

Original Research Article

Complementary feeding practices among children aged 6-24 months in rural area, Southern Benin: Challenges and Opportunities

ABSTRACT (ARIAL, BOLD, 11 FONT, LEFT ALIGNED, CAPS)

Aims: This study aims to provide in-depth knowledge of current infant feeding practices in order to create an evidence base and develop well-targeted strategies to reduce the prevalence of child malnutrition.

Study design: This was a cross-sectional and descriptive study..

Place and Duration of Study: This study was performed in two rural districts, *Bopa* and *Houeyogbe*, in southern Benin during October to December 2013.

Methodology: 1225 mother-child pairs, aged 6-23 months were randomly selected in seventeen villages through exhaustive sampling. Socio-demographic data of participants were obtained through semi-structured interviews. Complementary feeding practices were assessed using recommended IYCF indicators. Statistical analyses were performed with SPSS version 20. Statistical significance was set at $P < 0.05$.

Results: Overall, 20% had timely initiation of complementary feeding whereas 41% and 17% had early and delayed initiation of complementary feeding respectively. There is no specific CF and Cereal porridges and extracts from family diets were two categories of complementary foods. CF is characterized by unenriched porridges, mashed family diets and low consumption of fruits and eggs. Around 70% of children were provided in leaves vegetables consumed individually or mixed with other leaves. The most popular leaves were *Corchorus olitorius* (48%), *Hibiscus esculentus* (22%), *Solanum macrocarpon* (18%). The neglected used species (0.1%) identified were *Cleome ruidosperma*, *Telfairia occidentalis*, *Vitex doniana*.

Conclusion: Untimely initiation of complementary feeding was predominant. Complementary feeding practices in this area of Benin were suboptimal. The valorization of local biodiversity and traditional recipes was opportunity to improve quality of child's diet. Reinforce capacity building of stakeholders focused on child feeding may be a crucial step towards for child well-being.

Keywords: Complementary feeding, Complementary foods, Diversity, Leaves vegetables, Neglected used species, Recipes, Benin

1. INTRODUCTION

Appropriate infant feeding practices are fundamental to a child's growth, health, and development during the first 2 years of life. Optimal nutrition in the first year of life is crucial in laying the foundation for good nutrition and health in later life [1]. Globally, 159 million children under five years are still affected by stunting with more than a third living in Africa. The number of stunted children was halved in Asia and Latin America/Caribbean whereas the burden in Africa increased by 24% between 1990 and 2012 [2]. Undernutrition is responsible, directly or indirectly, for at least 35% of deaths in children less than five years of age [3]. In Africa, suboptimal infant feeding practices and poor nutrient density for key micronutrients are the major determinants that contribute to the high mortality among infants and young children [4,5]. Poverty, insufficient knowledge on infant feeding and cultural practices may affect the adequacy of the complementary diet [6]. In francophone West African countries, malnutrition remains a pertinent problem and mothers are not well educated on how to provide the correct nutrition for their babies [7]. This worrying situation occurs because of suboptimal complementary feeding practices as

result of inappropriate introduction of complementary foods, inadequate quantities and quality of diets crossed with inappropriate breastfeeding practices. In Benin, recent surveys show that only 15% of children achieved a minimum acceptable diet with 52% and 25% of children receiving the minimum meal frequency and the minimum dietary diversity respectively [8].

The Sustainable Development Goal (SDG) number 2 targets to end hunger, achieve food security, improve nutrition and promote sustainable agriculture by the year 2030 [9]. To reach this goal, successful infant feeding practices are crucial for preventing malnutrition. Apart from the creation of the National Council for Food and Nutrition (CAN), Benin has a national strategy for infant and young child feeding [10] but it remains of little operational. Indeed, the strategy does not highlights proposals for actions related to nutrition capacity building at the level of the health pyramid, the role and responsibilities of stakeholders on the one hand and designing tools and communication strategy on the other hand. Designing effective nutrition intervention programs requires good knowledge of current child feeding practices.

To the best of our knowledge, few papers have described complementary feeding practices in Benin. This study aims to provide in-depth knowledge of current complementary feeding practices in order to create an evidence base and develop well targeted strategies to improve infant feeding practices.

2. METHODOLOGIE

2.1 Study area and population

This cross-sectional study was carried out in two rural districts, *Bopa* and *Houeyogbe*, in Mono department, Southern of Benin. Mono department registered the highest food insecurity rate of the country (33%) compared to national level (12%) [11]. *Bopa* and *Houeyogbe* are characterized by a subequatorial and Sudano-Guinean climate respectively with four seasons: two rainy seasons and two alternating dry seasons. In *Bopa*, the vegetation consists of grasses, marshy grasslands and a mangrove stand along the “*Aheme*” lake. *Bopa* is more remote, more agriculture oriented while *Houeyogbe* is closed to main towns. “*Saxwe*” is the predominant ethnic.

2.2 Sampling technique

An estimated theoretical sample size was 1183 children based on the following parameters: 95% confidence level, 1.96 two-tailed z-score and an estimated prevalence of stunting of 44.7%, the margin of error at 5%, the design effect of 1.4 and the rate of non-response at 10%[12]. Exhaustive sampling was performed. In the first stage, for each district, villages holding at least 70 children aged 6 to 23 months were listed from the latest national population census database. From these lists, proportionally to the number of children, 8 villages in *Bopa* and 9 villages in *Houeyogbe* were randomly selected. A total of 1263 of households was selected and 38 of them left the area despite their commitment. Thus, the final sample size for the analysis was 1225 households and the non-response rate was 3%.

2.3 Data collection

Data were collected from a cross-sectional survey conducted between October to December 2013. A pretested semi-structured questionnaire was used to collect socio-demographic and health information, child, maternal and household characteristics. Locally recruited enumerators were trained and subsequently conducted interviews in local languages. Mothers or primary caregivers provided the details of feeding patterns (breastfeeding and complementary feeding practices).

2.3.1 Socio-economics surveys

The questionnaires used to collect data include three major types of information namely: the socioeconomic characteristics of households, the description of the complementary feeding practices and food consumption.

2.3.2 Complementary feeding indicators

To assess complementary feeding practices of infants and young children, three core infant and young child feeding (IYCF) indicators according WHO recommendations were used, namely minimum dietary diversity, minimum meal frequency and minimum acceptable diet [13].

"Minimum dietary diversity" (MDD): proportion of children aged 6-23 months who ate from four or more different food groups out of seven in a 24 h time period [13].

"Minimum meal frequency" (MMF): the proportion of breastfed and non-breastfed children aged 6-23 months who received solid, semi-solid or soft foods including milk feeds for non-breastfed children, at least the minimum number of times during the previous day. The minimum number of times was defined as two times for breastfed infants aged 6-8 months, three times for breastfed children aged 9-23 months and four times for non-breastfed children aged 6-23 months; [13] and *"Minimum acceptable diet" (MAD):* the proportion of children 6-23 months of age who received both minimum dietary diversity and minimum meal frequency [13].

2.4 Data analysis

Statistical analyses were performed with SPSS version 20. For categorical variables, frequencies and percentages were determined and represented in tables and figure. Chi-squared test was applied for comparison of categorical variables. For continuous variables, student's t-test was used to make comparison of means. Statistical significance was set at $P < 0.05$.

3. RESULTS

3.1 Socio-demographic, maternal and child characteristics

Socio-demographic characteristics of the study participants are presented in Table 1. Aged distribution revealed that 37.6%, 32.8% and 29.6% were aged 6-11 months, 12-17 months and 18-23 months, respectively. The sex ratio (male: female) equals 1.07. Majority of mothers (67%) did not attend formal school with the highest proportion observed in *Bopa*. The proportion of women who delivered at home is significantly higher in *Bopa* than Houeyogbe (24.2% vs 1.8%; $P = .001$).

Table 1 . Socio-demographics characteristic of the study participants

Characteristics	All n (%)	Districts		P
		Bopa n (%)	Houeyogbe n (%)	
Children				
Age of child (months)				.188
6-11	460 (37.6)	222 (39.9)	238 (35.6)	
12-17	402 (32.8)	183 (32.9)	219 (32.8)	
18-23	363 (29.6)	152 (27.3)	211 (31.6)	
Sex				.837
Male	631 (51.7)	285 (51.3)	346 (52.1)	
Female	588 (48.24)	270 (48.6)	318 (47.8)	
Maternal				
Age of mothers (years)				.136
<20	60 (4.9)	20 (3.6)	40 (6)	
20-34	930 (75.9)	432 (77.6)	498 (74.6)	
35+	235 (19.2)	105 (18.9)	130 (19.5)	
Maternal education				.000***
Did not attend school	822 (67.1)	446 (80.1)	376 (56.3)	
Literate &Primary	236 (19.3)	86 (15.4)	150 (22.5)	
Secondary & Above	166 (13.6)	25 (4.5)	141 (21.1)	
Place of delivery				.000***
Health institute	1075 (87.8)	421 (75.6)	654 (97.9)	
Home	147 (12)	135 (24.2)	12 (1.8)	
Household				
HFIAS Category				.018*
Food secure	242 (19.8)	128 (23)	114 (17.1)	
Food Insecure	983 (80.2)	429 (77)	554 (82.9)	
Nature of household (activity)				.001**
Agriculture	63.0 (768)	82.16 (456)	46.99 (46.99)	
No Agriculture	37.0 (451)	17.84 (99)	53.01 (352)	

mo: month ; CFding : Complementary feeding ; MDD : Minimum Dietary Diversity ; MMF : Minimum Meal Frequency ; MAD : Minimum Acceptable Diet;

Chi-2 Test. Level of significance *, **, *** With $\alpha=0.05$.

3.2 Timing of initiation of complementary feeding

Figure 1 shows the distribution of the prevalence of the age of introduction of complementary foods in infants and young children. Overall, 20% had timely initiation of complementary feeding whereas 41% and 17% had early and delayed initiation of complementary feeding respectively. The mean age for introducing solid foods was 4.9 ± 2.3 months.

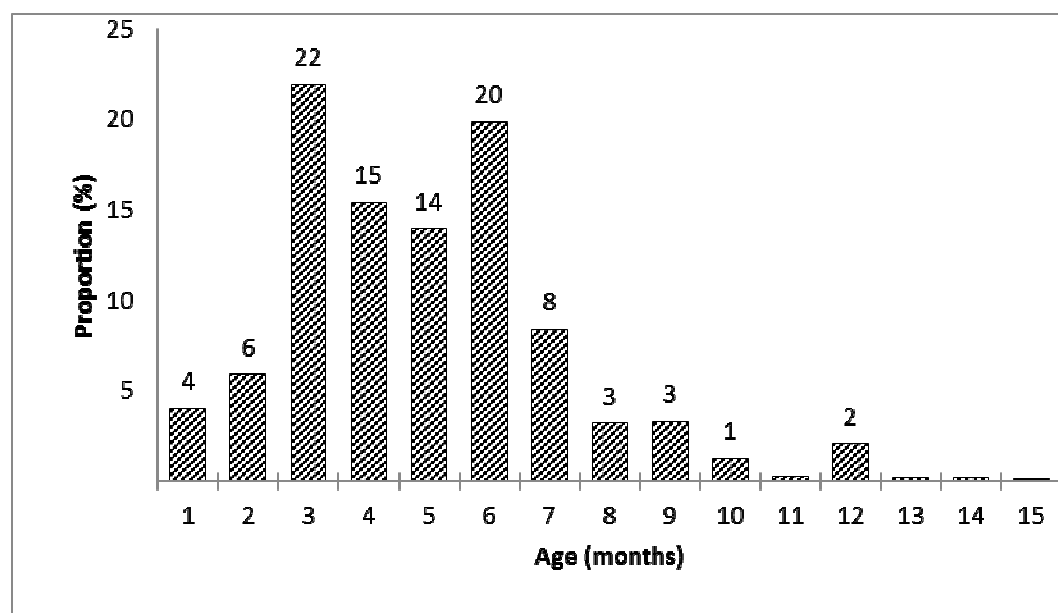


Figure 1: Age of introduction of the first complementary foods

3.3 Complementary feeding practices

3.3.1 Consumption frequency of food groups and food items

Majority (82%) of children consumed maize paste followed by rice (26%) and red cowpea (20%) (Table 2). Three in four children received flesh food with predominance of fishes. Conversely, eggs (2%) and dairy products (2.7%) are scarcely consumed. Fruit consumption was practically absent in the diet through the very low consumption (orange: 3.6% and banana: 1.4%). The use of diversity of leaves vegetables was spread in the both districts. Vitamin A-rich fruits and vegetables groups were more consumed in Bopa than Houeyogbe (27% vs 23%; $P = .001$).

165 Table 2: Proportion of children that consumed food groups and food items/recipes by districts

Food group and food items/recipes	All (n=1225)	Bopa (n=557)	Houeyogbe (n=668)	P
	n (%)	n (%)	n (%)	
Grains, roots and tubers	1215 (99.2)	552 (45.1)	663 (54.1)	1
Porridges of maize	682 (55.7)	290 (42.5)	392 (57.5)	
Maize paste	1003 (81.9)	474 (38.7)	529 (43.2)	
Rice	321 (26.2)	156 (12.7)	165 (13.5)	
Wheat (Pasta)	126 (10.3)	52 (4.2)	74 (6)	
Cassava	199 (16.2)	85 (6.9)	114 (9.3)	
Sweet potato	32 (2.6)	10 (0.8)	22 (1.8)	
Legumes and nuts	616 (50.3)	334 (27.3)	282 (23)	.001
White cowpea	38 (3.1)	13 (1.1)	25 (2)	
Red cowpea	245 (20)	148 (12.1)	97 (7.9)	
Soya cheese	32 (2.6)	11 (0.9)	21 (1.7)	
Dairy products	33 (2.7)	5 (0.4)	28 (2.3)	.0001
Dairy products	33 (2.7)	5 (0.4)	28 (2.3)	
Flesh foods	929 (75.8)	412 (33.6)	517 (42.2)	.180
Fermented fish « <i>Lanhoun</i> » (<i>Saxwe</i>)	358 (29.2)	88 (7.2)	270 (22)	
Dried fish (small)	330 (26.9)	146 (11.9)	184 (15)	
Fresh fish ; « <i>Chincha</i> » (<i>French</i>) « <i>sylvie</i> » (<i>Saxwe, fon</i>)	669 (56.4)	2525 (20.6)	439 (35.8)	
Fresh fish; “ <i>Tilapia</i> ” (<i>French</i>); “ <i>Akpavi</i> ”(Saxwe, Fon)	205 (10.7)	96 (7.8)	109 (8.9)	
Meat of hen	6 (0.5)	2 (0.2)	4 (0.3)	
Eggs	26 (2.1)	7 (0.6)	19 (1.6)	.72
Eggs of hen	26 (2.1)	7 (0.6)	19 (1.6)	
Vitamin A-rich fruits and vegetables	494 (40.3)	2.66 (21.7)	228 (18.6)	.001
Tomato	460 (67.6)	134 (30.3)	482 (39.3)	
Pepper (Red)	829 (67.7)	421 (34.4)	408 (33.8)	
<u>Leaves vegetables (LV)</u>				
<i>Corchorus olitorius</i> ; « <i>Crinclin</i> » (<i>French</i>), “ <i>Ninwi</i> ”(Saxwe)	593 (48.5)	294 (49.6)	299 (50.4)	
<i>Solanum macrocarpon</i>	217 (17.7)	136 (11.1)	81 (6.6)	
<i>Vernonia amygdalina</i>	70 (5.7)	37 (3)	33 (2.7)	
Moringa leaves ; LV of <i>Moringa oleifera</i> (<i>Moringa</i>)	37 (3)	19 (1.6)	18 (1.5)	
Cowpea leaves; LV of <i>Vigna unguiculata</i>	30 (2.4)	19 (1.6)	11 (0.9)	
Cassava leaves ; LV of <i>Manihot esculenta</i>	12 (1)	7 (0.6)	5 (0.4)	
LV_ <i>Talinum triangulare</i> ; « <i>Glaceman</i> » (<i>Fon</i>)				

Fruit				
Orange	44 (3.6)	3 (0.2)	41 (3.3)	
Banana	17 (1.4)	6 (0.5)	11 (0.9)	
Others fruits and vegetables	874 (71.3)	379 (30.9)	495 (40.4)	.012
<i>Okra ; Hibiscus esculentus ; « Gombo » ; « Fevi » (Saxwe)</i>	269 (22)	129 (10.5)	140 (11.4)	
Onion	853 (69.6)	371 (30.3)	482 (39.3)	
Pepper (Green)	715 (58.4)	287 (23.4)	426 (34.9)	
Mixed recipes	10 (0.8)	7 (0.6)	3 (0.2)	-
Mixed of rice and cowpea; « <i>Atassi</i> » (Saxwe, Fon)	46 (3.8)	16 (1.3)	30 (2.4)	
Mixed of Palm nut sauce, cowpea and maize flour; “Aïtoutou”	2 (0.2)	2 (0.2)	0	
Mixed of red coxpea and banana (<i>Yotchio djangon</i>)	1 (0.1)	1 (0.1)	0	
Spices and condiments	1018 (83.1)	468 (38.2)	550 (44.9)	.445
Garlic	662 (54)	282 (42.6)	380 (35)	
Cube ; « Bouillon » (French)	975 (78.1)	439 (35.8)	518 (42.3)	
Sugars	555 (45.3)	182 (14.9)	373 (30.4)	.000
Sugars	555 (45.3)	182 (14.9)	373 (30.4)	
Honey	5 (0.4)	0	5 (0.4)	
Miscellaneous (NUS³)				
LV_ <i>Cleome rutidosperma</i> ; « <i>Akaya, Sanvo</i> » (Saxwe)	1 (0.1)	1 (0.1)	0	
LV_ <i>Telfairia occidentalis</i> ; « <i>Lokoman</i> » (Saxwe)	1 (0.1)	0	1 (0.1)	
LV_ <i>Ipomea aquatica</i> ; « <i>Toyoe</i> » (Saxwe)	2 (0.2)	1 (0.1)	1 (0.1)	
LV_ <i>Launaea traxacifolia</i> ; « <i>Wonto</i> » (Saxwe)	6 (0.5)	4 (0.3)	2 (0.2)	
LV_ <i>Vitex doniana</i> ; <i>Prunier des savanes</i> « <i>Fonman</i> »	1 (0.1)	1 (0.1)	0	

¹ Only food items consumed by at least 1% of children are reported excepted neglected used species (NUS) wild edible products, flesh foods less consumed and local recipes observed with potential nutritional value.

² LV: Leaves Vegetables; 3 NUS: Neglected Used Species

3.3.2 Complementary foods pattern

Two categories of complementary foods were provided to children: Cereal porridges and extracts from family diets. No specific complementary foods were given to infants and young children. Complementary feeding was mostly initiated using locally prepared maize porridges ("Koko" or "Godo" in *Saxwe*, local language). Only 15% of children received enriched porridges. Besides porridges, mashed extracts from family dishes, were provided to children during the complementary feeding period. Extracts of family diets were often made up of staple foods and traditional sauces or mixed recipes (mixture of cereals and/or legumes with crushed condiments/spices). Cultivated leaves vegetables (eg. *Corchorus olitorius*, *Solanum macrocarpon*, *Moringa oleifera*) and Neglected Used Species (NUS) ones (eg. *Cleome ruidosperma*, *Launaea traxacifolia*, *Ipomea aquatic*) were consumed individually or mixed with others leaves as described in Table 2. *Chorchorus olitorius* commonly called "Ninwi" (*Saxwe*) or "Crincrin" (French) remains the most leafy vegetable frequently consumed by infant and young children.

3.3.3 Complementary feeding indicators

Prevalences of MDD, MMF and MAD was 60%, 71% and 46% respectively (Table 3). The proportion of children who achieved MDD was significantly higher in *Bopa* than *Houeyogbe* among children in the two age categories: (48.6% vs 38.7%; $P = .038$) for 6-11 months and (73.8% vs 62.1%; $P = .024$) for 12-17 months. Inversely, the proportion of children who met MMF was higher in *Houeyogbe* than *Bopa* (74.4% vs 66.8%; $P = .004$). Around 40% of mothers started earlier complementary feeding following the advice from parents and healthcare workers.

Table 3 Complementary feeding indicators and related feeding practices of primary caregivers

Characteristics	All n (%)	Districts		P
		Bopa n (%)	Houeyogbe n (%)	
CFding Indicators				
MDD				
6-11 mo	200 (43.5)	108 (48.6)	92(38.7)	.038*
12-17 mo	271 (67.4)	135 (73.8)	136 (62.1)	.014*
18-23 mo	267 (73.6)	108 (71.1)	159 (75.4)	.399
6-23 mo	738 (60.2)	351 (63)	387 (57.9)	.079
MMF				
6-11 mo	329(71.5)	148 (66.7)	181 (76.1)	.030*
12-17 mo	261 (64.9)	114 (62.3)	147 (67.1)	.345
18-23 mo	279 (76.9)	110 (72.4)	169 (80.1)	.101
6-23 mo	869 (70.9)	372 (66.8)	497 (74.4)	.004**
MAD				
6-11 mo	154 (33.5)	77 (34.7)	77 (32.4)	.622
12-17 mo	199 (49.5)	92 (50.3)	107 (48.9)	.841
18-23 mo	214 (59)	81 (53.3)	133 (63.0)	.067
6-23 mo	567 (46.3)	250 (44.9)	317 (47.5)	.388
Reasons for starting CF				
Breast milk was not sufficient	400 (31.9)	196 (34.4)	204 (29.8))	.001***
Parents/hospital advices	496 (39.6)	183 (32.2)	313 (45.8)	.001***
Always crying	249 (19.8)	111 (19.5)	138 (20.1)	.411
First CF provided to children				
Simple porridges	1010 (80.5)	479 (84)	531 (77.5)	.008**
Enriched porridges	188 (15)	62 (10.9)	126 (18.4)	

Others foods	50 (4)	25 (4.4)	25 (3.6)	
<i>Hand washing with soap before feeding child</i>				.01**
Yes	660 (52.3)	252 (44)	408 (59.1)	
No	603 (47.7)	321 (56)	282 (40.9)	
<i>How CF is fed to child</i>				
Hands	794 (63.3)	361 (63.3)	433 (63.2)	.506
Spoon	248 (19.8)	79 (9.5)	169 (24.7)	.001***
Cup	179 (14.3)	54 (9.5)	125 (18.2)	.001***
Bottle	19 (1.5)	4 (0.7)	15 (2.2)	.025*

CF : Complementary foods ; CFding : Complementary feeding
Chi-2 Test. Level of significance *, **, *** With $\alpha=0.05$.

4. DISCUSSION

Complementary foods were provided early or too late to more than halve children with the mean age for introducing CF estimated at 4.9 months. Untimely introduction of CF appeared as a concern with in the study area. Similar findings were observed in Tanzania and India where age of introduction was estimated at 3.30 months and 3-5 months respectively [14,15]. Counseling from parents and healthcare workers and mothers' perceptions were important factors influencing the beginning of complementary feeding. A study in Nigeria found that some mothers started complementary feeding early as a result of instructions given in the hospital [16]. Collaterals such as grandmothers and aunts, as vectors of dietary habits, should therefore also be addressed in nutritional interventions. Capacity building of healthcare workers focusing on child nutrition and behavior change communication also appears fundamental to provide appropriate counseling. No specific complementary foods were given to IYC. Indeed, cereal porridges and extracts from family diets are the two main CF consumed by children whilst three categories of CF including special dish were identified in Burkina Faso [17]. Concerning porridges, the majority of children were given maize-porridge and only few (15%) received enriched porridges. Lack of timing of mothers and low availability or accessibility of ingredients to prepare enriched flour are relevant limiting factors according respondents.

With regards to family dishes, children diets were composed of staple foods (cereals, roots, legume) accompanied by sauces. This finding is similar to studies carried out in southern-Benin describing that the complementary foods comprise porridges, snacks and family dishes [18]. Concerning sauces, around half of the children consumed leafy vegetable (LVs) sauce, mainly *Chorchorus olitorius* often prepared with red palm oil or palm nut. Indeed, many traditional vegetables are an essential source of vitamins, micronutrients and protein and, thus, a valuable component to attain nutritional security[19,20]. In addition, the sauces were considered as an important source of vitamin A for young Beninese children[21]. Therefore, the consumption of leafy vegetable sauces is a good dietary habits which contributes to improve dietary diversity. The high rate of MDD (60%) in the studied population compared to the national prevalence of 25% was likely related to the predominant consumption of diversity of LV. In addition, the high prevalence of MDD among Bopa's children under one year was likely related the frequency of LV provided that is higher than Houeyogbe. Inversely, the consumption of fruits practically absent in children' diet is one of the weaknesses registered. Currently, similar trend was also in India where fruits were also missed in the diet of child [15]. The promotion of fruit consumption appear capital to improve quality of child's diet. But, for nutrition education to be effective in changing behavior, it is critical that it is accompanied by environmental changes[22].

5. CONCLUSION

The findings of this study provide in-depth knowledge on feeding practices and potential constraints to the adoption of optimal feeding practices. Breastfeeding was widely practiced but EBF until 6 months was very poor. Too early or late introduction of CF remains a crucial concern that hampered optimal infant

237 feeding practices. Porridges and family dishes were the main CF provided to children. The local
238 biodiversity, fruit and the diversity of traditional potentially nutritious food recipes should be integrated to
239 the national strategy for infant and young child feeding to facilitate the implementation of food security
240 and nutritional programs. Believes, local perceptions and insufficient capacity building of healthcare
241 workers may be the potential bottlenecks to behavior change for adoption of adequate infant feeding
242 practices. Taking into account local perceptions appears fundamental to formulate key messages in order
243 to ensure sustainable behavior change. Moreover, reinforce capacity building of healthcare workers
244 focusing on child nutrition appears important to provide adequate counseling on issues regarding child
245 care, including infant feeding practices during antenatal and postnatal visits. Nutritional education at
246 community level targeting mothers and collaterals is an important strategy that contributes to the
247 effectiveness of nutrition interventions programs in order to improve child well-being.
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ETHICAL APPROVAL

Ethical approval was obtained from the Benin National Ethics Committee for Scientific Research (N°45/MS/DC/SGM/DFR/CNERS/SA). Thus study only involved parents of children who show complete willingness to participate based on attestation to the informed consent provided.

"All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki."

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