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MANAGEMENT QUALITY EVALUATION OF SEVERE ACUTE MALNUTRITION WITH COMPLICATIONS: THE CASE OF 0-59 MONTHS CHILDREN ADMITTED TO THE THERAPEUTIC NUTRITIONAL UNIT (UNT) OF THE *NOTRE DAME DES APÔTRES* (NDA) HOSPITAL IN N'DJAMENA, CHAD

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ABSTRACT
Malnutrition represents a considerable challenge for human health in Chad and its management is carried out base on the National Protocol for the Management of Acute Malnutrition. Thus, the objective of this study is to evaluate the management quality of severe acute malnutrition with complications in children aged 0-59 months admitted to the Therapeutic Nutritional Unit (TNU) of the *Notre Dame des Apôtres* Hospital (NDAH). The investigated population sample is made up of 101 mothers whose children are admitted to the TNU. Data is collected through anthropometric measurements, and a questionnaire addressed to the mothers of the admitted children, and to the TNU staff. The results of the study show that 93% of the mothers are married of which 68.89% live in monogamous families. On the other hand, 55.45% of the mothers or accompanying women do not have any revenue generating activity but mostly limited to household activities. The average number of children per woman is 2.9, i.e. 3 children per woman. Illiterate mothers count for 35.64% of the women, which is approximately the same percentage compare to that of those who have reached secondary school level. The majority of mothers rate the reception as good for the first and also for the other admission days at respectively 99.01% and 88.12%. All the staff (100%) reassure that the mothers of malnourished children admitted to the TNU are advised to breastfeed their children. Although the quality of malnutrition management in this hospital is acceptable, much remains to be done to ensure strict compliance with the national protocol for the management of acute malnutrition.

KEYWORDS: *Malnutrition, children, mother, quality, TNU.*

INTRODUCTION
Malnutrition represents a considerable challenge to human health, particularly in developing countries. It is defined as a pathological state resulting from the relative or absolute deficiency or excess of one or more essential nutrients. This condition can be clinically apparent or detectable only by biochemical, anthropometric or physiological analyses.[1] In developing countries, nearly 200 million children under five years are chronically undernourished or stunted, while the number of underweight children is close to 130 million.[2] Many studies have already established that acute malnutrition is a major contributor to infant and child mortality and to the poor health status of pre-school children in developing countries. As such, it constitutes one of the major public health problems. Indeed, one third (1/3) of children under 5 years suffer from acute malnutrition in the world. Of these, 70% live in Asia, 26% in Africa and 4% in Latin America and the Caribbean.[1] This prevalence of malnutrition is the result of the almost permanent food crisis that affects the population of these countries. The number of malnourished children is increasing every year. Among those who escape death, one third will experience disorders that will forever compromise their physical, psychosocial and cognitive development.[3] In Chad, child malnutrition is a chronic situation, particularly in the country's Sahelian strip, where it is the underlying cause of more than half of children under five deaths.[4] According to the results of the national nutrition survey, the national prevalence of global acute malnutrition was 12.9%, including 2.9% of the severe form (SAM), placing the country in an

alarming nutritional situation according to the WHO's 2006 classification.[5] Several factors could be the cause of the occurrence of malnutrition, including inadequate food intake, low dietary diversity, infections such as diarrhea, malaria, acute respiratory infections, anemia and measles. Other so-called underlying causes include poor infant and young child feeding practices, low access to safe water and inadequate hygiene, acute food insecurity, residual insecurity and inter-community conflicts.[5] Severely malnourished children are often severely ill at the first visit. Emaciation, anorexia and infections are common.[6] To tackle this situation, the Chadian government and its partners have set up programmes for the management of acute malnutrition in the ANU/UNA and TNU/UNT. The objective of the TNU/UNT is to treat children suffering from severe acute malnutrition with medical complications. TNU/UNT.s are located in hospitals.[4] Is the management of severe acute malnutrition with complications at the Therapeutic Nutritional Unit (TNU/UNT)/NDA carried out according to the national protocol for Integrated Management of Acute Malnutrition (IMN)? Are the NTU/UNT staff qualified? Have the mothers of children admitted to the NTU benefited from a nutritional education session? These are all questions that remain to be answered, hence the interest of this study, which aims to evaluate the quality of the management of severe acute malnutrition with complications at the Therapeutic Nutrition Unit (TNU/UNT) of the Notre Dame des Apôtres Hospital.

MATERIALS AND METHODS

Framework of the study

This qualitative, transversal, prospective study involved 101 mother-child pairs (children of 0-59 months old). Data were collected by means of anthropometric measurements**:** Brachial Perimeter (BP), toises, scales (accurate to the nearest 10 or 20 g) for those under 8 kg and another (Salter type) for those over 8 kg with a basin, tared. In addition, a structured questionnaire was used to interview mothers of admitted children and TNU/UNT. staff. The study was conducted at the TNU. of the *Notre Dame des Apôtres* Hospital in the Chagoua district of N'Djaména, Chad.

Study population

It involved mother-child pairs whose children were aged 0-59 months admitted to the TNU/UNT on the one hand and TNU/UNT staff on the other. All mother-child pairs admitted to the TNU/UNT and the TNU's nursing staff were included in the study. All persons who did not meet the above criteria were excluded from the study.

Study variables

The variables studied were age, sex, weight, oedema (register), BP (register), and other socio-economic and health variables.

Sampling

The sample included only of mother-child pairs whose children were aged 0-59 months admitted to the NDA/TNU/UNT. The sample size was calculated using the Lorentz formula below:

$$N = \frac{Z\alpha^2\, p\,(1-p)}{d^2}$$

N = minimum sample size required;
Z*α* = 95% confidence intervall, 1.96;
d = Margin error at 5% (standard value 0.05);
1 – p = **q**
P = SAM Prevalence (upper limit of SAM prevalence according to SMART survey 2019)**.**

Data analysis

The data collected were entered using Epi data software in accordance with the pre-established chronology. The analysis and processing of the data was carried out on Epi info version 7.1.3.3.

Administrative and ethical consideration

The study was carried out after obtaining permission for the research from the hospital authorities. As well as the free and informed consent of the study participants requested from each of the mothers and the nursing staff after explaining the purpose of the survey and the collection procedures.

RESULTS AND DISCUSSION

In this study, a sample of 101 women (mothers of children aged 0-59 months admitted to the Therapeutic Nutritional Unit of the Notre Dame des Apôtres Hospital) was surveyed compared to 68 women initially planned. This increase in sample size was intended to ensure a better precision in order to improve the quality of the collected data. Also, 20 agents among the nursing staff were interviewed.

Identification of mother and child pairs

Mothers status

The results show majority of mothers are married women (93%) living in monogamous (69.89%) marital status. The average age of mothers is 25 years. Married women represented 53.97% of cases in the study conducted by Kaboré et al. [7] In relation to age, Nalwanga et al. [8] found that the average age of 78.5% of mothers was 27.4 years and 11.3% were under 19 years. Indeed, the young age, insufficient preparation during pregnancy and the low education level of mothers could be factors favourable to the occurrence of malnutrition.[7]

Also, despite their status, which should reflect a slight economic stability or the father has at least one source of income, which would have been an advantage for the well-being of their children, the majority of married women have children who are victims of malnutrition.

With regard to the level of education of mothers, illiterate women and those with secondary education

each represented 35.64%. In the study by Kaboré et al. [7], 41.27% of mothers were illetrate, and 80% in the study by Traore et al [9] This is higher than the proportion determined in the present study. This difference could be explained by the urban character of this study where illiterate women have access to information compared to rural women. This leads us to question the capacity of these mothers to appreciate the importance of Exclusive Breastfeeding and the impact of malnutrition on child health. The results of the study by Tano et al.[10] showed that the nutritional status of children did not differ according to the mother's education level.

With regard to the socio-professional activities of the mothers, our results show that the majority of the investigated mothers are not active, representing 55.45% of the total study population. These women have an average of 3 children each. The authors found that the socio-economic level of the families was low in 90% of cases. This situation is thought to be one of the main determinants of global acute malnutrition.[9]

Identification of children

Among the children admitted to the TNU, there were 53 boys (52.48%) and 47.52% girls. The sex ratio was 1.09 in favour of the male sex in the study carried out by Konaté et al. [11] Savadogo et al. showed that during their study period, the centre received more boys (54.4%).[12] This result is similar to the one obtained in this study. Also, other authors found that more than half of the children enrolled in their studies were male (55.3%)[13]; (50.8%)[14]; (53.9%)[15]; (57.4%)[16]; (50.6%)[17]; (59.6%)[8]. On the other hand, there is a predominance of females in the work of Traore et al.[9] with a sex ratio of 0.92. Similarly, among the 68 children analysed by Dailey-Chwalibóg et al. [18], 56% were female.

The mean age of the children admitted was 12.37 months, with a predominance of children with age within 1-10 months (42.57%) and 11-20 months (39.60%) classes compared to 17.82% for those aged 21-30 months. The authors respectively determined in their studies a higher mean age than that observed in our study which is 23.9 (±14.8) and 14.4 months.[19, 8] Milcent et al. found a predominance of the 6-17 months age group which accounted for 42%.[20] About 67% of the children were under 24 months of age according to the study by Gebremichael et al.[16] For musa and Mustafa, the age categories of the patients in their study were (6-24), (25-42) and (43-59) months, accounting for 80.1%, 18.6% and 1.4% respectively.[21] Sangho et al found[22] a result similar to ours. The most affected children were aged between 12 and 24 months with a frequency of 43.4%. They indicate that the frequent occurrence in this age group can be explained by the fact that they are in the weaning period, with the late introduction of complementary foods, benefiting less attention and supervision during the meal, or obliged to share the dish with their elders.

Table N° 1: Socio-economic characteristics of mothers.

Variables	%
Marital status	
married	93
Divorced women	2
Widows	1
Singles	4
Matrimonial regime	
Monogames	69.89
Polygames	30.11
Level of education	
Illiterate	35.64
Secondary	35.64
Primary	7.92
Higher education	1.98
Literate	18,81
Main activities	
Without activities	55.45
Trade	23.76
Other activities	6.93
Agriculture	12.87
Breeding	0.99

Table N° 2: Identification of admitted children.

Variables	%
Sexes	
Male	52.48
Female	47.52
Average age	12.37 months
Age groups	
1-10	42.57
11-20	39.60
21-30	17.82

Status of children admitted to TNU/UNT

The situation of the children on admission was as follows: the average weight was 5.8 kg, ranging from 2.5 kg to 9.6 kg with a median of 5.9 kg. Children of both sexes had a similar mean weight, i.e. 5.8 kg for girls and 5.8 kg for boys. According to the three admission criteria (P/T, PB and presence of edema), we note that out of children admitted to the unit, 39.60% or 40 children had bilateral nutritional edema, of which 57.5% were girls and 42.5% were boys. Irena et al. determined a median weight of 6.5 kg (IQR, 5.5 -7.9), which is higher than that found in this study.[13] They also found that boys weighed more than girls, with a mean weight of 7.0 kg compared to a mean of 6.6 kg for girls at admission (P = 0.02). As in the Collins and Sadler [23] study, the median weight at admission was 7.25 kg overall. This may reflect the severity of the nutritional situation in the city of N'Djamena. Acute malnutrition without edema was the only clinical form observed in the series by Kaboré et al. for the 34 children aged 1 to 6 months.[7]

Table N° 3: Status of children on admission to UNT/UNT.

Situation on admission	
Average weight	5,8 Kg
Weight by gender	
Male Female	5.8 Kg 5.8 Kg
Presence of oedema according to gender Male Female	 42.5% 57.5%

Average admission period in TNU/UNT

We note that majority (68.32%) of children are admitted in hospital for less than one week. Furthermore, about 14% of the children stayed more than 10 days in the TNU/UNT, exceeding the standard recommended by the protocol. This was 14.06±9.30 days and 19.6 days respectively in the studies by Kaboré et al. and Sangho et al.[7, 22] The average admission period in therapeutic feeding centers observed in the study by Teferi et al. was 25 days for patients with severe wasting and 21 days for patients with edematous malnutrition.[24] That determined by Vygen et al. was 13.3-6.9 days.[25] Indeed, UNICEF listed the longer admission period in each phase of treatment, e.g. 30 days on F100 as one of the weaknesses noted in the TNU/UNT.[4]

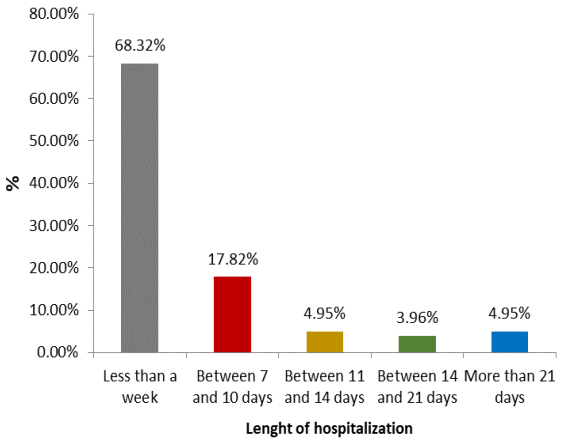

Figure 1: Distribution of mother or accompanying persons of children according to the lengh of hospitalization.

Mothers interview

Reception, service and care quality

During the individual interview of the mothers, the majority express an overall satisfaction by the given care and services with a rate of 92.00%. They are also satisfied with the first day reception (99.01%). They are also satisfied (88.12%) with the treatment during their stay, while 11.88% of the women are not satisfied. This result (11.88%) raises questions about the behaviour of the nursing staff towards the patients during this period of hospitalization. The staff must be kind and consider mothers as partners in the care of their children. A mother should never be reprimanded, blamed for her child's problems, humiliated or unwelcome. Helping, instructing, counselling and treating the mother in a friendly manner is also essential for the long-term treatment of the child.[6] This care satisfaction was also noted by Konaté et al. where nine out of ten women interviewed (90%) were satisfied with the nutritional care.[11]

Still on the subject of the management of these children, we note that 97.03% of the mothers interviewed confirmed that they had carried out clinical and/or radiographic examinations. Indeed, the success of the initial phase of treatment requires frequent and thorough clinical examinations and the anticipation of common problems so that they can be prevented, recognised and treated without delay.[6] Also, all the mothers (100%) said that the examinations were free of charge. Hence the respect of the recommendations of the national protocol for the management of SAM on the performance of systematic examinations and free care at the TNU/UNT. And this relieves the mothers of these children, most of whom are not engaged in income-generating activities, as the overall cost of SAM treatment assessed by Isanaka et al. was €148.86 per child treated.[26] This is not within the means of these children's families.

Associated diseases

Most mothers (81.19%) noticed the improvement of their children health status compared to the first admission day. However, 18.81% felt that their children's condition remained unchanged or deteriorated for various reasons. In particular, pathologies associated with malnutrition, such as diarrhoea, vomiting, persistent fever, respiratory difficulties and anaemia are the most frequently cited by the latter. Although reported on admission, at least one of these malnutrition-related conditions was reported by several authors. In particular diarrhoea,[19,16,21,25] pneumonia,[9,19,16,25] malaria,[9] gastroenteritis,[9,19,16] anaemia,[19] dehydration, [16] vomiting.[16,21,25] Indeed, child morbidity plays a key role in the occurrence of malnutrition. It has a direct effect on nutritional status.[10]

Hygiene and sanitation of the host facility

Globally, more than half (56.44%) of the investigated mothers regarding the state of cleanliness of the premises, find the structure less clean against 43.56% of mothers who find it clean. As for the cleanliness of the latrines, 54% of the mothers thought that the toilets are not clean, compared to 23% of the mothers who think the opposite and 23%, who think that they are only occasionally clean. These poor hygiene conditions reported by the mothers could be a source of contamination or nosocomial infection for the children and their mothers. It is known that water supply, safe sanitation and improved hygiene can contribute to the fight against malnutrition. This is why the Wash in Nutrition strategy reinforces this notion by promoting joint activities within nutritional centres and up to the household level of malnourished children, to ensure environmental and personal hygiene.[27] As for the

wearing of gowns, all the mothers (100%) confirmed that the agents wear gowns while on duty. These results show the extent to which agents respect the wearing of smocks in the TNU. Maite pointed out in her study that the large number of health centres where malnutrition management was done, and the lack of proper water and sanitation infrastructure at the centres, undermined the operational capacities of the actors present.[27]

Awareness raising on breastfeeding and mother-child nutrition

With regard to encouragement and awareness of mothers on breastfeeding as well as the nutrition of mothers and their children by the agents of the unit, we note an equal proportion of mothers having been encouraged or not by the agents to breastfeed their children if they are less than 23 months old, with respectively 40% on each side. Also, in relation to awareness-raising on the nutrition of the mother-child couple. The results show that a large proportion (65%) of mothers have not been aware of this aspect, compared to 35% aware mothes. Yet this awareness would have been an important point in the prevention of malnutrition. According to the study by Tano et al.[10], in urban areas, children who were not breastfed until the age of two were more frequently malnourished than breastfed children. Therefore, increased awareness and multidisciplinary engagement will be needed to begin to address the challenges and barriers to the assessment, prevention and management of paediatric malnutrition in our hospitals.[28]

Table N° 4: Summary of the mothers' interview.

Reception and quality of service and care according to the mothers' opinion	%
Care and services	
Good	92
Bad	8
first day reception	
Good	99.01
Bad	0.99
Treatment during admission	
Good	88.12
Bad	11.88
Clinical and/or radiographic examinations	
Yes	97.03
No	2.97
Free examinations	
Yes	100
No	00
Diseases that affect the condition of children in addition to Malnutrition	
Persistent fever	36.84
Vomiting	26.31
Diarrhoea	21.05
Other	15.78
Awareness raising on mother and child nutrition	
Yes	35
No	65

Staff interview

A total of 20 staff members of all categories are surveyed, including 09 nutritionists, 09 nurses, 01 senior paediatric technicians and 01 Medical doctor. Most (95%) of those interviewed assured us that the department has more than 20 workers, including more than 10 nurses but only one doctor. Also, all the staff interviewed (100%) reassure us that the TNU/UNT has a copy of the national protocol for the management of acute malnutrition and an adequate technical platform for the management of malnourished patients.

Clinical treatment

From these interviews, it is also noted that clinical examinations are done in most cases within the TNU/UNT, rarely outside (private clinic or laboratory) or at the hospital paediatric ward. Also, a systematic medical treatment with routine drugs associated with RUTF (ready-to-use therapeutic food) is administered to malnourished children for their management. In fact, according to the national protocol, in the TNUs, dietary treatment is combined with systematic medical treatment based on antibiotics (amoxicillin), vaccination against measles, management of complications and psychomotor stimulation.[4] Thus, the most pre-registered drugs are antibiotics such as ampicillin, amoxicillin, gentamycin, also dewormers such as Mebendazol and albendazole as well as artemether, Coartem and artesunate. Tesfay et al. reported in their study almost all children (98.8%) received antibiotics such as amoxicillin, ampicillin and gentamycin and more children received folic acid and iron supplements (68.1% and 61.9% respectively).[15] Similarly, Abate et al. reported that the most prescribed drugs were PO antibiotics (90%), amoxicillin, followed by vitamin A supplementation (74.0%).[14] Of the total, 44.6% of children were dewormed with Albendazole or

Mebendazole, 52.2% received folic acid. Similarly, WHO also recommends that in a child hospitalised for severe acute malnutrition with complications such as septic shock, hypoglycaemia, hypothermia, skin infection, respiratory tract infection or urinary tract infection, or who appears lethargic or sickly, antibiotics should be given parenterally [IM or intravenous (IV)]; in a child hospitalised for severe acute malnutrition who has no apparent signs of infection and no complications, an oral antibiotic should be given.[29]

Nutritional management

These interviews with staff reveal that in terms of nutritional treatments given to malnourished children admitted to the unit, the inputs used are therapeutic milks (F100, F75) and plumpy-nut. In addition to these, fortified porridges or family meals are also given to some children depending on their age. Indeed, according to the national protocol, in the TNUs, dietary treatment is carried out in two phases with the use of F75 and F100 therapeutic milks, and then the introduction of RUTF at the end of the second phase to prepare the child for transfer to the ANU/UNA. [4] Also, the supply of these inputs is ensured by the state's partners. Supplies are provided on a monthly basis, but there are sometimes shortages. The use of these inputs (therapeutics (F100, F75) and RUTF (plumpy-nut)) has been reported by several authors. Notably Lenters et al. who highlighted this in their study that in an urban trial in Senegal randomised children with SAM and MAM to receive either RUTF or F100 (a milk-based therapeutic product used for nutritional rehabilitation in hospital settings).[30] Tadesse et al. reported that RUTF was perceived as a high-quality food that was effective in treating symptoms of 'hunger disease' and in preventing SAM-related deaths.[31] And Tesfay et al. showed that patients who were not treated with plumpy-nut were 63.2% less likely to recover compared to those who were administered plumpy-nuts.[15]

CONCLUSION

Our study focused on the evaluation of the management of severe acute malnutrition with complications in the TNU of the Notre Dame des Apôtres Hospital in N'Djamena, Chad. It involved 101 mother-child pairs of severely malnourished children with complications admitted to the TNU of this hospital. This evaluation enabled us to highlight the situation of the mother-child pairs admitted and also to have clear informations on the management of these malnourished children admitted to the TNU. Indeed, this study shows that the quality of anthropometric and clinical parameters taken on admission was respected with slight inconsistencies that can be improved. The majority of the mothers surveyed are not active, and the malnourished children are those in the 1 to 20 months age group. A large proportion of those admitted have bilateral nutritional edema, more than half of whom are girls. The quality of service in the facility is acceptable given the level of intake, although the facilities are less clean, but globally the quality of care and service is satisfactory. A systematic medical treatment with routine drugs associated with RUTF is administered to malnourished children for their care as recommended by the protocol. The inputs used are therapeutic milks (F100, F75) and RUTF (plumpy-nut). But, for adequate care activities for malnourished children, efforts still need to be made. From the above, we can conclude that the quality of care for severe acute malnutrition with complications at the Therapeutic Nutritional Unit (TNU/UNT) of the Notre Dame des Apôtres (NDA) Hospital is acceptable. This requires an improvement in the of the malnutrition treatment quality, good hygiene and sanitation of the premises and awareness-raising among mothers.

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