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Kwashiorkor Prevalence and Forecast Trends in Under-Five Children Across Health Districts of Far North Cameroon

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Abstract: ***Kwashiorkor, a severe form of acute malnutrition characterized by nutritional edema, remains a pressing concern in Cameroon's Far North region. This study analyzes trends in kwashiorkor cases among children aged 0 to 59 months admitted to nutritional centers between 2020 and 2024. Data were collected from various health districts and assessed using Excel for trend analysis and forecasting. The highest prevalence was observed in Fotokol, Makary, Goulfey, and Mada districts, all within insecure zones experiencing displacement and food insecurity. The study further provides five-year forecasts indicating potential increases in specific districts. Results underline the need for targeted interventions, including improved child feeding practices, nutritional supplementation, and disease prevention measures to curb the rise of kwashiorkor in vulnerable populations.***

Keywords: kwashiorkor, child malnutrition, Far North Cameroon, health districts, prevalence trends

1. Introduction

Malnutrition contributes significantly to a high mortality rate among children under five in the world and, as an underlying factor, is estimated to contribute to more than one-third of all under-five deaths (Lim, 2012). In Cameroon, malnutrition is a public health problem. Indeed, the Far North region presents a precarious situation with a prevalence of global acute malnutrition of 8.0% according to the results of the SMART/SENS 2022 nutrition survey. Kwashiorkor, also known as edematous malnutrition, is one of the two main types of Severe Acute Malnutrition (SAM) and is estimated to affect hundreds of thousands of children each year (Alvarez et al., 2016; Frison et al., 2015; Kismul et al., 2014). Mortality is very high in children with marasmus, and even higher in those with marasmus (Prudhon et al., 1997). The 2019 World Health Organization (WHO) International Classification of Diseases defines kwashiorkor as a form of "severe malnutrition with nutritional edema, depigmentation of the skin and hair, and is associated with high morbidity and mortality" (Zulfiqar et al., 2017). The diagnosis of kwashiorkor remains primarily based on the observation of edema. However, numerous other clinical signs accompany, or even precede, its development, including lethargy, loss of appetite, behavioral changes, skin lesions, and hepatic steatosis (Blado et al., 2002). Although data on kwashiorkor are gradually accumulating, its etiology remains largely unclear (Fitzpatrick et al., 2021) and is linked to diet, poor sanitation, and the high prevalence of infectious diseases. This study is vital for public health planning in Cameroon's Far North region, where malnutrition persists amid conflict and displacement. By offering district-level insights and forward-looking data, the findings can guide targeted nutritional interventions and policy decisions to reduce child mortality and improve community health outcomes.

General Objective: To determine trends in the prevalence of kwashiorkor among children aged 0 to 59 months admitted to the health facilities of the region's health districts.

Specific Objectives:
- Determine the evolution of kwashiorkor by DS
- Determine the prevalence among children admitted to the health facilities by DS
- Calculate forecasts for the next three years.

2. Methodology

Type and Period of Study
This retrospective study analyzed kwashiorkor admission data from January 1, 2020, to December 31, 2024, retrieved from the District Health Information Software 2 (DHIS2).

Statistical Analysis
Data collected in DHIS2 were used to calculate percentages, plot trend linear regression, and make forecasts using Excel software.

3. Results

Trends in admissions of kwashiorkor cases to health facilities in the health districts of the Logone et Chari, Mayo Sava, and Mayo Tsanaga Department

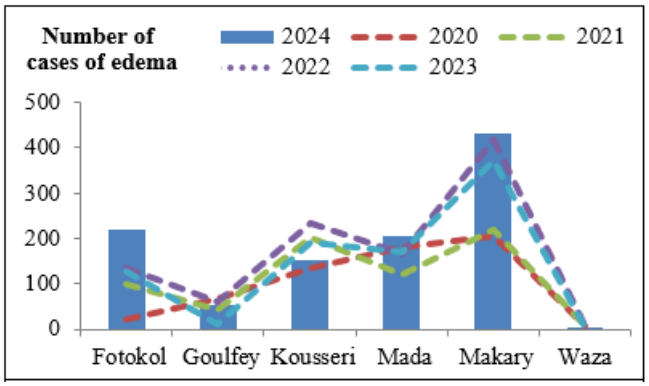

Figure 1: Evolution of admissions of kwashiorkor cases in children aged 0-59 months in the DS of Logone and Chari, 2020-2024.

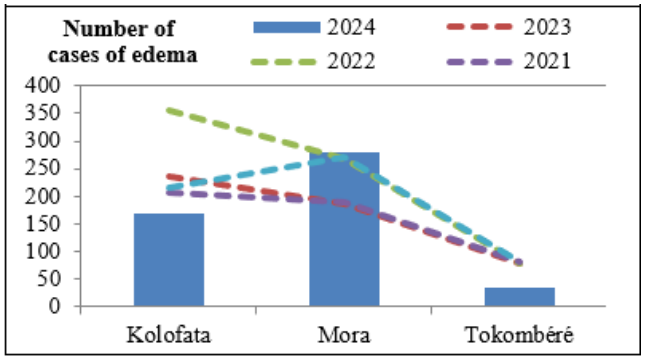

Figure 2. Evolution of admissions of kwashiorkor cases in children aged 0-59 months in the HD of Mayo Sava, 2020-2024

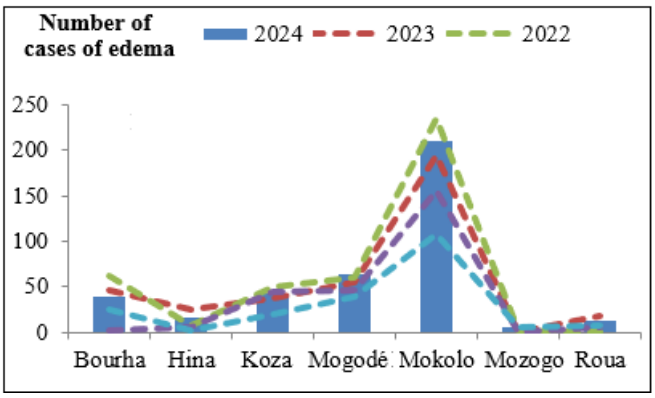

Figure 3: Evolution of admissions of kwashiorkor cases in children aged 0-59 months in the DS of Mayo Tsanaga, 2020-2024

Figures 1, 2, 3 show a significant number of cases of edema in the HD of Logone and Chari, Mayo Sava and some HD of the department of Mayo Tsanaga. An increase in cases from 2020 to 2022 in the HD of the Department of Logone and Chari, followed by a decrease in 2023 and a resumption of the increase in 2024. The Waza health district exhibited relatively stable admission numbers from 2020 to 2024. The Fotokol and Makary health districts recorded the highest number of cases of kwashiorkor over the entire period regardless of the seasonal calendar when the data are disaggregated by month. In Mayo Sava, a relative decline in cases was observed in the Kolofata health district from 2020 to 2024, and in the Mora district, a seesaw pattern, peaking in 2024. For the Mayo Tsanaga Department, the most impacted HD were Mokolo and Mozogo, which saw an increase in the number of cases from 2020 to 2024 but an increase in the number of cases in 2024 compared to 2023.

Trends in admissions of kwashiorkor cases to health facilities in the health districts of the Diamaré, Mayo Danay and Mayo Kani

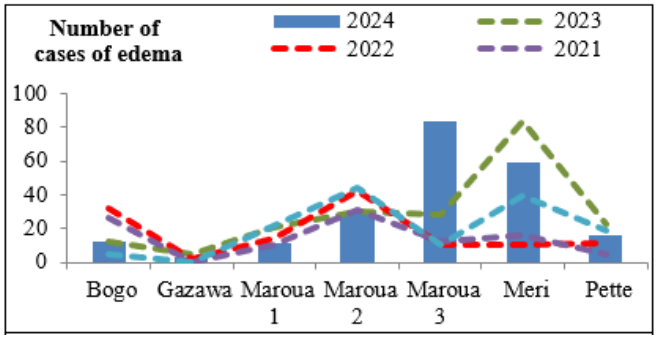

Figure 4: Evolution of admissions of kwashiorkor cases in children aged 0-59 months in the HD of Diamare, 2020-2024.

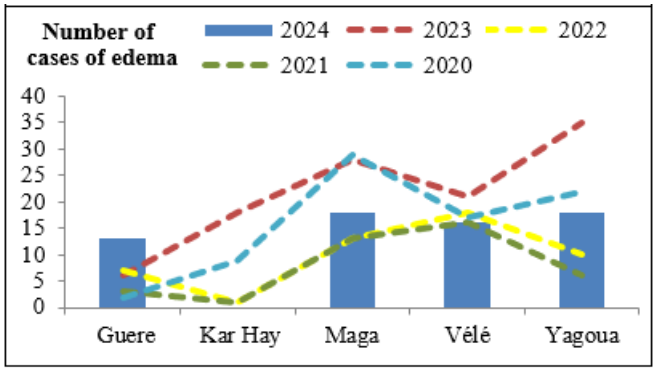

Figure 5: Evolution of admissions of kwashiorkor cases in children aged 0-59 months in the HD of Mayo Danay, 2020-2024

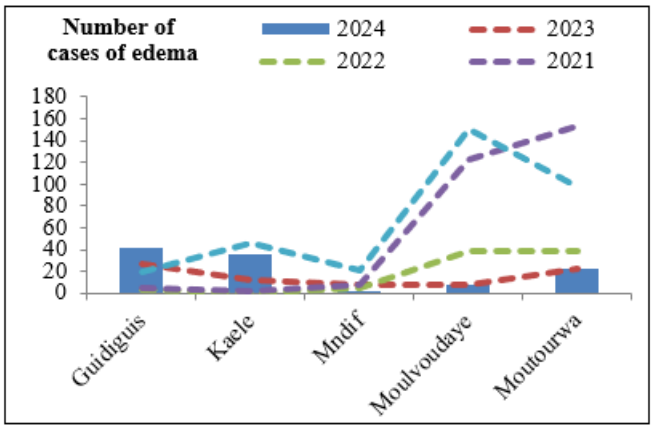

Figure 6: Evolution of admissions of kwashiorkor cases in children aged 0-59 months in the HD of Mayo Kani, 2020-2024.

From Figures 4, 5, 6 it emerges that the HD of Diamaré, Mayo Danay and Mayo Kani are those having admitted fewer cases of severe acute malnutrition with edema from 2020 to 2024. On the other hand, the HD of Moulvoudaye and Moutourwa in Mayo Kani admitted significant numbers of cases between 2020 and 2021 and which decreased from 2022. In Mayo Danay, a seesaw pattern is observed, with a decrease between 2021 and 2022, an increase in 2023, and a decrease in 2024. Regarding Diamaré, a decrease is

observed from 2020 to 2023 and an increase in 2024. This trend may be influenced by the supplementation of children aged 6–23 months with micronutrient powders (MNPs), which may have improved the nutritional status of children during this period.

Prevalence of kwashiorkor in the Health Districts of the region from 2020 to 2024 among children admitted to nutritional centers.

Table 1: New admissions of kwashiorkor cases to HD feeding centers, 2020-2024.

HD	New admisson with edema	New admission	% of edema
2024			
Fotokol	220	1424	15,4
Makary	431	3788	11,4
Goulfey	55	579	9,5
Mada	204	2946	6,9
2023			
Fotokol	128	1028	12,5
Kolofata	235	3033	7,7
Mada	171	2707	6,3
Makary	370	3236	11,4
Mogode	55	563	9,8
Mora	186	3265	5,7
Pette	23	437	5,3
Tokombere	77	1431	5,4
2022			
Bogo	32	545	5,9
Bourha	62	1182	5,2
Fotokol	136	816	16,7
Kolofata	357	2890	12,4
Mada	167	2267	7,4
Makary	418	3394	12,3
Mogode	60	647	9,3
Mokolo	235	4266	5,5
Mora	268	3538	7,6
Moulvoudaye	38	528	7,2
2021			
Bogo	26	248	10,5
Bourha	36	641	5,6
Fotokol	100	891	11,2
Kolofata	208	2915	7,1
Mada	120	2192	5,5
Makary	220	2622	8,4
Mogode	46	271	17,0
Mora	188	3499	5,4
Moulvoudaye	123	741	16,6
Moutourwa	415	1423	29,2
Vele	16	247	6,5
2020			
Fotokol	20	164	12,2
Goulfey	66	771	8,6
Kaele	46	558	8,2
Kolofata	214	2200	9,7
Kousseri	211	2944	7,2
Koza	20	368	5,4
Mada	182	637	28,6
Makary	205	1087	18,9
Maroua 2	44	874	5,0
Mogode	39	269	14,5
Mokolo	109	1697	6,4
Mora	271	2833	9,6
Moutourwa	98	548	17,9
Tokombere	82	1013	8,1

Between 2020 and 2024, there was a gradual decline in the number of health districts reporting kwashiorkor prevalence rates above 5% of kwashiorkor cases. 14 HD in 2020, 10 DSs in 2022 and 4 HD in 2024. On the other hand, the DSs most affected on a recurring basis, having received from 2020 to 2024, a significant number of cases are, Fotokol, Makary, Goulfey, Mada, with respectively 14.4%, 11.4%, 9.5%, 6.9% prevalence in the Department of Logone and Chari. This high prevalence compared to other departments could be explained by the suboptimal practices of Infant and Young Child Feeding (IYCF) due to the instability of the population which regularly suffers attacks from Non-State Armed Groups

It would also be associated with biological factors (Bhupathiraju and Hu, 2025), in particular infectious diseases that are prevalent in the area. According to Golden (1998), edematous malnutrition in children under five is not only due to a protein deficiency but to one or more type I nutrients, particularly those involved in antioxidant protection. Zulfiqar and colleagues, 2017 explain this state by the combination of social and economic factors, in particular poverty, which leads to low food availability, unsanitary living conditions, wars and forced migrations that lead to cyclical food shortages. A decrease in the practice and duration of breastfeeding, combined with inadequate weaning practices (Zulfiqar et al., 2017). According to the annual epidemiology bulletin of the Far North region in 2025, regarding morbidity, the main pathologies most reported were typhoid fever (48.0%), influenza syndromes (40.8%) and diarrhea with dehydration.

Forecasts of admissions of edema cases in Health Districts.

For effective monitoring, forecasts of kwashiorkor cases in the most affected DS were made over three years.

Table 2: Admissions trend and correlation in Logone and Chari Health Districts, 2025-2027

Health Districts	Equation	R
Fotokol	Y=42,8x-7,6	0,3
Kousséri	Y= 3x+173,6	0,1
Goulfey	Y= -5,4+63,6	0,4
Mada	Y= 9,5x+140,3	0,5
Makary	Y=60,2x+148,2	0,9
Waza	Y= 0,3x+4,5	03

Table 3: Forecast of admissions of kwashiorkor cases in health districts among children under five years of age, 2025-2027

Year	Fotokol	Goulfey	Kousseri	Mada	Makary	Waza
2025	214	31	192	197	213	6
2026	249	26	195	207	273	7
2027	292	20	198	216	333	7

According to Table 3, the number of kwashiorkor cases could increase in the coming years in the HD of Fotokol and Mada, decrease in the HD of Goulfey and Makary, and remain stable in Kousseri and Waza.

Table 4: Forecast of kwashiorkor admissions in Mayo Sava Health Districts among children under five years of age, 2025-2027

Health Districts	Equation	R
Kolofata	Y=-6,5x+255,9	0,1
Mora	Y= 1,8x+233,4	0,6
Tokombéré	Y=-9,9+100,5	0,8

Table 5: Forecast of admissions of kwashiorkor cases in health districts among children under five years of age, 2025-2027

Year	Kolofata	Mora	Tokombéré
2025	217	244	160
2026	210	246	170
2027	204	248	180

According to the calculated forecasts, it appears from Table 5 that the number of cases could increase in the health districts of Kolofata and Tokombéré and decrease in the health district of Mora.

4. Conclusion

This analytical study highlights the persistent prevalence of kwashiorkor among children under five in specific health districts of Cameroon's Far North, particularly in areas affected by insecurity and displacement. While certain districts show declining trends, others remain critically affected, as confirmed by both historical data and forecast projections. The results emphasize the need for sustained, district-specific interventions focused on preventive nutrition strategies, disease control, and community education. Aligning humanitarian support with targeted public health policies could substantially reduce the burden of malnutrition in these vulnerable zones.

References

[1] **Lim S. S., 2012.** Évaluation comparative des risques liés à la charge de morbidité et aux blessures attribuables à 67 facteurs de risque et groupes de facteurs de risque dans 21 régions, 1990-2010 : analyse systématique pour l'Étude mondiale sur la charge de morbidité2010. Lancet 380: 2224-2260.

[2] **SMART/SENS, 2022**. Rapport préliminaire Enquête nutritionnelle selon la méthodologie SMART chez les enfants de moins de cinq ans dans quatre régions du Cameroun.

[3] **Alvarez, J.L., et al.,** Putting Child Kwashiorkor on the Map, in CMAM Forum Technical Brief. 2016.

[4] **Frison, S., F. Checchi, & M. Kerac.** Omitting edema measurement: how much acute malnutrition are we missing? Am J Clin Nutr, 2015. 102(5): p. 1176-81. 4.

[5] **Kismul, H., J., Van den Broeck, & T.M. Lunde**, Diet and kwashiorkor: a prospective study from rural DR Congo. PeerJ, 2014. 2: p. e350.

[6] **Prudhon C., Golden M.H.N., Briend A &Mary JY. 1997**. Modèle de standardisation de la mortalité des enfants sévèrement malnutris, basé sur l'état nutritionnel à l'admission dans les centres de nutrition thérapeutique .Revue européenne de nutrition clinique 51 :771-777.

[7] **Organisation Mondiale de la Santé**, **2006.** Normes de croissance de l'enfant: taille/longueur pour l'âge, poids pour l'âge, poids pour la taille, poids pour la taille et indice de masse corporelle pour l'âge : méthodes et développement . Genève: Organisation mondiale de la Santé.

[8] **Zulfiqar A. Bhutta , James A. Berkley , Robert HJ Bandsma , Marko Kerac , Indi Trehan &André Briend**, 2017. Malnutrition infantile sévère Nature Reviews - Abrégés sur les maladies volume 3, Numéro d'article : 17067.

[9] **Badaloo, A, Reid, M, Forrester, T, Heird, W C and Jahoor F., 2002.** Cysteine supplementation improves the erythrocyte glutathione synthesis rate in children with severe edematous malnutrition. The American Journal of Clinical Nutrition 76 (3):646-652.

[10] **Fitzpatrick M., Gonzales G. B., Rutishauser-Perera A. et Briend A., 2021.** Kwashiorkor : réflexions sur la série de webinaires visant à « réexaminer les données probantes » https://www.ennonline.net/fex/65/fr/kwashiorkor-

[11] **Bhupathiraju S. N., Hu F., 2025.** Malnutrition protéinocalorique Vérifié/Révisé oct. 2023 | Modifié mars 2025 Révisé par Glenn D. Braunstein, MD, Cedars-Sinai Medical Center.

[12] **Bulletin Annuel Epidémiologique** de la Région de l'Extrême-Nord, 2024, 29p.

[13] **Golden M.H.N., 1998.** Malnutrition œdémateuse British Medical Bulletin, volume 54, numéro 2, pages 433–444, https://doi.org/10.1093/oxfordjournals.bmb.a011699.