

Assessment of Nutritional Status and Associated Factors in Infants Aged 6 to 23 Months in Rural Burundi

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Abstract

This study was carried out in the Health districts of Kayanza and Gahombo. Its aim was to assess the nutritional status and associated factors of infants aged between 6 and 23 months. This descriptive and cross-sectional study was carried out in the health centers of the action zone during medical consultations in community medicine from 13 to 22 February 2023. For this purpose, 53.0% of a sample of 398 mothers of infants aged 6 - 23 months were male, and the most represented age group was 12 - 23 months with 53.8%. Mothers were asked about the diet of their children. All the children involved in this study were vaccinated, whereas 99.2% were given vitamin A supplements. The most frequent illnesses in this age group were acute respiratory infection (ARI) (73.4%), fever (66.6%), diarrhea (53.8%), and vomiting (40.5%). Analysis of nutritional status showed that infants had severe (8.3%) and moderate (70.4%) acute malnutrition. Factors associated with infant nutritional status comprised the occupation of mother ($P = 0.009$), level of education of mother ($P = 0.0625$), and prolonged diarrhea ($P = 0.004$). To remedy this problem, concrete nutritional and educational interventions are needed to promote optimal infant nutrition during the first two years of life.

Keywords

Nutritional Status, Infant, Complementary Feeding, Burundi

1. Background

In Burundi, particularly in Kayanza Provincial Health Office where our study was carried out, the prevalence of chronic malnutrition and severe malnutrition is 58.2% and the prevalence of severe malnutrition is the 6%. The aim of this study was to measure the nutritional status of infants receiving complementary foods and associated factors.

2. Introduction

According to the World Health Organization (WHO), diversification or complementary feeding is defined as the introduction of nutritionally adequate complementary foods to meet the growing nutritional needs of infants from 6 to 24 months of age [1]. During the first 1,000 days of an infant's life, complementary feeding is period of transition from an exclusive milk diet to varied diet tending towards an autonomous, adult model [2]. According to the WHO, malnutrition is a pathological state resulting from the relative or absolute insufficiency or excess of one or more essential nutrients, whether manifested clinically, or detectable only by biological, anthropometric or physiological analyses [3]. Child malnutrition remains a global health challenge, leading to high morbidity and mortality, as well as stunted growth [4]. The effects of childhood malnutrition are long-lasting and persist into adulthood [5]. For proper growth and harmonious development, WHO recommends that infants should be exclusively breastfed for the first six months of life, and that to meet changing nutritional needs, infants should receive safe and nutritionally adequate complementary foods from 6 months of age, while breastfeeding should continue until two years of age or beyond [6]. Poor feeding practices for mothers, infants, and young children are associated with high levels of malnutrition [1]. Optimal breastfeeding and complementary feeding practices have been shown to be effective for harmonious child development [7]. Around one third of infant mortality is caused by malnutrition linked to inappropriate complementary feeding practices, especially for children under five years [8]. Malnutrition in all its forms increases the risk of illness and early death [9]. Inadequate nutrition remains a critical factor in the growth and development of children, especially those under the age of 2 [1].

According to the latest National Nutritional Safety and Mortality Survey, only 26% of Burundian infants aged between 6 and 23 months achieve minimum dietary diversity. Also, the survey showed that 66% of these infants achieve minimum meal frequency. The prevalence of malnutrition in children aged between 6 and 23 months was 52.2% for chronic malnutrition, 9.8% for moderate acute malnutrition, and 1.1% for severe acute malnutrition [10]. According to this national survey, the prevalence rate of chronic malnutrition, moderate acute malnutrition, and severe acute malnutrition in Gahombo Health District (HD) were found to be 68.3%, 7%, and 1%, respectively. Similarly, the rates of these indicators of nutritional status and mortality were respectively 58.2%, 5.7%, and 0.3%

Kayanza HD [10]. To our knowledge, data on complementary feeding and its impact on the nutritional status of children aged between 6 and 23 months and their associated factors were not available in the two studied HDs, namely Kayanza and Gahombo. This challenge is linked to the lack of research on complementary feeding of children aged between 6 and 23 months. The **objective** of this study is to assess the nutritional status of infants during complementary feeding and to determine the associated factors in order to shed light on the correlation between nutritional status and infant health. The results of this study could enrich the knowledge of mothers on complementary feeding in Burundi, and more specifically in the health districts of Kayanza and Gahombo

3. Materials and Method

3.1. Description of Study Site

The study is carried out in two HDs of Kayanza and Gahombo in Kayanza province in the north of Burundi. The study area lies between 2°47'16" and 3°13'78" South Latitude and 29°25'11" and 29°55'95" East Longitude, with a surface area of 783.06 Km², representing 63.49% of the area of Kayanza province. It is bordered to the north by the Republic of Rwanda, to the west by Cibitoke provinces, to the south and south-east by Butaganzwa and Rango communes of Kayanza province, and to the east by Ngozi province. These two HDs cover six communes, namely Kayanza, Muruta, Kabarore, Gatara, Gahombo, and Muhanga out of 9 communes that constitute the Kayanza province. The area of interest had a population of 614,772 inhabitants with a density of 785 inhabit/km² [11] (**Figure 1**).

3.2. Period and Type of Study

Based on an anonymous questionnaire, the date of this cross-sectional, descriptive, and analytical study were collected from 13 to 22 February 2023. All children aged between 6 and 23 months whose mothers had consented to participate were included in the study. However, children of the same whose mothers refused to consent were not included.

3.3. Inclusion and Non-Inclusion Criteria

Inclusion criteria: All children aged 6 to 23 months whose mothers had consented to participate were included in the study.

Non-inclusion criteria: Children aged 6 to 23 months were not included in the study, including mothers and caregivers who had not consented to participate.

3.4. Sample Size

The minimum sample size was calculated using the formula of François Daniel [12] as follows:

$$n = \frac{t^2 \cdot N}{t^2 + (2e)^2 (N - 1)}$$

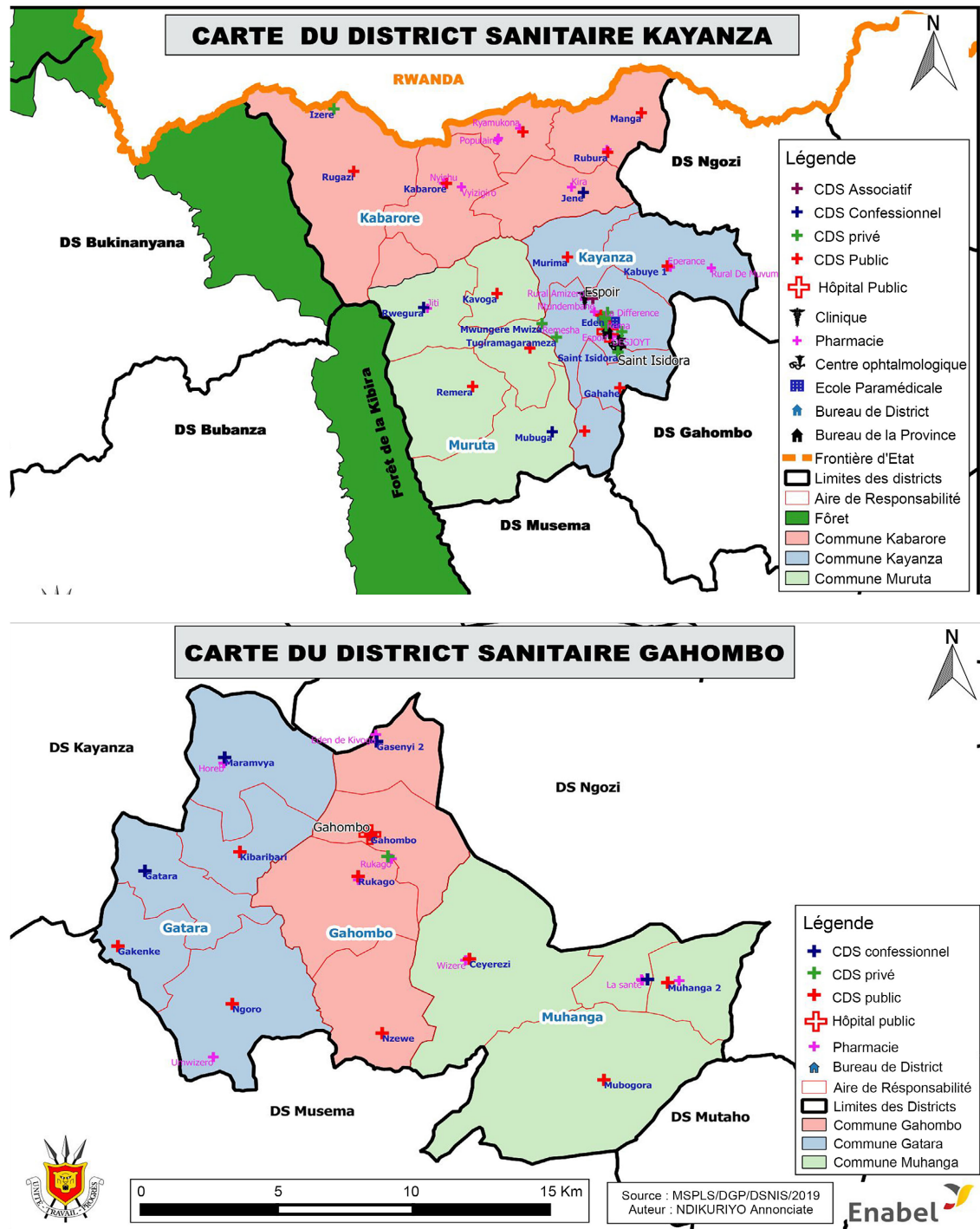


Figure 1. National health information system (NHIS) 2018.

With n the sample size, t the risk of error associated with the confidence interval, which is equal to (1.96), N the total population of the two districts (31035), e the desired absolute precision expressed as a fraction of 1. ($e = 0.05$). After calculation, n was found to be equal to 379.4. With 5% of 379 (i.e., 19) non-respondents during our survey, we arrived at $n = 398$ infants to be surveyed.

$$n = \frac{1.96^2 \times 31035}{1.96^2 + (2 \times 0.05)^2 (31035 - 1)}$$

$$n = \frac{119224.056}{314.181}$$

$$n = 379.4$$

3.5. Data Collection Techniques and Tools

3.5.1. Data Collection Process

During the survey, authorization was obtained from a health center manager, and the interviewers received training. Anthropometric measurements of all children were carried out using an electronic scale with a digital display dial capable of weighing from 1 kg to 150 kg, or a combination of the two.

Prior to the actual survey, the interviewers received training. To validate the questionnaire, a preliminary survey of 20 mothers has been conducted. Anthropometric measurements of all children were carried out using an electronic scale with a digital display dial capable of weighing from 1 kg to 150 kg or a hanging scale with a capacity of up to 25 kg for children to measure the weight. The height of children was also recorded as well as the , a measuring tape for children up to 2 years of age in the supine position, graduated in 0.1 cm to measure height, and a mother band graduated in 25 cm to measure mid-arm circumference (MUAC) to measure brachial perimeter were measured.

The survey was carried out on the basis of a questionnaire administered to the mothers to collect data relating to nutritional status, socio-demographic characteristics, preventive aspects, and feeding practices. Nutritional status comprised anthropometric measurements (weight, height, sex, and age) of all selected children that were surveyed to identify the different forms of malnutrition and their respective degrees and (severe, moderate, overall). As a result, MUAC is also a measurement and nutritional indicator divided into three zones. A green zone above 12.5 cm means that the child is normal, a yellow zone between 12.4 cm and 11.5 cm means a risk of malnutrition and the child should be examined and monitored, and receive nutritional supplements. The red zone measures less than 11.5 cm and indicates severe malnutrition requiring stabilization treatment.

Socio-demographic characteristics included the age and sex of the child, and the age and marital status of the mother as well as her level of education. Preventive aspects **focused** on vitamin A intake in children and infant vaccination. Feeding practices comprised the breastfeeding and complementary feeding practices.

Breastfeeding practices, complementary feeding practices from 6 months, breastfeeding practices, different food groups consumed by the child, benefits of breastfeeding and “how to feed the child for illnesses contracted during the last two weeks of the survey”.

3.5.2. Data Analysis

Data were entered using Kobocollect software and then exported to SPSS 25 for

statistical analysis to derive percentages. The odds ratios (OR) were presented with a 95% confidence interval. The significance level was set at 5%.

3.6. Ethical Considerations

The free and informed consent of the mothers surveyed was obtained after explaining the objectives of the study before the administration of the questionnaire. The data collected were analyzed in strict compliance with the confidentiality and anonymity of the respondents.

4. Results

4.1. Socio-Demographic Characteristics of Mothers and Their Infants Aged between 6 and 23 Months

Globally, 53.04% of the infants were aged between 12 and 23 months, and the male sex was predominant at 53.0%. The majority (94.2%) of infants had birth weights ranging from 2500 g to 4000 g and 89.2% of infant weights were between 5.1 kg to 10 kg. Similarly, 8.3%, 21.44%, and 70.4% of infants had a brachial perimeter (BP) less than 115 mm, from 115 mm to 125 mm, and higher than 125 mm, respectively. Among the respondent mothers, 80.2% were married, 76.1% were in school, 83.9% had a profession, and 71.6% were aged between 20 and 29 (**Table 1**).

4.2. Infant Health Characteristics

The health characteristics of the infants are described in **Table 2**. 99.2% of infants had received vitamin A supplementation while 90.7% had vaccination cards, and 100% of had been correctly vaccinated according to the vaccination schedule in force in Burundi. Illnesses contracted in the last two weeks were in the following order (**Table 2**): ARI (73.4%), fever (66.6%), diarrhea (53.8%), and vomiting (40.5%). The majority of mothers (60.6 %) had between one and two children.

4.3. Prevalence of Malnutrition by Brachial Circumference (BP)

Concerning the prevalence of malnutrition in relation to brachial perimeter, the results showed that 70.4% of infants had a BP greater than 125 mm (no malnutrition), 21.4% had a BP between 115 and 125 mm (moderate acute malnutrition) and 8.3% had a BP less than 115 mm (severe acute malnutrition/stunting) (**Table 3**).

4.4. Factors Associated with the Nutritional Status of Infants

Table 4 shows the factors associated with infant nutritional status in the bivariate analysis. A non-significant association was found between infant nutritional status and child gender, infant age, marital status of the mother and cough, vomiting, and fever as illnesses contracted within the last two weeks before the survey. The association between the nutritional status of infants and the occupation of

Table 1. Socio-demographic characteristics of infant and mother.

Features	Number (n = 398)	(%)	
marital status of mothers	Single	27	6.8
	Bride	319	80.2
	Common-law union	18	4.5
	Widowed/Divorced	34	8.5
level of education of mothers	Out of school	95	23.9
	Schoolchildren	303	76.1
occupations of mothers	With profession	334	83.9
	No profession	64	16.1
Age of mothers	<20 years	27	6.8
	20 - 29 years	285	71.6
	30 - 40 years	79	19.8
	41 and over	7	1.8
gender of child	Male	211	53.0
	Female	187	47.0
age of child	12 - 23 months	214	53.8
	6 - 8 months	77	19.3
	9 - 11 months	107	26.9
Birth weight in g	<2500 g	1	0.3
	2500 g	18	4.5
	>4000 g	4	1.0
	2500 - 4000 g	375	94.2
Current weight in kg	≤5 Kg	3	0.8
	10.1 - 15 Kg	40	10.1
	5.1 - 10 Kg	355	89.2
Brachial Perimeter (BP) in mm	<115 mm	33	8.3
	>125 mm	280	70.4
	115 - 125 mm	85	21.4

Table 2. Infant health parameters.

Characteristics (n = 398)	Workforce	(%)	
Possession of vaccination card	No	37	9.3
	Yes	361	90.7
Child's vaccination status	Yes	398	100.0
Vit A supplementation	No	3	0.8
	Yes	395	99.2
Presence of signs of illness/Vomiting	No	237	59.5
	Yes	161	40.5
Frequency of signs of illness/Fever	No	133	33.4
	Yes	265	66.6
Frequency of signs of illness/Diarrhea	No	184	46.2
	Yes	214	53.8
Frequency of signs of illness/ Cough with fever (ARI)	No	106	26.6
	Yes	292	73.4

Table 3. Prevalence of malnutrition by brachial circumference.

Characteristics (n = 398)		Workforce	%
Brachial perimeter (BP) in mm	<115 mm	33	8.3
	>125 mm	280	70.4
	115 - 125 mm	85	21.4

Table 4.

		Brachial Perimeter (BP) in mm			P-value
		<115 mm	>125 mm	115 - 125 mm	
		(%)	(%)	(%)	
gender of child	Female	5.8	34.7	12.6	0.914
	Male	2.5	35.7	8.8	
Age of child	12 - 23 months	4.5	38.7	10.6	0.123
	6 - 8 months	1.5	15.1	2.8	
	9 - 11 months	2.3	16.6	8.0	
marital status of mothers	Single	1.3	3.0	2.5	0.540
	Bride	4.3	60.3	15.6	
	Common-law union	1.5	1.5	1.5	
	Widowed/Divorced	1.3	5.5	1.8	
Occupations of mothers	With profession	7.8	55.8	20.4	0.009
	No profession	0.5	14.6	1.0	
level of education of mothers	Out of school	4.0	11.8	8.0	0.0625
	Schoolchildren		58.5	13.3	
Vomiting	No	2.8	47.7	9.0	0.245
	Yes	5.5	22.6	12.3	
Fever	No	2.5	23.4	7.5	0.598
	Yes	5.8	47.0	13.8	
Diarrhoea	No	2.5	38.9	4.8	0.004
	Yes	5.8	16.6	16.6	
Cough with fever (ARI)	No	2.5	16.3	7.8	0.125
	Yes	5.8	54.0	13.6	

mothers was statistically significant ($P = 0.009$). Similar significance was also observed with reference to the level of education ($P = 0.0625$) and diarrhoea as a disease contracted in the last two weeks before the survey ($P = 0.004$).

5. Discussion

The aim of this study was to assess the nutritional status of children aged between 6 and 23 months and associated factors. In the surveyed population, 80.2% of mothers were married. This result was lower than those of other sub-Saharan African researchers in their studies conducted by Dagnew *et al.* in Ethiopia (91%) [13], Marinda *et al.* in Zambia (99.4%) [14], Mbusa *et al.* in

Democratic Republic of Congo (DRC) (83.6%) [6], and Tafese *et al.* in Ethiopia (85.3%) [15]. This observation could be explained by the advanced level of education in the previous countries. The study also showed that 76.1% of mothers attended school, a result similar to those of other researchers such as Princillia *et al.* in Senegal (74.5%) [16], Chiabi *et al.* in Cameroon (83.3%), [1], Ran Laadjel *et al.* (year), who found that 55.71% of mothers attended school in Algeria [17]. Thus, the levels of education of mothers could justify the relatively high rates of healthy children. Nevertheless, in our study population, 83.9% of women had a profession. In the DRC the results of Mbusa Kambale *et al.* (year) [6] were close to ours observation (71%). Similar results were also observed in the study of Chiabi *et al.* in Cameroon (70.7%) [1] and Rania Laadjel *et al.* in Algeria (71.62%) [18]. For our population, infants aged between 12 and 23 months were more preponderant with 53.8%. This result is close to that found in the last national survey on the nutritional situation and mortality [10]. And those found by other researchers such as Reynold *et al.* (50%) in Kenya [19], Zhang *et al.* 98 in China (75%) [5], Tafese *et al.* in Ethiopia (73.2%) [15], and Ariyo *et al.* in their studies conducted in Nigeria (85.9%) [4].

In this study, the results showed that the male sex was preponderant at a rate of 53.0%. Similar results were found by other researchers, including Rochoy *et al.* in his study conducted in Ethiopia (58%) [20], Princillia *et al.* in Senegal (57%) [16], and Ariyo *et al.* in Kenya (56.2%) [4]. In addition, the birth weight of children in our population was between 2500 g and 4000 g, which was more prevalent in 94.2% of births. This observation was in line with the study of Mbusa Kambale *et al.* in the DRC (85.1%) [6].

With regard to nutritional aspect, 99.2% of children received vitamin A supplementation from birth to two years of age. The same observation was made during the last national survey on nutritional security and mortality in Burundi [10]. Nevertheless, this proportion is in line with the recommendations of the WHO [21]. Similar results were found by Diaby in his study carried out in Senegal (90.4%) [22]. In addition, 90.7% of children had vaccination cards, and 100% of children in our population received at least one vaccine. This observation could be explained by the fact that all respondent mothers were met when coming to the vaccination department for a consultation. This approach is far superior to that of the researcher Mounkaila *et al.* in Niger, 68.6% of children having received full vaccinations [9]. Moreover, these results are slightly higher than those observed in the national survey carried out in 2020 [10]. This could be explained by the involvement of health staff and light mom raising community awareness.

In this study, 8.3% and 70.4% of children were severely and moderately malnourished, respectively. WHO standards for brachial circumference (BP) show that in a well-nourished population there are very few children with a BP below 115 mm in the children aged between 6 and 60 months. Children with a BMI below 115 mm have a higher risk of death than those with a BMI above 115 mm [23]. This is due to inappropriate complementary feeding for reasons of lack of

diversified foods in quantity and quality according to the opinions of the mothers surveyed. Similar results were found by Mbusa *et al.* in their study in the DRC with 98.3% for a PB more or less great than 125 mm [6].

With regard to level of education of mothers, this study showed a significant association with complementary feeding of children ($P = 0.0625$). This finding was by Chiabi in his study conducted in Cameroon [1]. This situation could be explained by the high level of education of mothers as the majority has attended school. These mothers have little time to look after their children. However, the same results showed a statistically significant association between the occupation of mothers and the nutritional status of children ($P = 0.009$). This finding is in line with the results of the study of Mbusa Kamable in the DRC [6]. Diarrhea also had a significant influence on the nutritional status of children ($P = 0.004$). Similar observation has been made by Allomasso in his study conducted in Benin [24].

Study Limitations

The limitations of this study were that mothers with malnourished children were unwilling to complete the entire questionnaire, and caregivers did not facilitate the conversation between the respondent and the interviewer.

6. Conclusion

The nutritional situation of infants and its associated factors in the two health districts of Kayanza and Gahombo remains a public health problem, although some health indicators are at a satisfactory level. The immunization status of the infants studied is at a very high level. Diarrhoea, vomiting, fever, cough and ARI are the diseases most frequently encountered in the area of responsibility of the two districts, but diarrhoea conditions have a real impact on nutritional status. Vitamin A supplementation for children, which boosts their immune systems, is at a very satisfactory 99.2%. Moderate acute malnutrition is by far the most frequent form of malnutrition, at 70.3%, while severe acute malnutrition is 8.3%. Factors statistically associated with infant nutritional status were mother's occupation ($P = 0.009$), mother's level of education ($P = 0.0625$) and recent diarrhoea ($P = 0.004$).

Conflicts of Interest

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

References

- [1] Chiabi hiabi, A., Kago Tague, D.A., Nguéfack, F.D., Laksira, A., Nguéfack, S., Mah, E. and Simnoue, D. (2020) Diversification alimentaire chez les nourrissons de 6 à 24 mois à l'hôpital régional de Garoua, Cameroun. *Journal de Pédiatrie et de Puériculture*, **33**, 77-82. <https://doi.org/10.1016/j.jpp.2019.07.006>

- [2] Rochoy, M., Mameche-Yazit, A., Puszkarek, T. and Carré, M. (2021) Diversification alimentaire chez les enfants de 6 à 12 mois: Connaissances des parents et facteurs influençant leurs pratiques. *Journal de Pédiatrie et de Puériculture*, **34**, 262-270. <https://doi.org/10.1016/j.jpp.2021.03.006>
- [3] Diallo, A.M. (2020) Connaissances, attitudes et pratiques des mères sur l'alimentation des enfants de 0 à 23 mois et leur statut nutritionnel à la pédiatrie/URENI du CSRéf de Niafunké de décembre 2018 au février 2019. Ph.D. Thesis, Université des Sciences, des Techniques et des Technologies de Bamako, Bamako.
- [4] Ariyo, O., Aderibigbe, O.R., Ojo, T.J., Sturm, B. and Hensel, O. (2021) Determinants of Appropriate Complementary Feeding Practices among Women with Children Aged 6-23 Months in Iseyin, Nigeria. *Scientific African*, **13**, e00848. <https://doi.org/10.1016/j.sciaf.2021.e00848>
- [5] Zhang, M., Giloi, N., Shen, Y., Yu, Y., Sherin, M.A. and Lim, M.C. (2022) Prevalence of Malnutrition and Associated Factors among Children Aged 6-24 Months under Poverty Alleviation Policy in Shanxi Province, China: A Cross-Sectional Study. *Annals of Medicine and Surgery*, **81**, Article ID: 104317. <https://doi.org/10.1016/j.amsu.2022.104317>
- [6] Mbusa Kambale, R., Bwija Kasengi, J., Ambari Omari, H. and Masumbuko Mungo, B. (2017) État nutritionnel et facteurs influençant la diversification alimentaire précoce des nourrissons de 6 à 24 mois dans deux unités de PMI de la République démocratique du Congo. *Journal de Pédiatrie et de Puériculture*, **30**, 107-112. <https://doi.org/10.1016/j.jpp.2016.12.004>
- [7] Diagne-Guèye, N.R., Diack-Mbaye, A., Dramé, M., Diagne, I., Fall, A.L., Camara, B., Faye, P.M., Sylla, A., Diouf, S., Sy-Signaté, H. and Sarr, M. (2011) Connaissances et pratiques de mères sénégalaises vivant en milieu rural ou suburbain sur l'alimentation de leurs enfants, de la naissance à l'âge de six mois. *Journal de pédiatrie et de puériculture*, **24**, 161-166. <https://doi.org/10.1016/j.jpp.2010.12.001>
- [8] de la Santé, O.M. (2008) Second WHO European Action Plan for Food and Nutrition Policy 2007-2012. SUISE WHO, Geneva.
- [9] Mounkaïlla, A.A.I., Ibrahim, A.S., Seini, H.S., Toudou, A. and Idi, A.M. (2022) [Supplementary Feeding and Nutritional Status of Children Aged 6 to 24 Months in the Rural Commune of Liboré in Niger]. [publication information/link.](#)
- [10] Author (2023) Ministère de la Santé Publique et de Lutte contre le Sida Enquête nationale sur la situation nutritionnelle et mortalité au burundi 2020. [publication information/link.](#)
- [11] ISTEEBU (2023) Situation géographique de la province kayanza.
- [12] Giezendanner, F.D. (2012) Random Sample Size and Margin of Error. *Instruction Publique, Culture et Sport*, **7**, [page.](#)
- [13] Belachew, A., Tewabe, T., Birhie, A., Birehanu, M., Alehegn, T., Simachew, A. and Tsegaw, A. (2019) Factors Associated with Compliance with World Health Organization-Recommended Infant-Feeding Practices by Mothers with HIV Infection in Northwest Ethiopia. *Current Therapeutic Research*, **91**, 39-44. <https://doi.org/10.1016/j.curtheres.2019.100568>
- [14] Marinda, P.A., Chalula, F., Khayeka-Wandabwa, C., Audain, K. and Thilsted, S.H. (2023) Dietary Diversity and Nutritional Status of Children Aged 6-59 Months from Rural Fishing and Non-Fishing Communities in Zambia. *Scientific African*, **19**, e01527. <https://doi.org/10.1016/j.sciaf.2022.e01527>
- [15] Tafese, Z., Reta, F., Mulugeta, B. and Anato, A. (2022) Child Undernutrition and Associated Factors among Children 6-23 Months Old in Largely Food Insecure

Areas of Rural Ethiopia. *Journal of Nutritional Science*, **11**, e63.

<https://doi.org/10.1017/jns.2022.61>

- [16] Mouissi Loukoula, D.P., Mpouho Ntsougha, E.M., Diégane Tine, J.A., Sougou, N.M., Camara, M.D., Seck, P.A., Toure, N.K., Bassoum, O., Faye, A. and Seck, I. (2020) Facteurs Associés À L'alimentation Complémentaire Appropriée Des Enfants Allaités Ages De 6 À 23 Mois Dans La Commune De Kaolack (Senegal). *International Journal of Innovation and Applied Studies*, **29**, 1242-1252.
- [17] Laadjel, R. and Taleb, S. (2020) Factors Associated with the Age of Initiation of Dietary Diversification in Children Aged 6 to 60 Months in Eastern Algeria: Correlation with Nutritional Status. *Nutrition Clinique et Métabolisme*, **34**, 238-247. <https://doi.org/10.1016/j.nupar.2020.03.004>
- [18] Rabeah Rania, B., Sonia, M., Adel, B., Nada, M., Salem, Y. and Samir, B. (2022) Évolution du statut nutritionnel d'une cohorte d'enfants tunisiens au cours de l'hospitalisation: Facteurs de risque de la dénutrition hospitalière. *Nutrition Clinique et Métabolisme*, **36**, 59-67. <https://doi.org/10.1016/j.nupar.2021.12.001>
- [19] Reynolds, E.C., et al. (2021) Mothers' Perspectives of Complementary Feeding Practices in an Urban Informal Settlement in Kisumu County, Western Kenya. *Current Developments in Nutrition*, **5**, NZAB065. <https://doi.org/10.1093/cdn/nzab065>
- [20] Rochoy, M., Mameche-Yazit, A., Puzzkarek, T. and Carré, M. (2021) Diversification alimentaire chez les enfants de 6 à 12 mois: Connaissances des parents et facteurs influençant leurs pratiques. *Journal de Pédiatrie et de Puériculture*, **34**, 262-270. <https://doi.org/10.1016/j.jpp.2021.03.006>
- [21] World Health Organization (2003) Global Strategy for Infant and Young Child Feeding. Geneva.
- [22] Diaby, H. (2020) Diversification alimentaire chez les nourrissons de 6 à 24 mois dans le département de la pédiatrie du CHU Gabriel Touré de Bamako/Mali. Lieu de dépôt: Bibliothèque de la FMPOS. Ph.D. Thesis, Université des Sciences, des Techniques et des Technologies de Bamako, Bamako.
- [23] Trèche, S., de BENOIST, B., Benbouzid, D., Verster, A. and Delpeuch, F. (1995) L'alimentation de complément du jeune enfant. OMS/ORSTOM, Paris.
- [24] Allomasso, R., Coulibaly, R., Glitho, O.I. and Hell, K. (2006) Principaux facteurs affectant l'état nutritionnel et de santé des enfants exposés à l'aflatoxine au Bénin: Application du model Probit. *Bulletin de recherche agronomique du Bénin*, **53**, 9-17.