimum dietary diversity for children. Thus, in a study carried out in Ouagadougou, the author was able to show that children who eat more than three foods per day presented acceptable dietary diversity scores [23]. Regarding the consumption of different food groups, children who consumed more legumins group, dairy products group, meat products group, eggs group, fruits and vegetables rich in vitamin A group and other fruits and vegetables group presented acceptable dietary diversity scores with a significant variation ($p < 0.05$). The fact that these foods are not the first staple diet in Burkina Faso [32] could explain this situation. The consumption of these foods constitutes therefore intermediate meals and would mean that the child had already consumed other staple foods. This would give a better chance of reaching the minimum number of recommended food groups.

CONCLUSION

The objective of this investigation was to assess the dietary diversity of children aged from 6 to 23 months and the factors associated with dietary diversity. Regarding food consumption, children consumed more cereals, legumins and fruits. In general, eggs were consumed very little. Regarding dietary diversity, more children reached minimum dietary diversity with an average of 5.75 food groups consumed for non-breastfed and 4.45 food groups consumed for breastfed children. Regarding the minimum acceptable food, an average of 74.59% of children reached the minimum acceptable food intake. The analysis of the factors associated with children's dietary diversity showed a significant correlation between the mothers' education levels, the mothers' occupation, the child's gender, the number of daily meals and the consumption of some food groups. All dietary diversity indicators showed satisfactory levels particularly for non-breastfeed children. However, efforts remain to be made in the consumption of eggs and milk products.

DECLARATIONS

Authors' contributions

All authors contributed equally to the design and the realization of the study.

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Consent to publication

The authors unanimously agree that the information in this manuscript will be taken into account by your journal for publication and confirm that the results of this manuscript have not been published elsewhere.

Competing interests

The authors declare no conflicts of interests.

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