Original article

Complementary feeding practices among mothers of children aged 6 to 59 months in the rural commune of Sinder/Tillaberi/Niger

Abstract:

Adequate nutritional practices during early and early childhoodare essential to ensure the growth, health and development of the full potential of these children (1). These practices begin with exclusive breastfeeding for the first six months of the child's life (2), then continue with complementary feeding while continuing breastfeeding up to two years or more (3). This study aims to assess the practices of complementary feeding by mothers and wet nurses in the rural commune of Sinder. This is a descriptive cross-sectional study, on a representative sample of mothers of children under five years old. A questionnaire was completed using a structured interview. The data were collected with ODK software and then analyzed with SPSS and Epi Info version 7.2 software.Simple random sampling method were used to determine the sample size. A total of 166 mother-child pairs were identified. Before the 6th month, the majority of children were introduced to complementary foods (55.56%), 44.44% of mothers gave complementary foods at the ideal time. The average age of introduction of complementary foods is 4.9±2.77 months. Children on complementary feeding represent about 38% and those on total ablactation about 62%. The average age of weaning was 17.2±4.67 months. The frequency of consumption of complementary foods (CF) varies from one to three times a day but the majority of children (55.56%) are fed two (2) times a day. Cereal-based foods were the most consumed. The minimum acceptable diet was not satisfactory for the majority of children.

Key words: Complementary feeding, rural area, meal frequency, children.

I. Introduction:

Adequate nutritional practices during early and young childhood are essential to ensure the growth, health and development of the full potential of these children (1). These practices begin with exclusive breastfeeding for the first six months of the child's life (2), then continue with complementary feeding while continuing breastfeeding for two years or more (3). From 6 months, children's nutritional needs exceed what breast milk alone can provide. It is therefore essential to provide them with fluid, semi-solid or solid foods in addition to breast milk (4). To promote optimal growth, it is strongly recommended to increase the consistency of foods gradually with the age of infants. Diets that meet minimum standards for meal frequency and diversification are essential to avoid micronutrient

deficiencies, stunting and wasting. If appropriate complementary feeding practices were extended to a near-universal scale, nearly 100,000 deaths of children under five could be avoided each year (5). Exclusive breastfeeding during the first six months, adequate complementary feeding and healthy eating practices up to the age of two are essential to ensure normal growth and development of the child during this crucial period (6). In Niger and particularly in rural areas, complementary feeding is very poorly diversified. It is generally presented to the child in the form of simple porridge of local cereals (kunu), millet ball (Fura) or to (Tuwo), which have a low energy and nutritional density (7). The repetitive and non-diversified consumption of these foods, very often prepared and stored in poor hygienic conditions, could have an impact on the health and nutritional status of children. The wasting and stunting of children observed in rural areas are indicative, among other things, of the monotony of their basic diet, the nutritional intake of which is low for young children (8).

This chapter aims to evaluate the practice of complementary feeding and to estimate the nutritional and energy value of the foods offered to children aged 6 to 59 months in the rural commune of Wogo in Sinder.

This specifically involves:

- Identify the period of introduction of additional food
- Evaluate the practice by mothers of additional food in infants and young children
- Test knowledge of mothers or nurses on good practices of additional food as recommended by WHO

II. Methodology

II.1 Study framework

The study was conducted in the rural commune of Sinder, an island commune on the Niger River. It covers an area of 300 km^2 and is made up of around fifty islands. It is located in the Tillabery region (15°2'27"N 2°42'18"E), one of the eight (8) regions of Niger. Twelve (12) villages were the subject of this study by random draw.

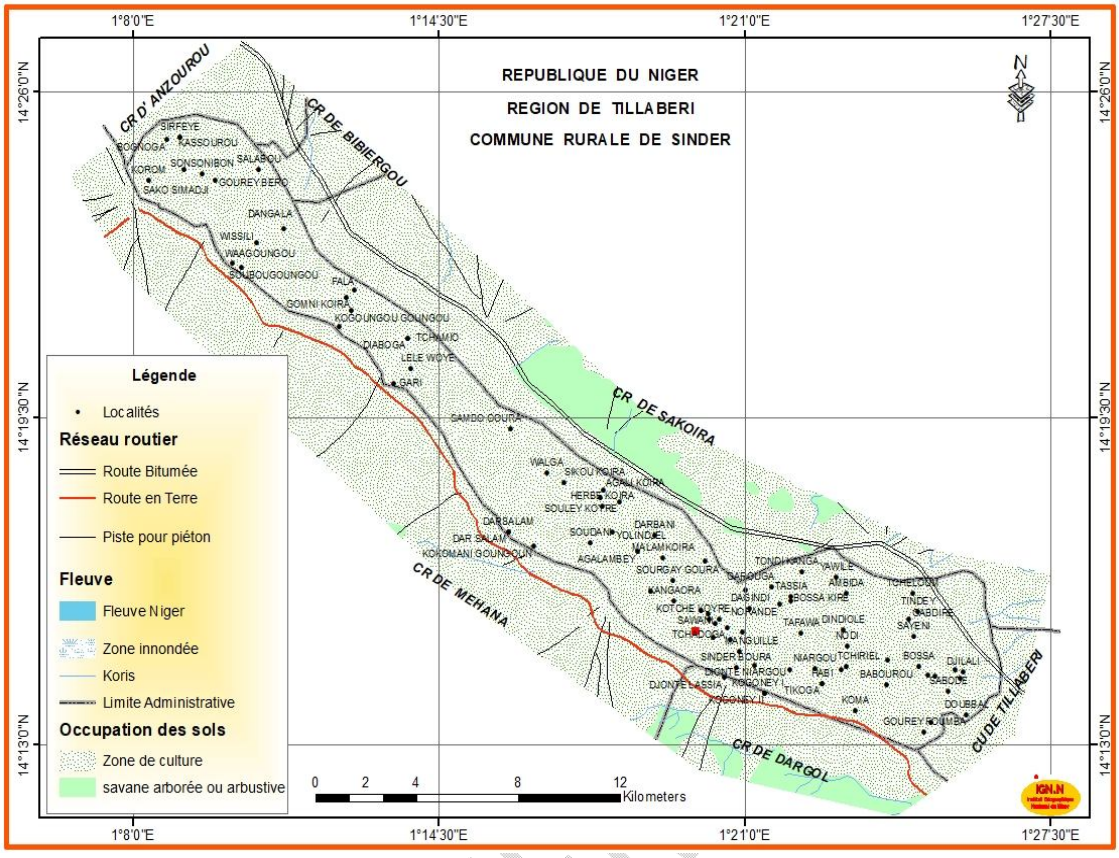

Figure 1: Map of the rural commune of Sinder (IGNN, 2021).

II.2 Type, Period and Duration and Population of the Study

This is a descriptive cross-sectional study with two passages. The 2 visits to the study area were carried out just after the harvests (October-December) and during the lean period (June–August) of the year 2021. Questionnaires on complementary foods and their introduction periods were completed by all mothers.

II.3 Inclusion criteria and ethical considerations

The study was approved by the University's Academic Scientific Council. It was authorized by the regional and municipal administrative authorities. The protocol conformed to the 1975 Declaration of Helsinki as revised in 2008. Participation in the study was voluntary. All mothers with children aged 6 to 59 months whose informed consent was obtained were included in the study. No biological samples of any kind were taken.

II.4 Data analysis

The ODK Open Data Kit software (https://opendatakit.org) was used for data collection and processing was carried out with SPSS software (version 28.0) IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 10. Armonk, NY: IBM Corp and Epi info software version 7.2. Atlanta Center for

Disease Control and Prevention (CDC), United States in collaboration with the World Health Organization (WHO) free software tools for public health practitioners and researchers worldwide.

II.5 Sampling

We used Simple random sampling method.The minimum household size n which will ensure a level of confidence α will be determined by the following formula:

$n= z\alpha^2 p(1-p)\ deff/i^2$ (Schwartz, 1960).

$n= 1.96^2 \times 0.09(1-0.09) \times 1.5/ 0.05^2$

n= 188.77 so the minimum size n of our sample is 189.

For this work we collected a sample of 250 children aged between 0 and 59 months. Including 166 children aged 6 to 59 monthswho are the subject of this study.

II. Result

II.1. Socioeconomic and demographic characteristics of mothers/guardians of children

The study included 166 mothers and their children aged 6 to 59 months. Table I presents the socioeconomic and demographic characteristics of mothers/guardians of children aged 6 to 59 months. The population of mothers is mostly very young with an average age of 30.15±4.33 years. About 38% are between 15 and 24 years old and 35% between 25 and 34 years old. Mothers who were not in school represented 61.45% compared to 38.55% who were in school, of whom 25.9% had primary education and 12.65% had secondary and higher education. About half of the mothers (50.6%) were unemployed, 30.12% were engaged in small business and crafts, 11.45% had a stable or occasional salaried activity and 7.8% worked in the agriculture and livestock sector. Married mothers represented 97% of the mothers and the remaining 3% were divorced or widowed. The majority of the mothers were multiparous, 76.51%. Mothers who received advice from health workers on the practice of optimal breastfeeding represented 73.49%. The percentage of mothers who gave birth in a health center was 73.49% compared to 26.51% of home deliveries.

Table I. Socio-economic and demographic characteristics of mothers/guardians of children aged 6 to 59 months.

Parameters	Percent	Number
Ages		
15 – 24	37.95	63
25 – 34	34.94	58
37 – 53	27.11	45
Averageage of mothers	30.15±4,33an	

s

Level of education		
Unscolarised	61.44	102
Primary	25.9	43
Secondary/higher	12.65	21
Occupation		
Uemployed	50.6	84
Agriculture/ livestock	7.83	13
Work (OJF)	11.45	19
Commerce/ craft	30.12	50
Marital status		
Maried	97	161
Divorced/widowed	3	5
Parity		
Primiparous	9.03	15
Biparous	14.46	24
Multiparous	76.51	127
Mothers'information		
Yes	73.49	122
No	26.51	44
Place of delivery		
Health center	73.49	122
Home	26.51	44

II.2. Practice of complementary feeding by mothers/guardians of children

The 166 mothers of children aged over 6 months were questioned on the date of introduction, the nature and the frequency of intake of the first complementary foods given to their infants. The results are presented in Table II. The children were aged 6 to 59 months, the predominant age range being 24 to 59 months (42.77%) with an average age of 23±6.12 months. Before the 6th month, the majority of children were introduced to complementary foods (55.56%), 44.44% of mothers gave complementary foods at the ideal time. The average age of introduction of complementary foods is 4.9±2.77 months. Children on complementary feeding represent approximately 38% and those on total ablactation approximately 62%. The majority of children were weaned between 21 and 24 months (27.71%). The average age of weaning was 17.2±4.67 months. The frequency of consumption of complementary foods (CF) varies from one to three times a day, but the majority of children (55.56%) are fed two (2) times a day. In ablactated children, the frequency of meal intake varies from two (2) to four (4) per day but 41.75% of them had three (3) daily intakes. From 6 months, all children had received water. The different foods given to children were porridge 82.54%, Djitti (traditional plant decoction) 49.21%, family dish 61.9%, pureed beans 25.4%, fish 50.79%, meat 12%, vegetables 11.11%, dairy products 17.46% and fruits 6.35%. The composition of the family dish in households was as follows: for

breakfast, 67.46% take the reheated dish from the previous day, 47.59% take porridge. At lunch, 59.04% have the ball (fura) or porridge and a dish (rice sauce, rice beans, tuber) 40.96%. The evening dish consists of to (corn or rice) with sauce and fish or meat 15.06%, without fish or meat 17.46%. Rice with sauce with fish or meat represents 25.30% and rice with sauce without fish or meat represents 42.16%.

Table II. Complementary feeding practices by mothers/guardians of infants and young children aged 6 to 59 months.

Parameters	Percent %	Number N
Age of children in months		
6 - 11	21.69	36
12 - 23	35.54	59
24 - 59	42.77	71
Age of introduction of complementary foods		
< 6months	55.56	35
From6months	44.44	28
Feedingstatus of children		
Children on complementaryfeeding	37.95	63
Children on definitive ablactation	62.05	103
Age of weaning (in months)		
11 - 16	17.47	29
17 - 20	15.06	25
21 - 24	27.71	46
> 24	1.81	3
Meal consumption frequencies of children		
1	25.40	16
2	55.56	35
3	19.05	12
Nature of complementaryfoods		
Water	100	63
Porridge	82.54	52
Djitti	49.21	31
Family meal	61.90	39
Pureedbeans	25,4	16
Fish	50.79	32
Meat	19.05	12
Vegetables	11.11	7
Dairy products	17.46	11
Fruits	6.35	4

Table III shows that mothers aged 15 to 24 years more often gave optimal complementary feeding 63.64% than mothers in other age groups, but the association is not significant (p = 0.10). Mothers who attended school and those with a secondary or higher education gave more complementary foods at the right time (66.67%) than those who did not attend school, but the association is not significant (p = 0.34). Unemployed mothers and those working in agriculture and livestock farming diversified the diet of their infants aged 6 months and over more, with respective rates of 56.25% and 55.56%. However, the difference is not significant (p = 0.08). Multiparous mothers (57.5%) and those who were sensitized (54.17%) practiced more diversified and timely complementary feeding with respective probabilities of 0.02 and 0.00. Married mothers (53.45%) and those who gave birth at home (81.82%) gave more optimal feeding to their infants, as recommended by WHO, at 6 months, as recommended by WHO, with respective probabilities of 0.09 and 0.001.

Table III. Optimal complementary feeding according to the sociodemographic and economic characteristics of mothers and guardians of children.

Paramters	Optimal complementaryfeeding		Total	Probability
	Yes	No		
Ages				
15 - 24	63.64(14)	36.36(8)	100(22)	**.100**
25 - 34	54.55(12)	45.45(10)	100(22)	
35 - 53	36.84(7)	63.16(12)	100(19)	
Level of education				
unschooled	45.71(16)	54.29(19)	100(35)	**.340**
Primary	60(12)	40(8)	100(20)	
Secondary/higher	62.5(5)	37.5(3)	100(8)	
Profession				
uemployed	56.25(18)	43.75(14)	100(32)	**.080**
Agriculture/livestock	55.56(5)	44.44(4)	100(9)	
work O/J/F	37.5(3)	62.5(5)	100(8)	
Commerce/craft	50(7)	50(7)	100(14)	
Parité				
Primiparous	33.33(2)	66.67(4)	100(6)	**.020**
Biparous	43.75(7)	56.25(9)	100(16)	
Multiparous	58.54(24)	41.46(17)	100(41)	
Mothers' information				
Yes	54.17(26)	45.83(22)	100(48)	**.000**
No	46.67(7)	53.33(8)	100(15)	
Marital status				
Married	52.46(32)	47.54(29)	100(61)	**.090**

Divorced/Widowed	50(1)	50(1)	100(2)	
Place of delivery				
Health center	46.15(24)	53.85(28)	100(52)	**.001**
Home	81.82(9)	18.18(2)	100(11)	

III. Discussion

III.1. Sociodemographic and economic characteristics of mothers and guardians of children

The results of this study showed that the age of mothers was between 15 and 53 years with an average of 28.15±4.2 years. The most represented age group (42.4%) was between 15 and 24 years. In a study conducted in the rural commune of Liboré in Niger, the authors found an average age of mothers of 28.47 years, similar to our observations (9). In Mali, the authors observed an average age of mothers of 26.56 years ± 5.05 years (10). In Nairobi, Kenya, mothers under 25 years old were the most represented (11).

Mothers who did not attend school represented 61.44%, those with primary education 25.9% and those with secondary and higher education 12.65%. This could be explained by the low school enrollment rate of young girls in Niger, in general and in rural areas in particular, due to social constraints. Some parents are reluctant to send their daughters to school (12). In a study conducted in the village of Tshamalale in the DRC, only 5% of mothers were not in school, those at the primary level represented 36.5% and mothers at the secondary or higher level represented 59% (13). Note that the proportion of mothers with a secondary or higher education level (59%) far exceeds the rate of schooled mothers (38.55%) observed during the present study. In another study conducted in Kware in Nigeria, a country whose North shares the same socio-cultural realities as Niger, 66% of mothers were not in school, 18% had a primary level and 16% a secondary or higher level (14), a profile similar to that observed in the present study. Unemployed mothers at the time of the survey represent 50.6%. Among those who have an activity, the majority are engaged in small businesses or crafts (30.12%). This high rate of unemployed mothers has already been observed in studies conducted in the sub-region. Thus, in Nigeria, authors had identified 61% of unemployed mothers, 12% of civils servants and 27% of traders (14). In Mali, Mariko (15) had found that 52% of the mothers surveyed were housewives and civil servants represented 16%.

About three quarters (3/4) of the mothers were multiparous (76.51%), biparous represented 14.46% and primiparous 9.03%. In a study conducted in Mali, multiparous mothers represented only 11.9%. Mothers were predominantly biparous (54.8%) and primiparous (33.3%), which is about triple the

percentages observed in the present study (16). In Kenya, a study reported a predominance of multiparous mothers 39% while biparous and primiparous mothers represented 27.8% and 33% respectively (11).

Mothers were sensitized to 73.49% on good practices of optimal breastfeeding by health workers. These results are different from those obtained in the Kaolack district of Senegal where the authors reported that 61% of women had received advice during ANC and 67% during CPoN (17). In Nigeria, 28% of mothers had not received information on optimal IYCF practices compared to 72% who had received it (18).

Married mothers represent 97% of the sample and divorced or widowed mothers represent 3%. In a previous study conducted in Maradi, Niger, married mothers represented 98% of the sample, and divorced and widowed mothers 2% (12). In Kenya, the authors reported that 90.5% of mothers were married at the time of the survey compared to 9.5% who were not (11).

The majority of mothers surveyed gave birth in health centers (73.49%); only 26.51% gave birth at home. These results are higher than those obtained in a previous study conducted in Maradi, Niger, where the authors reported that 62% of mothers gave birth in a health center compared to 38% who gave birth at home (12). A study conducted in Nairobi, Kenya, supports this view, since it reports that 71.4% of mothers gave birth in a hospital setting compared to 28.3% who gave birth at home (11).

III.2. Introduction of complementary foods

The World Health Organization (WHO) recommends introducing complementary foods from the age of 6 months (19). In this study, only 44.44% of mothers introduced complementary foods (CF) from 6 months. In previous studies conducted in Niger but in the regions of Diffa and Niamey, the authors showed that 57.6% and 60.5% of mothers introduced complementary foods at the ideal age of 6 months (20; 21). In Benin, authors observed that only 5% of mothers in rural areas know the ideal age for introducing complementary foods and 74% of them say that complementary feeding can be done before the sixth month (22). In Côte d'Ivoire, the authors reached the same result by finding that 74% of mothers surveyed were unaware of the concept of optimal complementary feeding. Only 48.5% of these mothers introduced foods very early (23). This high rate of rural mothers with low knowledge of the age of introduction of complementary foods is thought to be due to a lack of nutrition education (22). The proportion of mothers who started complementary feeding in a timely manner at six months was 55% in India and 56% in Liberia (24), 49% in Ethiopia (25), and 60% in Kenya (11). In sub-Saharan African countries, 85.5% of infants were reported to have received complementary foods before 6 months of age (26). The mean age of introduction of CF is 4.9±2.77 months. In Ethiopia, the mean age of introduction of CF was 4.19 months in the 2011 Demographic and Health Survey (25). In a study conducted in the DR Congo, the authors reported a mean age of introduction of AC of

4.20±1.59 months (13). Approximately 72.5% of the mothers interviewed had introduced AC early, according to these authors compared to 55.56% in the present study. The optimal age of introduction of complementary foods is still debated among mothers. If the introduction of AC is done too early, this will reduce the quantity of breast milk consumed given the reduced gastric capacity of the infant; if it is done too late, breast milk alone will no longer be sufficient to meet the nutritional needs of the infant, leading in each case to a risk of malnutrition (27; 28). The WHO guidelines for optimal feeding of young children recommend not only the introduction, from the age of 6 months, of diversified and sufficient complementary foods, but also to continue breastfeeding the child until 2 years or more (29). In the present study, only 28% of mothers weaned their infants between 21 and 24 months of age and about 2% continued breastfeeding beyond two years of age. In a study conducted in rural Egypt about half (50.2%) of mothers reported that the infant should be completely weaned from breast milk by 2 years of age, and 37.1% of them reported that weaning would occur after 18 months (30). In Kano, Nigeria, only 24.5% of mothers continued breastfeeding until 18 to 23 months of age and 7% until 24 months and beyond. These authors also reported that 61.5% of mothers stopped breastfeeding abruptly while 38.5% weaned their infants gradually (31). The complementary foods consumed by children from 6 months were mainly composed of local cereal porridge (82.54%), fish (50.79%), family dishes (61.9%), dairy products (17.46%), legumes (beans) (25.4%), vegetables (11.11%), fruits (6.35%), meat (19.05%). Children also receive water (100%) and plant decoctions (49.21%). During a study carried out in Tessaoua in Niger, the authors reported that the most consumed ACs by children were cereals (90%), followed by legumes (35.4%) with a low consumption of fruits and vegetables 0.8% and 2% (12). Still in Niger but in the rural commune of Liboré, the authors reported that the most consumed ACs by children were cereals, followed by legumes, fish and meat. The use of fruits and vegetables is quite low (9). This predominance of cereals as AC was also observed in Mali (32). Cereals were the food most commonly consumed by children as AC (35.73%) and dairy products represented only 0.5% (33). In Yaoundé in Cameroon, cereals, seeds and tubers constituted the essential part of the diet for more than 80% of infants, less than half of them had received foods from the meat/fish/egg group the day before the survey and fruits and vegetables were consumed in small quantities (34). In Kenya, from six months, breastfeeding mothers introduced foods such as mashed potatoes (49%), porridge (49%), cereals 26%, caramelized milk 15% and powdered milk 10% as complementary foods to their infants (35).

This study highlighted that most of the complementary foods are mainly carbohydrate in nature as reported from Ethiopia (36). Although these local complementary foods are cheap and readily available in developing countries, studies have observed that their energy density and nutrient value are suboptimal (35;36). WHO and UNICEF recommend that breastfeeding mothers be encouraged to feed their infants with local nutritious complementary foods that are rich in calories, proteins, minerals and vitamins and prepared under good hygienic standards (19).

WHO recommends a frequency of 2 to 3 meals per day for infants aged 6 to 8 months and 3 to 4 meals per day for those aged 9 to 23 months, with one or two additional snacks when needed (37). In

this study, the frequency of consumption of meals by children in complementary feeding varies from one meal (25.40%) to three meals (19.04%) per day. Thus, 74.6% of infants have at least two meals per day. This result is higher than the rates previously reported which were 44.7% (25) and 50.4% (38) in Ethiopia, 57.3% in Ghana (39), 30% in the Democratic Republic of Congo (40) and 42% in India (41). In another study carried out in Niger but in the rural commune of Liboré, the authors reported that 62.8% of children had consumed only one meal per day, 29.9% two meals, 3.6% three meals and 0.7% more than three meals in the 24 hours before the survey. According to these authors, this poorly diversified diet would be dictated by household poverty which forces them to limit the number of daily meals (9).

III.3. Complementary feeding practice by socio-demographic and economic characteristics of mothers and guardians

Young mothers aged 15–24 years were more likely to practice appropriate complementary feeding to their infants. However, the association between maternal age and optimal complementary feeding practice was not significant ($p = 0.1$). In a study conducted in Sokoto, North-West Nigeria, the authors reported that mothers aged less than 35 years provided appropriate complementary feeding to their infants than those aged more than 35 years. Here too, maternal age was not predictive of good complementary feeding practices ($p = 0.20$) (42). However, a previous study conducted in the same region of Nigeria found a significant association between maternal age and timely introduction of complementary foods ($p = 0.040$) (43).

In this study, school-attending mothers practiced more appropriate complementary feeding of infants than those who had never attended school. However, there was no significant association between the level of schooling and the practice of adequate complementary feeding ($p = 0.34$). In a study conducted in Ethiopia, the authors found a significant association between mothers' schooling and the practice of adequate complementary feeding (44). The probability of having adequate complementary feeding was lower among mothers who had not attended school than among mothers who had attended primary, secondary or higher school (44). Other authors had also reported the positive impact of mothers' schooling on adequate complementary feeding of infants (45; 46; 47; 48; 49). This would be due to the fact that school-attending mothers are more exposed to the media and maternal and child health services. They are thus more likely to have the necessary knowledge on appropriate complementary feeding practices (43; 48).

In this study, unemployed mothers were the ones who most practiced optimal complementary feeding. The mother's occupation was not significantly associated with the practice of optimal complementary feeding ($p = 0.08$). In a study conducted in the city of Shashemene in Ethiopia, the authors reported that unemployed women adopted optimal complementary feeding more often than those who had a profession (50). Other studies conducted in Africa have shown that maternal employment was associated with optimal complementary feeding practices, particularly in Ethiopia (49; 51) and Uganda (52). Child nutrition is likely to improve if mothers' incomes increase because they would be better able

to provide nutritious, healthy and varied foods that ensure better growth for children (47; 51; 53). In Nepal a significant association between optimal complementary feeding and maternal occupation was reported (54).

In this study, multiparous mothers practiced more optimal complementary feeding. Maternal parity was significantly associated with optimal complementary feeding (p=0.02). In Ethiopia, authors reported a significant association between optimal complementary feeding and parity. They also demonstrated that multiparous mothers practiced more appropriate complementary feeding (50; 51).

Mothers who received information on optimal breastfeeding practice practiced more optimal complementary feeding. Maternal awareness was significantly associated with optimal complementary feeding of children (p=0.000). In Enemay district, northwest Ethiopia, mothers who attended antenatal care during their child's pregnancy were found to practice optimal complementary feeding (55). This observation is similar to that reported by Harar in Ethiopia where mothers who were followed up during antenatal consultations were 2.8 times more likely to practice optimal complementary feeding at the recommended age than those who were not followed up (56).

In this study, married mothers practiced optimal complementary feeding the most. However, the marital status of the mother was not significantly associated with the practice of optimal complementary feeding (p = 0.09). Authors reported, in a study conducted in Sokoto in the North-West of Nigeria that married mothers more often gave optimal complementary feeding to their infants. However, this association was not significant (p = 0.4) (42). The polygamous family environment would be the main determinant of the rapid introduction of complementary foods. Mothers living in a polygamous family were twice as likely to introduce complementary foods to their infants in a timely manner (p = 0.012) (57).

Mothers who gave birth at home practiced optimal complementary feeding more than those who gave birth in health facilities. However, according to other studies, it was rather mothers who gave birth in a health facility who practiced optimal complementary feeding the most, particularly in the southern part of India (58); in Nairobi, Kenya (11), in Harar (56) and in Jijiga (51) in Ethiopia. We found a significant association between the place of delivery and the practice of optimal complementary feeding (p = 0.001).

IV. Conclusion

In this study, at 6 months all children hadreceived complementary food. However, the majority of mothers did not practice optimal complementary feeding for their children. The first complementary foods introduced to infants from 6 months were mainly water and porridge. Cereal-based foods were the most consumed. The minimum acceptable diet was not satisfactory for the majority of children.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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