

Risk Factor for Malnutrition in Children Aged 6 to 59 Months Hospitalized in a Pediatric Ward in the South of the Sahara

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Abstract

Malnutrition is a major public health problem in Mali, along with the country's political and security instability. We initiated this work with the objective of determining the frequency as well as the risk factors favoring the occurrence of malnutrition in children aged 6 - 59 months hospitalized in the pediatrics department of the Gabriel Tour  University Hospital in Bamako, country reference service to identify potential interventions to plan. A cross-sectional study was carried out over a period of 4 months. A bivariate logistic regression analysis allowed us to identify risk factors with degree of significance if $p < 0.05$. During the study period, 2888 children were hospitalized, including 348 aged 6 to 59 months, or a frequency of 12.04%. One in two children was malnourished, *i.e.* a frequency of 50%. It more frequently affected infants aged between 6 and 23 months with a frequency of 33.7%, with a hospital frequency of growth retardation which was 23% including 14.7% of severe form. The emaciation was 27% of which 18.7% were severe form. The underweight was 42.2% with 31% in severe form. We found the diet inequality in all malnourished and non-malnourished children. A bivariate analysis showed that children with an out-of-school mother have a 2.4-fold risk of being malnourished (OR = 2.425; CI = 1.9 - 4.2; $p < 0.03$). Also children from households with no stable income (non-salaried father) have twice the risk of children from a household with stable income (OR = 2.120; IC = 1.1 - 4.1; $p < 0.002$). Finally, inappropriate nutrients (early introduction of food and early weaning) have been strongly associated with the occurrence of malnutrition. The prevalence of malnutrition reflects the way children eat. Emphasis should be placed on nutritional education and financial stability in households.

Keywords

Malnutrition, Contributing Factors, Pediatrics

1. Introduction

Malnutrition is a major public health problem in many countries of the world and is a priority in the Sustainable Development Goals (SDG2) [1]. It is both a medical and social disorder often rooted in poverty, defined by WHO as a pathological condition resulting from relative or absolute deficiency or excess of one or more essential nutrients, whether manifested clinically or detectable only by biochemical, anthropometric or physiological analyses. Malnutrition encompasses three groups of conditions: undernutrition, micronutrient malnutrition and overnutrition [2]. It affects vital functions, especially cognitive ones, especially in early childhood, and contributes significantly to the establishment of poverty through obstacles linked to a low learning and production capacity [3]. According to the United Nation annual report, 52 million children under the age of five are stunted, of which 17 million are severely stunted and 155 million are stunted [4]. Malnutrition plays a role in about 45% of deaths among children under five in low- and middle-income countries [5]. In West Africa, in 2014, 32% of children under five were chronically malnourished, 9% were acutely malnourished, and 20% were underweight [6]. Furthermore, it was estimated in 2008 that stunting, severe wasting and intrauterine stunting together were responsible for 2.2 million deaths in children under five years. [7]. The 2010 MICS survey reported a national prevalence of 9% Global Acute Malnutrition (GAM) including 2% Severe Acute Malnutrition (SAM), stunting (28%) and wasting (19%) [8]. Since 2012, Mali has been experiencing a politico-military crisis that has worsened the nutritional situation, as shown by the results of previous national studies [9]. In 2013, the EDSM-V reported a national prevalence of 13% GAM and 5.1% SAM. According to the same survey chronic malnutrition remains a concern with a national prevalence of 38.3% and weight insufficiency of 26% [10]. According to the results of the SMART survey, the prevalence of GAM observed in all regions and the District of Bamako is 10.7% including 2.6% of SAM, the rate of chronic malnutrition (23.1%) and weight insufficiency (16.3%) [9]. According to a study conducted in 2011 at the Gabriel Touré University Hospital, the rate of malnutrition of all types was 54.1%, broken down as follows: 40.9% for stunting, 37.8% for underweight and 21.3% for wasting [11]. These child malnutrition rates have reached the critical threshold set by WHO. Thus, with the persistence of the country's political and security instability, this work was initiated with the objective of determining the frequency and risk factors favouring the occurrence of malnutrition in children aged 6 to 59 months hospitalized in the paediatric department of the Gabriel Touré University Hospital in Bamako, the country's reference service, with a view to identifying the potential for planning interventions.

2. Methods

The Intensive Nutritional Recovery and Education Unit (INREU) of the Paediatric Department of the Gabriel Touré University Hospital in Bamako served as

the study setting. It is a reference unit in the country in the nutritional care of malnourished children hospitalized in all the services of the said department (Neonatology service to which it is attached, general paediatrics service, paediatric emergency service and the paediatric oncology unit). Since its inception in 2008, it has provided annual nutritional recovery to approximately 1000 malnourished for associated complications. This is a prospective cross-sectional study over a period of 4 months from 01 June 2019 to 30 September 2019. All children aged 6 - 59 months hospitalized in the paediatric department during the period and whose parents or carer consented. A medical file was opened for each patient from which an individual survey was made. A questionnaire was submitted to the parents or carers of the children in order to collect information about the children. The variables studied were: socio-demographic characteristics of the parents (Residence, level of education, household income, socio-economic conditions), clinical characteristics of the patient (age, sex, weight, height), diagnostic criteria (weight/height ratio measures acute malnutrition or emaciation, weight/age measures underweight and height/age measures chronic malnutrition or stunting).

The sampling was exhausted.

The parameters were defined as follows [10]:

1) Emaciation or acute malnutrition: a child is emaciated if his or her weight-for-height Z-score is less than 2 standard deviations ($-2SD$) from the median of the reference population are considered lean (moderately emaciated) or acutely undernourished. When the Z-score is below minus 3 standard deviations ($-3SD$) is considered severely emaciated.

2) Stunting or chronic malnutrition: children whose Z-score for height for age is less than 2 standard deviations ($-2SD$) from the median of the reference population are considered too short for their age (stunting) or chronically undernourished. Children below minus 3 standard deviations ($-3SD$) are considered severely stunted.

3) Underweight or undernourished: children whose weight-for-age Z-score is less than 2 standard deviations ($-2SD$) from the median of the reference population are considered moderately underweight. Children with a weight-for-age Z-score below minus 3 standard deviations ($-3SD$) from the median are considered severely underweight.

Data entry and analysis were carried out using SPSS software (version 20.0). A bivariate logistic regression was fitted to identify the factors influencing the occurrence of malnutrition with determination of the odds ratio, the 95% confidence interval and significant p if $p < 0.05$. Informed consent from parents or carers was required before participation in the study.

3. Results

During the study, 12% of those hospitalised (348 out of 2888) were between 6 and 59 months of age. One child out of two was malnourished, a frequency of

50%.

The majority of children had become malnourished before their second birthday (6 - 23 months) in 33% of cases. The hospital incidence of stunting was found to be 23%, of which 14.7% were severe. Wasting was 27% with 18.7% severe. Weight insufficiency was 42.2% with 31% severe. The majority of cases were male (29%) with a sex ratio of 1.3 (Figure 1). Regarding the socio-economic conditions of our malnourished patients, we noted that a significant number of fathers did not have a fixed salary, 18% of whom were workers. Housewives were in the majority in 45.1% and had not received any education in 30.2% of cases (Figure 2). For the feeding habits of children aged 6 to 59 months, poor feeding practices were observed in both malnourished and non-malnourished groups. But in the malnourished group, most of these children were predominantly breastfed (39.4%). The majority (36.8) of children had started to receive other foods corresponding to diversification between 6 - 12 months and porridge was the food in question of breastfeeding was early (0 - 18 months) in 12.6% and unprepared in 24.7% of cases (Figure 3). The pathologies most associated with malnutrition were gastroenteritis in 31.6% followed by acute respiratory infections (ARI) in 17.8 and malaria in 15.5% of cases (Figure 4).

A bivariate analysis showed that children with an out-of-school mother were 2.4 times more likely to be malnourished (OR = 2.425; CI = 1.9 - 4.2; p < 0.03).

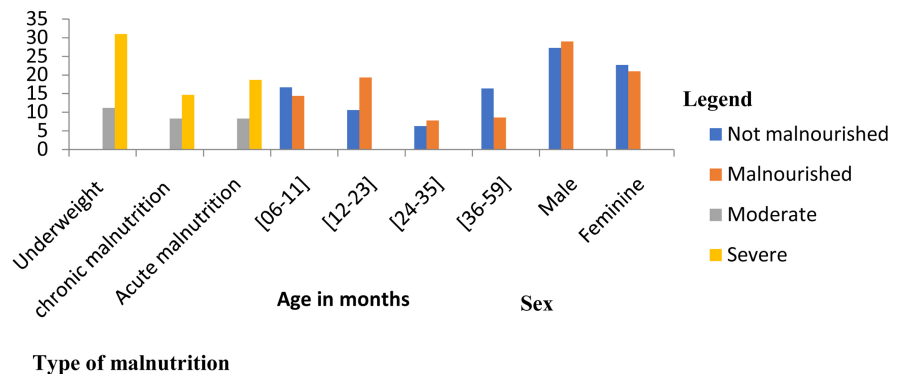


Figure 1. Distribution of children by clinical characteristics of children.

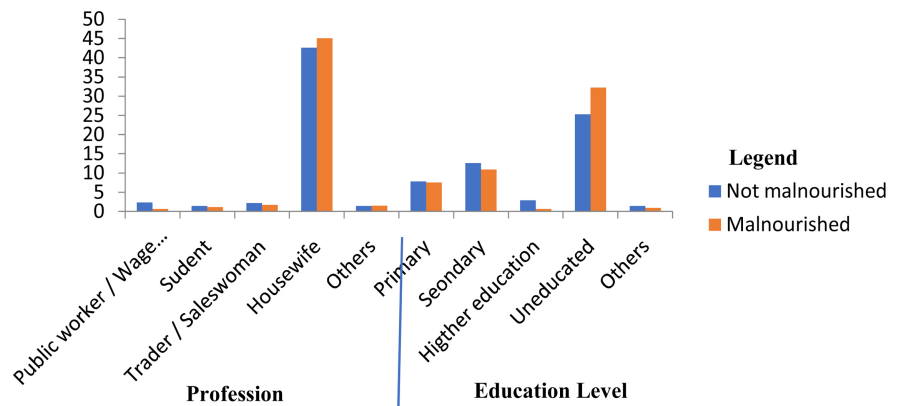


Figure 2. Distribution of children by mothers' characteristics.

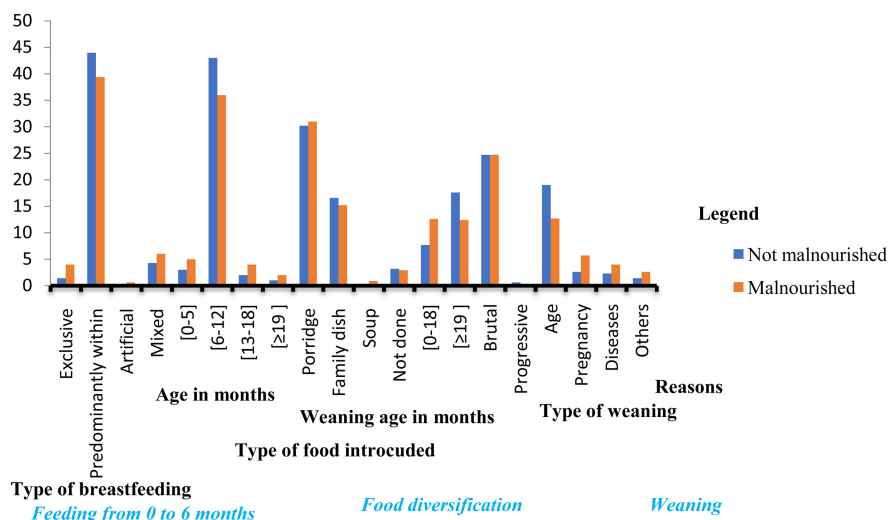


Figure 3. Distribution of children by child nutrition.

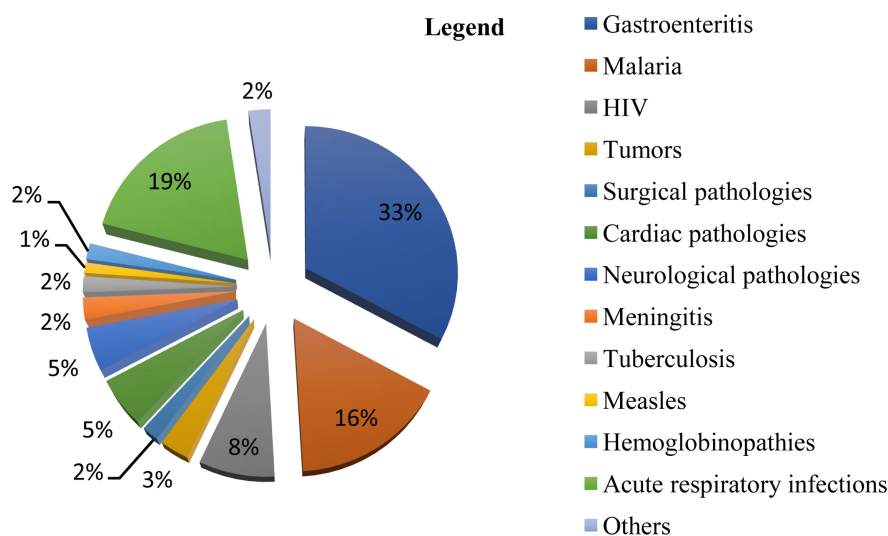


Figure 4. Distribution of children according to pathologies associated with malnutrition n = 174.

Also children from households with no stable income (OR = 2.120; CI = 1.1 - 4.1; $p < 0.01$). finally, poor child feeding practices such as early introduction of food before 6 months of age and early weaning increased the risk of malnutrition by 1.6 and 2.3 times, although the association was only significant for early weaning (OR = 2.31; CI = 1.2 - 4.2; $p < 0.01$) (Table 1).

4. Discussion

Limitations and Difficulties Encountered

We conducted a cross-sectional study. This type of study makes it possible to take stock of a given question in a given environment, during a given period, taking into account the realities of the field (the hospital). We used data from a survey we conducted in the pediatric department. As malnutrition is a sensitive

Table 1. Risk factors for the occurrence of malnutrition.

Risk factors	OR (IC)	Value P
Introduction of additional feed (months)		
<6	1.638 (0.768 - 3.493)	0.197
≥6	1	
Weaning age (months)		
0 - 18	2.312 (1.246 - 4.289)	0.007
≥19	1	
Mother's age (year)		
15 - 30	1.242 (0.736 - 2.096)	0.417
>30	1	
Mother's level of education		
Not in school	2.425 (1.930 - 4.185)	0.037
Educated	1	
Father's professional activities		
Not employed	2.120 (1.093 - 4.113)	0.023
Public worker/Wage earner	1	

OR: Odds Ratio, IC: Confidence Interval.

subject, we have difficulty in getting answers to some of the questions.

During the course of our study (from 1 January to 30 September 2019), we identified 348 children who met our inclusion criteria. Acute malnutrition was detected in 27% of the children, chronic malnutrition in 23% and weight insufficiency in 42.2%. Our results are up from national data which in the 2018 GDHS-VI [12] estimated 9% acute malnutrition 27% chronic malnutrition and 19% weight insufficiency. According to the SMART 2018 survey [13], acute malnutrition represents 10%, chronic malnutrition 24.1% and weight insufficiency 18.6%. This high rate is explained by the fact that our study only involved children who were hospitalised. The majority of malnourished children were male (29%) with a sex ratio of 1.3. This result is identical to those reported by Kngaye S *et al.* (ratio of 1.3) [14] and the SMART 2017 survey (ratio of 1.3) [9]. Unlike our study, Savadogo AS [15] and Musimwa AM and al [16] found a sex ratio of 0.45 and 0.7 respectively. This male predominance in our study cannot be explained by our survey method; we did not find any study that could explain it. The mean age was $1761 \pm 11,297$ months standard deviation (SD) with extremes of 6 and 59 months. The 12 - 23 month age group was the most affected, with 19.3% of malnourished cases. Maiga B *et al.* [17] reported a frequency of 58.5% in this same age group. According to Kangaye S *et al.* [14], the age group most affected by malnutrition is 6 to 23 months (66.2%). On the other hand, Musimwa AM *et al.* [16] and Diarra B [18] reported in their studies that the 24 - 35 month age group was the most represented. Our result can be explained by the difficulties related to diversification at this age, which in most cases is not carried out under ideal conditions, and also early weaning in favour of close

pregnancies and illness of children. Most mothers of malnourished children were housewives (45.1%) and multiparous (23.9%). They were financially dependent on their husbands, most of whom had low incomes. These couples with low socio-economic status are vulnerable and any children born to them are at risk of malnutrition. Ouédraogo SO *et al.* [19] in their study reported that 90.7% of parents of malnourished children had a low socio-economic level. Kouakou JG *et al.* in their study on the prevalence of malnutrition and determining factors, showed that when the father's professional activity did not guarantee adequate income, this could multiply the risk of malnutrition by 3 [20]. In contrast, in our study, the mothers' level of education (OR = 2.425; $p < 0.03$) and the fathers' professional activity (OR = 2.120; $p < 0.02$) are determining factors for malnutrition. A large majority of malnourished children (39.4%) were predominantly breastfed up to 6 months, compared to 4% of children who were exclusively breastfed. This result is similar to Kouakou JG *et al.* [20], who reported that one child in ten was exclusively breastfed. Our result differs from that of the EDISM-V, which reported 33% exclusive breastfeeding [10]. The low rate of exclusive breastfeeding our study could perhaps be explained by the analphabétisation of parents which results in insufficient information about the benefits of exclusive breastfeeding. Diversification started between 6 - 12 months of age in 36.8% of the children with an average of 6.94 months \pm 2.5 ET. The same age range was observed by Maiga B *et al.* [17] in 66.4% with an average of 8 months weaning of malnourished was done mostly (14.9) between 0 - 18 months. This could be explained by the high rate of uneducated housewives. We found that gastroenteritis was frequently associated with malnutrition (31.6%). This result is close to that of Musimwa AM *et al.* [16] who, in a study of clinical data encountered in malnourished children, described diarrhoea as the first association with malnutrition with a frequency of 38.5%. Ouédraogo SO *et al.* [19] and Thiam L *et al.* [21] reported high rates of diarrhoea associated with malnutrition with 60.9% and 29.8% of cases respectively. Indeed, malnutrition leads to deterioration of the intestinal mucosa, thus limiting absorption, hence the high frequency of diarrhoea in all authors.

We recorded 17.8% of cases of acute respiratory infections associated with malnutrition. Ngirabega JD *et al.* [22] reported 45.3%, Musimwa AM *et al.* [16] (42.5%) and Thiam L *et al.* [21] (29.9%). These results corroborate with the clinical condition of malnourished children who are prone to many infections due to a failure of their immune systems. Our study took place during the winter period, which is favourable of the proliferation of mosquitoes. Thus, malaria was associated with malnutrition in 15.5% of cases. Our result is close to those of Thiam L *et al.* [21] and Ngirabega JD *et al.* [22] who found respectively 10.5% and 11.9%. To determine the risk factors for malnutrition, we assessed the following variables: diversification, age at weaning, mother's age, mother's education and father's occupation. We were able to establish an association between age of diversification and malnutrition with OR = 1.638 (0.768 - 3.493). This association was not significant ($p < 0.19$). Aouehougon [23] in his study showed

that there was no significant association between diversification and malnutrition ($p < 0.88$). Unlike us, Nyime [24] reports a statistically significant ($p < 0.02$).

Our result could be explained by the fact that we were not able to receive precise information on the age of diversification. In contrast, we found a statistically significant association between weaning and malnutrition (OR = 2.312; $p < 0.01$). This may be explained by the difficulties young mothers have in weaning, which is generally poorly conducted because infants are often weaned early. The association is statistically significant between mothers' level of education and malnutrition (OR = 2.425; $p < 0.03$). Aouehougon [23] reached the same result with (OR = 1.5; $p < 0.03$). Our result could perhaps be explained by the high number of uneducated mothers. Through instruction, mothers acquire better knowledge about malnutrition, different types of food and hygiene. The association of mothers' age with malnutrition was not significant (OR = 1.242; $p < 0.417$) in our study. As for Kouakou J G *et al.* [20] ($p < 0.42$).

However, the association between the father's professional activity and malnutrition was statistically significant (OR = 2.120; $p < 0.02$). Kouakou J G *et al.* [20] also found this association significant, with (OR = 2.77; $p < 0.01$). In contrast to these results, Nyime [24] reported that there was no association (OR = 4.422; $p < 0.12$) between socio-economic level and malnutrition. Our result could be explained by the fact that most of the fathers (labourer, farmer) had a low income, unable to meet the nutritional requirements of the children.

5. Conclusion

Malnutrition remains a preoccupying situation in Mali. This high incidence is a reflection of children's eating habits and the country's financial situation. The focus should be on nutritional education and improving living conditions in our families.

Conflicts of Interest

None.

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