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Original Research Article

Mortality among Malnourished Children Admitted to the Intensive Nutritional Recovery and Education Unit (URENI) of the Fana Reference Health Centre

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Abstract: A cross-sectional study with two collection techniques, a retrospective collection involving 347 files and a cross-sectional collection by face-to-face mode interview of the mothers of the 9 children who died during the collection period and part of the nursing staff. It aimed to assess mortality among malnourished children aged 6-59 months and to contribute to the improvement of their health status. The mortality rate among the malnourished is relatively low 3.69%. Malaria was frequently associated with malnutrition: 53.65%. Hypovolaemic and septic shock were the most common causes of death with 46.15 and 38.46%. In view of these results, emphasis should be placed on early referral of children with complications and also on vaccination campaigns, awareness-raising on exclusive breastfeeding and dietary diversification. In Mali in general and in Fana in particular, malnutrition remains a huge health problem in children aged 6-59 months.

Keywords: Mortality, children, URENI, Fana.

INTRODUCTION

Malnutrition is a medical condition resulting from the deficiency or excess of one or more essential nutrients, whether manifested clinically or detectable only by biochemical, physiological or anthropometric analyses [1].

In Mali, according to Standardized monitoring and assessment of relief and transition (SMART) 2020, it is noted that hunger, poverty and malnutrition are linked to food insecurity.

At the national level, 7.2% of children aged 6 to 59 months suffer from acute malnutrition, including 1.3% of the severe form.

Although the national prevalence of global acute malnutrition has fallen below 10%, the situation is still precarious, as it could increase in the event of any deteriorating economic situation. It should also be noted that this survey was carried out during the harvest period, when there was an abundance of food, which certainly played a role in reducing the extent of global acute malnutrition.

Despite the reservation linked to the survey period, this prevalence of Global Acute Malnutrition (GAM) (7.2%) is still far from the objective of reducing it to below 5% of the global nutrition targets by 2025. Hence the need to maintain efforts to not only reduce but also sustain the reduction over time (SMART, 2020) [2].

In Mali, malnutrition and the poor health status of the population appear to be major public health problems that must be addressed in development programmes. Data from the latest SMART nutrition survey carried out in August-September 2019 give prevalences of: for acute malnutrition, 9.4% [8.7-10.2] including 2.0% [1.7%-2.4%] of severe form against 11.2% [10.4-12.1] including 2.6% [2.2-3.1] of severe form in August 2018; 11.0% [10.3-11.7] of acute

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malnutrition including 2.4% [2.1-2.7] of severe form in August 2017 according to weight/height; for underweight or global malnutrition 18.1% [17.0-19.3] including 4.8% [2.4-5.5] of severe form against 18.1% [17.0-19.3] including 5.0% [4.5-5.6] of severe form in August 2018; 16.8% [16.0-17.7] of which 4.1% [3.7-4.6] was severe in August 2017; and stunting 28.6% [25.1-281] of which 08.6% [07.8-09.5] was severe in August 2018; 22.3% [21.0-23.7] of which 6.8% [6.1-7.6] was severe compared to 23.4% [22.3-24.6] of which 7.4% [6.8- 8.0] was severe [3].

According to a 2011 World Health Organization (WHO) report, the main causes of under-five mortality were: respiratory infections 18%, prematurity 17%, perinatal asphyxia 11%, diarrhoea 10% and malaria 7%; with low birth weight, non-immunisation, non-practice of breastfeeding, promiscuity and poor hygiene as the main risk factors [4].

OBJECTIVES

2-1-General:

Assessing the causes of mortality among malnourished children admitted to the URENI in Fana.

2-2-Specific:

- To determine the nutritional status of malnourished children aged 6 to 59 months admitted to the URENI in Fana.
- To determine the mortality rate among malnourished children aged 6 to 59 months admitted to the URENI in Fana.
- To determine aspects of mortality in malnourished children aged 6-59 months admitted to the URENI in Fana.

METHODOLOGY

1-Study framework: The study was conducted in the health district of Fana, Koulikoro region.

2- Type of study: This is a cross-sectional study with two collection techniques:
-a retrospective collection of files from September 2019 to October 2020

A cross-sectional collection carried out by face-to-face interviews with doctors and nurses in the intensive care unit of the URENI and mothers of severely malnourished children who died during the survey period.

3-Study period: The study covered the period from May 2020 to October 2021.

4-Study population: malnourished children aged 6-59 months, doctors, URENI nurses and mothers of deceased severe acute malnourished children.

4-1-Inclusion and non-inclusion criteria:

Inclusion:

- Records of children aged 6-59 months with severe acute malnutrition with complications who died or not during the study period.
- URENI intensive care doctors and nurses
- Mothers of severely malnourished children aged 6-59 months who died during the survey period

No Inclusion:

- Children whose records are either lost, torn or incomplete
- ICU doctors and nurses who did not agree to participate or were absent at the time of the survey
- Mothers of deceased severe acute malnourished children aged 6-59 months who did not agree to participate in the study

5- Sampling: We included a total of 356 malnourished children, 3 doctors and 3 senior health technicians.

6-Variables studied:

- Nutritional status of children aged 6-59 months admitted to the URENI
- Criteria for admission to the URENI (weight/height ratio, brachial circumference and oedema)
- Causes associated with mortality among malnourished children (i.e. conditions associated with death and other causes)
- Indirect, such as the qualification of URENI staff, the vaccination status of

7-Data collection techniques and tools:

Data were collected from the records, from the admission register for the retrospective period and from the face-to-face interview of the 3 doctors and senior technicians included and the mothers of the severe acute malnourished children aged 6 to 59 months who died during the survey period for the prospective period.

The tools used were the multi-part questionnaires, the tally sheets and the admission register.

8-Data entry and analysis

The data were entered and analysed with Epi info software version 7.1.3.

The Pearson's $\chi 2$ test was used to search for associations between the factors studied and mortality, the Fischer's exact test if the theoretical number of malnourished children was less than 5, with a significance level of $p< 0.05$, and the Yates correction for numbers calculated to be less than 5.

9-Ethical considerations:

The administrative staff of the referral health centre, the mothers of the deceased severe acute malnourished children from 6 to 59 months, the doctors and nurses of the URENI were informed and we are committed to respecting anonymity and medical secrecy before the beginning of the study. It is after the verbal informed consent of the different parties that the study started.

RESULTS

1- Socio-demographic data of malnourished children:

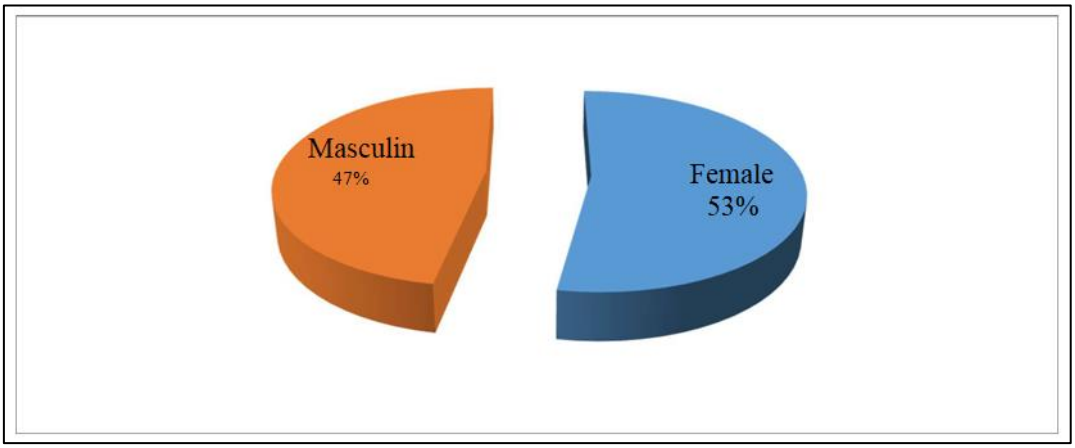

Figure 1: Distribution of malnourished children admitted to URENI by gender

Females predominated at 53% with a sex ratio of 0.89

Table I: Distribution of children aged 6-59 months admitted to the URENI by age group

Age group (in months)	Workforce	Percentage
6-11	91	25,56
12-23	139	39,04
24-35	98	27,57
36-47	19	5,34
48-59	09	2,53
Total	356	100

The most represented age group was 12-23, i.e. 39.04%, with an average age of 18.38 months

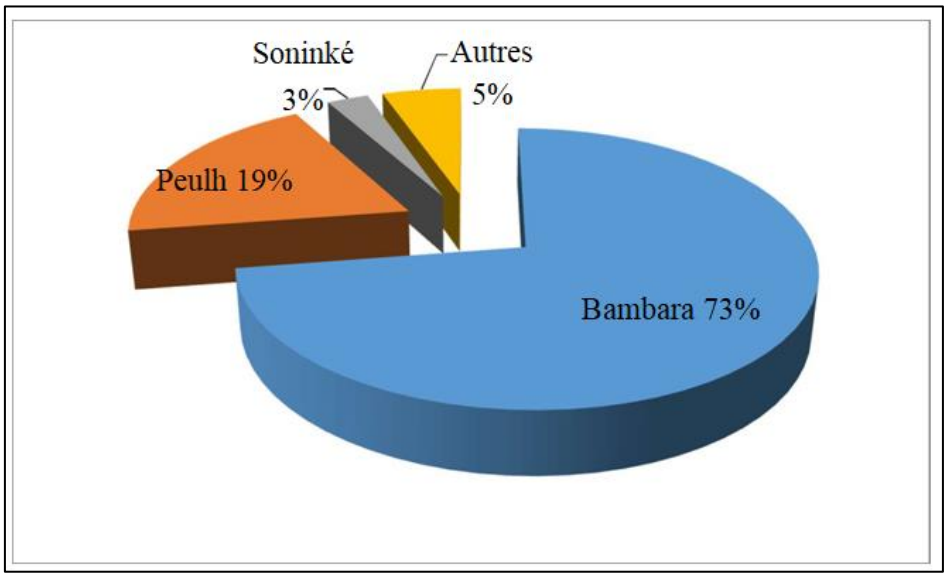

Figure 2: Distribution of malnourished children by ethnicity with 72.6%, the Bambara ethnic group was the most represented

2-Situation of URENI staff:

Table II: Distribution of URENI staff by grade

Grade	Workforce	Percentage
Doctor	03	23,08
Senior health technician	03	23,08
Health technician	03	23,08
Caregiver	04	30,76
Total	13	100

The nursing staff is dominated by orderlies and nurses with a total of 76.82%.

We included a total of 6 URENI staff, including 3 doctors and 3 senior health technicians.

Table III: Distribution of staff included by number of training courses received

Number of training courses received	Workforce	Percentage
No	01	16,67
A	03	50
Two	02	33,33
Total	06	100

The vast majority of the agents included had received at least one training on Integrated Management of Acute Malnutrition (IMN), i.e. 50%.

Table IV: Distribution of included staff according to knowledge

Knowledge	Workforce		Percentage
	Yes	No	
Main complications	06	0	100
State of shock	06	0	100
Principles of care of shock	06	0	100
Total	06	0	100

All staff included were aware of the main complications, shock and the principles of its management, i.e. 100%.

3-Nutritional status of children admitted to the URENI:

Table V: Distribution of malnourished children according to admission criteria

Criteria	Workforce	Percentage
Weight/Size	270	75,84
Brachial perimeter	08	2,24
Oedema	74	20,78
Other	04	1,12
Total	356	100

Other: Choice of companion, Poor appetite

The weight/height ratio was the most used admission criterion with 75.84% of the population

Table VI: Distribution of malnourished children by type of admission

Type of admission	Workforce	Percentage
Spontaneous	176	49,44
Received from URENAS	180	50,56
Total	356	100

Patients received from the Severe Ambulatory Nutritional Recovery and Education Unit (URENAS) dominated the study with 50.56% of the study population.

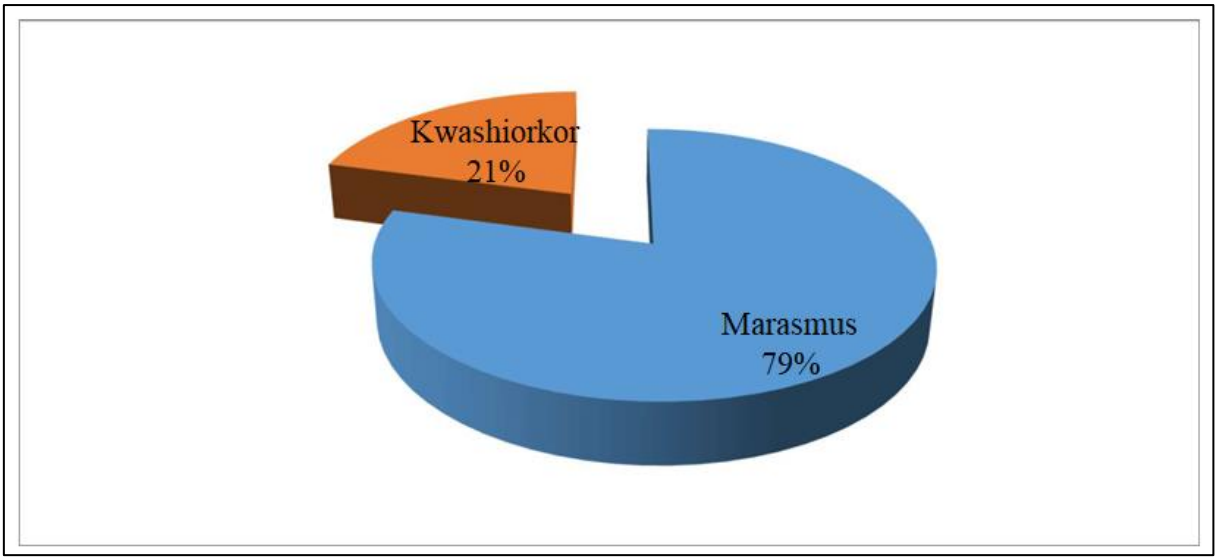

Figure 3: Distribution of malnourished by type of malnutrition

Marasmus was the most represented form of malnutrition with 79.22%.

Table VII: Distribution of malnourished children according to their fate at the URENI

Patient outcome	Workforce	Percentage
Successfully treated	336	94,38
Referral	04	1,12
Abandonment	03	0,84
Deceased	13	3,66
Total	356	100

With 94.38% of patients successfully treated, the largest number of children who died represented 3.66% of the total number.

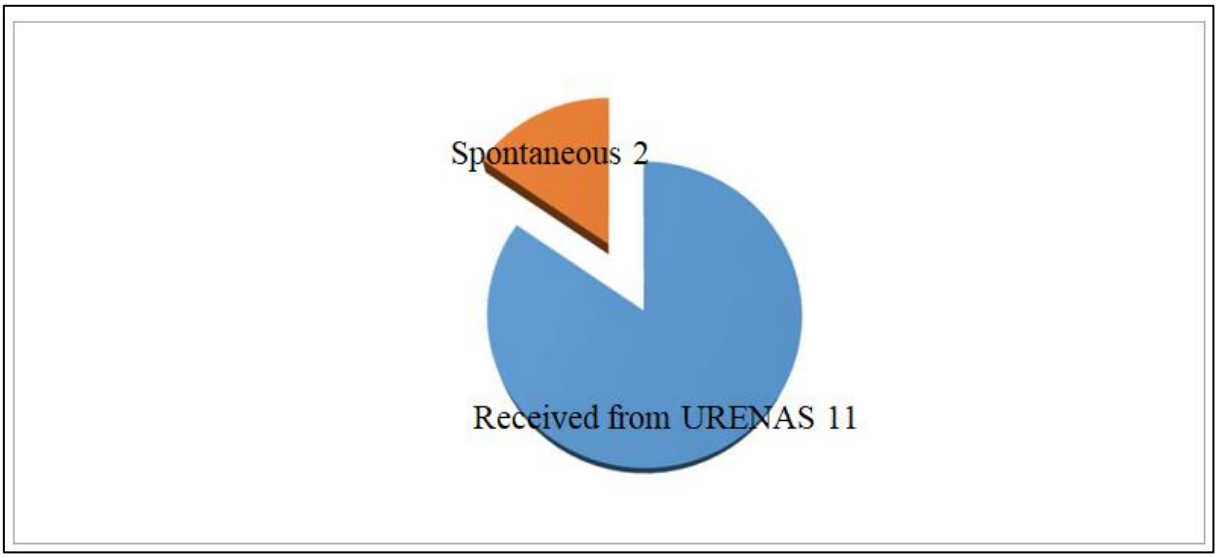

Figure 4: Number of malnourished children who died by type of admission

According to their origin, the greatest number of deaths was noted among the URENAS recipients with 11 cases compared to 2 cases of children admitted directly out of a total of 13

4-Pathologies associated with admission:

Table VIII: Distribution of malnourished children according to associated pathologies

Associated pathology	Workforce	Percentage
Severe malaria	191	53,65
Respiratory infections	63	17,70
Candidiasis	43	12,07
Skin lesions	22	6,18
Diarrhoea	28	7,87
Meningitis	01	0,28
Other	08	2,25
Total	356	100

Severe malaria and respiratory infections were the most dominant associated diseases with 53.65 and 17.70 respectively.

5-Causes associated with death:

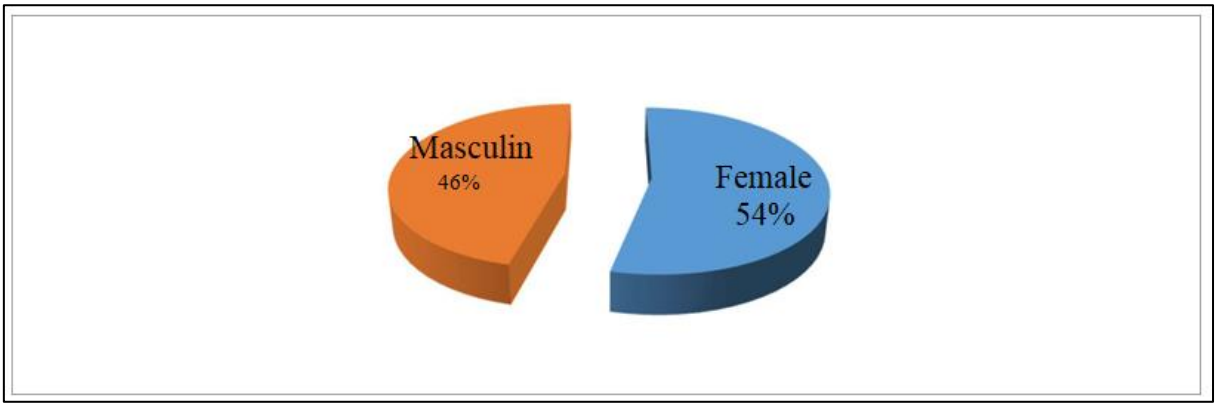

Figure 5: Percentage of malnourished children who died by gender

The female gender had the highest number of deaths with 7 of the cases of death compared to 6 in children admitted directly out of a total of 13.

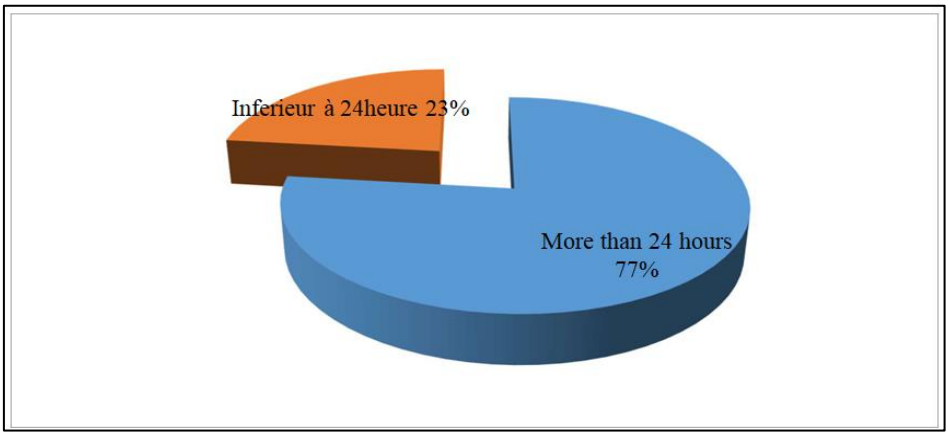

Figure 6: Distribution of malnourished children who died by time of death Children who died after 24 hours of admission dominated the study with 76.9%

Table IX: Number of malnourished children who died according to their vaccination status

Deceased Vaccination status	Workforce	Percentage
Not vaccinated	08	89
Vaccinated	01	11
Total	09	100

Almost all the children who died were not properly vaccinated (89%)

Table X: Distribution of malnourished children who died according to the reasons for the complication

Deceased Reasons for the complication	Workforce	Percentage
Self-medication	01	11
Delay in decision	03	33
X^2 of Yates = 6.21p	=0.012	

Table XI: Distribution of malnourished children who died according to the type of complication observed

Complications	Workforce	Percentage	p
Septic shock	05	38,46	0,00
Hypovolemic shock	06	46,15	0,00
Toxic shock	01	7,7	
Cardiogenic shock	01	7,7	
Total	13	100	

Among the complications, septic shock and hypovolemic shock were the most frequent with respectively 38.46 and 46.15% of deaths, X^2 = 136.11 and 163.73.

Table XII: Distribution of deceased malnourished people according to associated pathologies

Pathologies	Workforce	Percentage	p
Severe malaria	04	30,77	0,11
Respiratory infections	02	15,38	0,84
Skin lesions	05	38,47	0,00
Diarrhoea	02	15,38	0,84
Total	13	100	

The highest number of deaths was observed in malnourished people with skin lesions, i.e. 38.47% with X^2 = 24.77 and p=0.00.

COMMENTS AND DISCUSSIONS

1-Sociodemographic aspects:

The breakdown by age category showed that the most represented age group was 12-23 months with a rate of 39.04%.The average age was 18.38 months with extremes of 6 and 59 months. This could be explained by poor weaning technique and poor dietary diversification which occurs most often at this age.

In our study, women represented 53% of the total workforce with a sex ratio of in favour of women. This result is comparable to that of Djiré A [5] in 2013 in commune V of the District of Bamako, which found 53.8%.

The Bambara were the most represented ethnic group with 72.6% of the workforce. This domination of the Bambara ethnic group could be explained by the fact that the population of the study area is predominantly Bambara.

2-Nutritional status:

2-1-Type of malnutrition:

Marasmus was the most represented form with 79.22% against 20.78% of kwashiorkor [6] in 2010 at Gabriel Touré Hospital in Bamako, who obtained 80.3% marasmus and 19.7% kwashiorkor.

2-2-Weight / Size:

A large majority of the malnourished were severely emaciated, i.e. 75.84%. Sissoko F(28) in 2010 at Gabriel Touré hospital, Zakari R [7] in 2008 at Niamey hospital and NCHS [8] in 2007 in Chad found 97.7%, 92%, 92% respectively.

3-Associated diseases:

Severe malaria was the condition most often associated with malnutrition 53% followed by respiratory infections 17.70%, candidiasis 12.07%, diarrhoea 7.87%. Traoré B [9] in 2010 in Yanfolila found 48.8% respiratory infections, 38.8% diarrhoea, 37.2% fever and 34.4% malaria. This discrepancy could be explained by the difference in the length and timing of the study periods.

4- Becoming a URENI:

In our study the rate of successfully treated patients was 94.38%. It is significantly higher than that of SONDE I [10] in his 2009 study, which found a cure rate of 71.3% at the Centre de Récupération et d'Education Nutritionnelle (CREN) in Tenghin, Burkina Faso, and much higher than that of a study conducted by the Ministry of Public Health [11] in 2008 and 2009 in communes I, II, V and V of Bamako which found a rate of 43.35% and 41%.

Malnourished people who died represented 3.66%, comparable to the study carried out by the Ministry of Public Health [11] in 2008 and 2009 in communes I, II, V and V of Bamako which found a rate of 2.66% and 2.77% respectively.

This rate is lower than those found by SONDE I [10] and GUINDO A [12] in 2009 who in their studies found a mortality rate of 19% at the Tenghin CREN in Burkina.

These deaths could be explained by the marked alteration of the immune system caused by malnutrition, resulting in a high vulnerability to infections. It can also be linked to the late referral of children, especially the malnourished, which jeopardises the vital prognosis of these patients.

Drop-out was only 0.84% in our study. This rate is lower than that found in the study conducted by the Ministry of Public Health [11] in 2008 and 2009 in communes I, II, V and V of Bamako which found a rate of 13.93% and 11.10%. In 2010, in Birambizo in the province of Kivu (DRC), a study reported a dropout rate of 8.8% [13].

Our dropout rate is much lower than that found in a study conducted by the Red Cross in Baroueli in 2010 [14] which reported a dropout rate of 40.5%.

These dropouts could be explained by the fact that some parents thought that the child had fully recovered, on the one hand, and by a lack of resources or insufficient awareness, on the other.

5-Mortality:

5-1-Pathologies associated with death

Skin lesions were most often linked to death at 38.47% (p=0.00) followed by severe malaria at 30.77% (p=0.10), respiratory infections and Candidiasis at 15.38% (p= 0.84) each. Richard MbusaKambale, Joe BwijaKasengi and Ghislain BisimwaBalaluka [15] found in 2013 in Bukavu, DRC, Human Immunodeficiency Virus (HIV) 40%, Respiratory infections 23.7%, Meningitis 20.7%, Urinary tract infection 16.7%, Measles 10%, Malaria 6.1% and Gastroenteritis 5.2%.

5-2-Complications:

Hypovolaemic shock and septic shock were the most common complications associated with death with 46.15% (p=00.00) and 38.46%. Richard MbusaKambale, Joe BwijaKasengi and Ghislain BisimwaBalaluka [15] found in 2013 in Bukavu in the DRC that 20.9% of deaths were related to septic shock (p=0.0004).

This could be explained by the fact that these children, due to their immunodepression and homeostatic disorders linked to malnutrition, are very sensitive to infections and dehydration, both of which are favoured by the skin lesions.

5-3-Vaccination status:

Malnourished deaths that were not properly vaccinated accounted for 88.89% (p=0.00). This result is far superior to that of Kanté L [16] in 2009 at Gabriel Touré Hospital and that of the Mali Demographic and Health Survey (EDSM) V [17] which each found 2.9% and 49%. This discrepancy could be explained by insufficient awareness or a failure of the Expanded Programme of Immunisation (EPI) in our study area.

5-4-Staff situation

In our study, it was found that 83.83% of the staff included in the study had received training on IMCI and that all the staff knew the main complications of malnutrition, knew how to recognise a state of shock and how to manage it (100%).

In his study Djiré A [5] in 2013 in commune V of the District of Bamako found 90% of agents trained on the PCIMA.

CONCLUSION

Malnutrition remains a public health problem in the world, particularly among children under 5 years of age, and our country is not spared. The death rate is below the threshold given by the WHO. The most common causes of death were hypovolaemic shock and septic shock.

Comments and Discussions

It is a cross-sectional study with two collection techniques, a retrospective collection involving 347 files from September 2014 to October 2015 and a cross-sectional collection by face-to-face interview of the mothers of the 9 children who died during the collection period from April to October 2016 and some of the nursing staff.

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