



## RESEARCH ARTICLE

### STUDY OF THE FACTORS ASSOCIATED WITH THE OCCURRENCE OF ACUTE MALNUTRITION IN CHILDREN AGED 6 TO 59 MONTHS IN THE HEALTH DISTRICT OF BAMAKO COMMUNE VI IN MALI

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#### ABSTRACT

**Objectives:** The objective of this work was to assess the factors associated with the occurrence of acute malnutrition in children aged 6 to 59 months in the health district of Commune VI of Bamako. **Method and materials:** This was a prospective, cross-sectional, descriptive and analytical study, which took place from August to October 2012, in the Health District of Commune VI of Bamako. The target was children aged 6 to 59 months. The WHO-type two-stage cluster random sampling was chosen. **Results:** The study included a total of 359 children. The socio-demographic characteristics and anthropometric data of the children were analyzed. A high prevalence of 14.2% for acute malnutrition (AD) was found. Children on Exclusive Breastfeeding were 3.84 times less likely to have AD with  $p=0.00007$ . Low birth weight (LBW) was a risk factor for the occurrence of AD OR= 8.04, 95% CI [3.72-17.62]. **Conclusion:** The high prevalence of AD in the health district of Commune VI of Bamako requires the rapid implementation of a response program focused on strengthening the nutritional surveillance system for children, for active screening in the community.

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## INTRODUCTION

According to statistics, in 2012 malnutrition was responsible for more than a third of deaths in children under five years of age worldwide (1). In sub-Saharan Africa, the proportions were estimated at 42% for stunting, 9% for wasting and 7% for underweight (1). In Mali, in 2011, a nationwide SMART nutrition survey found a prevalence of Global Acute Malnutrition (GAM) among children under 5 years of age of 10.4%, including 2.2% of severe acute malnutrition (SAM) and 8.2% of moderate acute malnutrition (MAM). Alarming proportions are noted in Timbuktu with 16%, GAO (15.2%), Koulikoro (13.2%) and Kayes (13%) (2). A rapid survey carried out in December 2011 in the north of Kayes, Koulikoro, Ségou and in the west of Mopti found a prevalence rate of 14.2% of acute malnutrition (2). The nutritional status of children in the health district of Commune VI of Bamako was insufficiently documented. This study was initiated with the aim of assessing the factors associated with the occurrence of acute malnutrition in children aged 6 to 59 months in the district.

## METHOD AND MATERIALS

**FRAMEWORK OF THE STUDY:** This study was conducted in the health district of Commune VI, the largest in the district of Bamako, with 94 km<sup>2</sup>, for an estimated population of 620,360 inhabitants in 2012 and an annual growth rate of 9.4%. It is made up of 10 districts, 4 of which are urban and 6 are semi-urban. The socio-health coverage of Commune VI is provided by: 1 Reference Health Center (CSREF) with a social service and a hygiene brigade; 12 community health centers (CSCOM) managed by the Community Health Associations (ASACO) out of 13 provided for in the municipality's socio-health development plan (PDSC 2005 – 2009); 35 health structures (private, mutual, parapublic); 20 traditional therapists listed; 37 pharmacy pharmacies and a youth clinic (Centre Jeune Sport et Santé). In total, the health district of Commune VI has one URENI (Intensive Nutritional Recovery and Education Unit) at the Reference Health Center (CSREF) and 12 URENAM (Outpatient Nutritional Recovery and Education Unit for

Moderates) in the health areas. The municipality's economy is still dominated by the primary sector (agriculture, livestock, fishing), which accounts for 44.5% of the gross domestic product (GDP) (3).

**TYPE AND DURATION OF STUDY:** This was a prospective, cross-sectional, descriptive, and analytical study. It took place from August to October 2012, in the health district of Commune VI of Bamako.

## STUDY POPULATION

**Sampling method:** Two-stage random cluster sampling of the WHO type was chosen. The sampling frame consisted of the exhaustive list of health areas in the health district with their respective populations. With the population of children aged 6 to 59 months for each health area and the total district population known, the ENA for SMART software was used to pull all the clusters and distribute them to the district health areas.

**Cluster identification:** The 30 WHO clusters were selected and distributed directly by the ENA software to the 12 health zones of the district on the basis of their respective populations. The total population of children aged 6 to 59 months in the health district is estimated at 94,123. The table below summarizes the distribution.

**Table 1. Distribution of clusters in district health areas**

Geographic unit	Population size	Cluster
ASACOBABA	9153	1, 2, 3,4
ASACOSODIA	9105	RC, 5,6
ASACOFA	4787	7, RC
ASACOMA	3432	8
ASACOMIS	2259	9
ASACONIA	15352	10, 11, 12, 13,14
ASACOSE	13310	15, 16, 17, 18,19
ASACOSO	8793	20, 21,22
ANIASCO	10945	RC, 23, 24,25
ASACROYIR	10290	26, RC, 27,28
ASACOCY	3265	29
ASACOMA 2	3432	30
TOTAL	94123	

As a result, 30 clusters and five reserve clusters (RCs) were pulled and distributed across the district's health areas using ENA for SMART software.

**Statistical units:** The target population was children aged 6 to 59 months and their mothers or caregivers residing in Commune VI of Bamako. The sample size was set using the ENA for SMART software. Thus, the number of children to be included in the study is estimated at 312 and the number of households to be surveyed at 304. The primary statistical unit is the household, and the secondary statistical unit was children aged 6 to 59 months and mothers or caregivers. The total number of households to be included in the study (304) was divided by the total number of clusters (30) to obtain the number of households in each cluster (NMG).  $NMG = 304/30 = 11$ . The random sampling method was chosen to identify the households to be surveyed. In each health area, the exhaustive list of households was used as the sampling frame. A basic survey was used to randomly select households until the required number of households for the cluster was obtained (in our case, 11 households per cluster). All the households shot were visited. At the household level, all children responding to

inclusion were enrolled. Data collected at the household level: the child's socio-demographic data: age, sex, sibling rank; the child's vaccination status, AE practice, and medical history were noted; Anthropometric measurements of weight, height, mid-upper arm circumference and the presence or absence of oedema were recorded in all children aged 6 to 59 months present. All consenting mothers or caregivers were interviewed to collect information about: the person(s) in charge of the child; the parents' profession and level of education; the mother's age, marital status, knowledge of the duration of EI and supplementation foods; the type of household, the number of people living in the household, and the household's water supply.

**Data collection:** was done from a survey sheet. This sheet includes information on the child, the household and the practice of feeding. The equipment used to take anthropometric measurements (weight, height, upper arm circumference) consists of: two scales for mother and child; two fathoms of SHORR and six strips of SHAKIR. Data entry was done on EXCEL, the Epi info 2000 software version 3.5.3 and the ENA software.

**Data analysis:** For anthropometric data, the analysis was done on the ENA for SMART software, using the WHO 2006 reference population. For socio-demographic data and data relating to food knowledge and practice, the analysis was carried out using the Epi info 2000 software version 3.5.3. Univariate analyses were performed to calculate frequencies and confidence intervals for qualitative variables and means and standard deviations for quantitative variables. Bivariate analyses were performed for comparison of proportions and means. The results were expressed with a 5% risk of error.

## ETHICAL CONSIDERATIONS

The study was conducted within a framework of strict compliance with medical ethics and deontology. Data confidentiality was guaranteed. For informed consent, respondents were informed of the objectives and constraints of the study, their rights to refuse to participate in the study or to leave it at any time. Also, the equipment of the DRS of Bamako was used to take anthropometric measurements (weight, height, upper arm circumference).

## RESULTS

### DESCRIPTIVE STUDY

**SOCIO-DEMOGRAPHIC DATA OF CHILDREN:** The study involved 359 children aged 6-59 months, including 183 girls (51%) and 176 boys (49%). The sex ratio was 1.03. The mean age of the sample is 26.15 months with a standard deviation of 15.37. The median is 24 months and the mode is 6. Children between 6 and 24 months of age accounted for 54.3% (195) of the study population compared to 45.7% (164) for the 25-59 month age group. The mean sibling size was 3.41 with a standard deviation of 2.18. The minimum size was 1, for a maximum of 10. The proportion of children occupying between the 1st and 3rd rank in the sibling group was estimated at 63% of the sample. In a proportion of 2.5% of cases, another person was responsible for the child's care, apart from the father and/or mother.

**SOCIODEMOGRAPHIC AND ECONOMIC CHARACTERISTICS OF HOUSEHOLDS:** A total of 358 mothers and 1 babysitter were interviewed.

**Marital status of the mother:** 93% of the mothers were married and the single represented 5.9%.

**Mother's level of education:** 52.4% of mothers were illiterate and 4.1% had a university education.

**Mother's occupation:** housewives were the most represented in a proportion of 52%. Students accounted for 8.1%.

**Father's occupation:** Heads of household without any income-generating activity are poorly represented with 3%; manual workers 25.6% and 16.2% were in paid employment.

**Father's level of education:** The majority of heads of household were illiterate with a proportion of 39%. The university level was 8.7%.

**Number of persons living in the household:** The average household size was 11.3 with a standard deviation of 6.6. The minimum size was 3 for a maximum of 38. The median was 10 and the mode was 5.

**Household water supply:** The most used source of water was the tap with 49.6% followed by the well with 32.6%.

**Children's medical history:** Only 17.5% of children had no medical history in the last two months prior to the survey; 29% had had an Acute Respiratory Infection and 23.4% had diarrhea.

**Childhood vaccination status:** The majority of children were fully vaccinated (69%). Breastfeeding: Exclusive breastfeeding was practiced in 73% of cases.

**Weaning:** The majority of children were weaned (67%) and 8% were weaned before 12 months.

#### Reasons for withdrawal:

**Table 2. Distribution of the sample according to the reasons for withdrawal**

Reasons for withdrawal	Actual	Proportion
For no reason	87	36,3
Insufficient breastmilk	46	19,2
Pregnancy	38	15,8
Advanced age of the child	38	15,8
The mother's studies	12	5
Mother's illness	11	4,6
Mother absent during the day	4	1,7
Death of the mother	1	0,4
Separation of parents	1	0,4
Fasting	2	0,8
Total	240	100%

A significant proportion of children (36.3%) were weaned without reason. The main reasons for withdrawal were: insufficient breast milk with 19.2%; the advanced age of the child with 15.8% and the mother's studies in 15.8% of cases.

#### CHARACTERISTICS OF THE SAMPLE ACCORDING TO THE NUTRITIONAL STATUS OF THE CHILDREN

**Distribution of the sample according to the type of malnutrition:** Of the 359 children in the sample, 226 had a malnutrition picture (all forms combined), i.e. a rate of 62.95%. The prevalence of acute malnutrition was 14.2% (51 cases), chronic malnutrition was 28.7% (103 cases) and mixed malnutrition was 20% (72 cases). Malnutrition was more common in its moderate forms.

**Prevalence of acute malnutrition by mid-upper arm circumference (MUAC) bracelet:** the prevalence of global acute malnutrition according to the MUAC was 10.9%, including 2.5% of cases of severe acute malnutrition.

#### ANALYTICAL STUDY

**Distribution of acute malnutrition according to age, sex, weaning age, exclusive breastfeeding (AME) and the rank of the child in the siblings:** A statistical link was not found between acute malnutrition and age group or sex. However, children in the 6 to 24 month age group had a higher risk of acute malnutrition OR= 1.48. Children weaned before 24 months had a higher risk of acute malnutrition than those weaned after 24 months with an OR= 3.05. A statistically significant association existed between AME and the occurrence of acute malnutrition. Children on AME were 3.84 times less likely to be acutely malnourished with p=0.00007.

**Distribution of acute malnutrition according to birth weight, vaccination status and medical history of the child:** Acute malnutrition was more common in children born with low birth weight. A statistically significant association was found between low birth weight and the occurrence of acute malnutrition in children. Indeed, children with low birth weight were 8 times more likely to be acutely malnourished than children with good birth weight, OR = 8.04, 95% CI [3.72-17.62] p=0.

#### DISCUSSION

The study found a rate of 62.95% of malnutrition (all forms combined). With high prevalences of 14.2% of acute malnutrition and 20% of underweight and an average prevalence of chronic malnutrition of 28.7% (according to the WHO classification), the nutritional status of children in the health district of Commune VI is quite alarming. These prevalences are below the national level for stunting and underweight, with proportions estimated at 38% and 27% respectively in 2009(4). It appears that the wasting rate of 14.2% is well above the national rate (Mali) of 10.4% observed in 2011 (2), but higher than the rate of 8% found in 2011 in Benin (5). However, it is lower than the rate of 15.2% found in a study conducted in Senegal in 2008 in the health district of Goudomp (6) and the rate of 13.4% found in 2011 in Algeria (7). It was also noted that this rate (14.2%) is lower than the rate of 18.8% found in the health district of Commune IV of Bamako in Mali in 2011 (8), but higher than the rate of 11.8% found in the health district of Kayes in 2010 (9). This rate of acute malnutrition, which is still high at the level of the health district, can be explained by the poverty of the population, 68% of whom live below the poverty line, the non-involvement of Community Basic Organizations and the

underuse of community relays in activities to combat malnutrition, resulting in a very high drop-out rate. of 38.5% observed during the 1st half of 2012 in the URENs of the health district of Commune VI (3).

The study showed that children under exclusive breastfeeding (AE) were 3.84 times less likely to be acutely malnourished with  $p=0.00007$ . Therefore, exclusive breastfeeding plays a role in the low proportion of malnourished children in the 6–24-month age group. The latter group represented 54.3% of the sample and exclusive breastfeeding during the first 6 months was practiced in 74% of the children. Indeed, according to the literature from all over the world, a decline in artificial feeding and a better practice of exclusive breastfeeding could save the lives of 1.5 million children per year (12). EA was not a common practice in our countries. The proportion of children who benefited from the practice was 34% in Senegal according to EDSIV in 2005 (11) and 38% in Mali according to EDSIV in 2006 (13). However, significant rates, comparable to the result of this study (74%), have been found in more recent studies in Senegal, particularly in the health district of Goudomp with 88% in 2008 (6) and the health district of Sédhio with 75% in 2007 (14). In Mali, studies conducted in the health districts of Commune IV of Bamako in 2011 (8) and Kayes in 2010 (9) found rates of 61.5% and 52% respectively. To ensure better protection, children must receive vaccine doses according to a specific schedule. The proportion of children correctly vaccinated is 81.1%. This vaccination coverage rate is comparable to the rate of 83.1% in the health district of Commune IV of Bamako and higher than the estimated national level of 76.2% (13). An estimated 12 million children die each year from measles, pneumonia and diarrhea. These pathologies are also a major cause of malnutrition in children and contribute greatly to worsening the vital prognosis (1). In this study, the proportion of children who had a medical history in the last two months is estimated at 82.5%. One of the important causes of these morbid episodes is low birth weight. Indeed, low birth weight can be due to preterm birth or intrauterine growth retardation and is a risk factor for the occurrence of perinatal diseases. In this study, a very strong link is found between birth weight and the occurrence of malnutrition. Thus, in children with low birth weight, there is an 8 times greater risk of acute malnutrition, 7.78 times more risk of chronic malnutrition and 10.31 times more risk of mixed malnutrition, than in children with a good birth weight.

## CONCLUSION

This study, conducted in an urban environment, showed the extent of acute malnutrition in commune VI of the district of Bamako. Indeed, the study found that acute malnutrition mainly affected children under 2 years of age, particularly those who had not benefited from AE during the first six months of life. Low birth weight is associated with a high risk of all forms of malnutrition. According to WHO standards, acute malnutrition with a prevalence of 14.2% was very high and required the implementation of a response program in the health district of Commune VI of Bamako.

**CONFLICTS OF INTEREST:** The authors have no conflicts of interest to report.

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