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Clinical and Evolutive Profile of Emaciaton in Seropositive Children Treated at the University Teaching Hospital (UTH) of Treichville (Côte D'ivoire)

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Abstract:

Objective: *To describe the main epidemiological, diagnostic, therapeutic and evolutionary aspects of HIV-infected and emaciated children in the CHUT Medical Pediatric Department in order to improve their survival.*

Methods: *Our retrospective, descriptive study was conducted from January 2010 to December 2013. It involved 69 files of children aged 0 to 59 months infected with HIV treated and followed in the care unit. The sample was calculated according to the formula of MARK LORENTZ.*

Results: *The mean age was 23.5 ± 17.25 months [3 to 59 months]; the sex ratio was 1.02. At admission 60.86% of the patients were at the family meal and 48% had a weight of less than 10 kg. Immunologically: 40.58% were category C (CDC classification) and the CD4 level <15% in 30 patients.*

At the beginning of our study, the prevalence of wasting was 59.32%, including 40.48% for severe acute malnutrition (28/69) and 18.84% for moderate acute malnutrition. Infections of the ENT sphere 20.29% and respiratory 13.04% dominated by tuberculosis.

At the end of the 12-month review, we think of a significant reduction in the percentage of wasting from 59.32% to 11.60%. The good nutritional status for the P / T ratio increased from 31.88% to 75.36%. We found a satisfactory evolution (75,36%), in spite of a weak completeness of the treatment (20,29%).

Biology showed an increase in the percentage of patients with a CD4 count> 25% (56.52%).

Conclusion: *Good therapeutic and nutritional management can improve their survival.*

Keywords: *Children-HIV- Malnutrition- ATPE- Therapeutic milks.*

Introduction

Wasting or acute malnutrition (AD) is a nutrient deficiency that reflects nutritional status at a given time when a subject is dealing with an acute problem, such as an infection or a food crisis **[1]**. This acute malnutrition can be moderate or severe.

It weakens the child and causes various infections, leading in association with diarrhea, measles, pneumonia and malaria or infection with HIV / AIDS abnormally high mortality according to studies **[2] [3] [4]**.

In sub-Saharan Africa, the prevalence was 8.3% in 2014, or 13 million children. It was higher in the West and Central Africa regions (10.1%) than in East and Southern Africa (6.3%) **[5].** And particularly in Côte d'Ivoire this prevalence of acute malnutrition

is 8% and 2% for severe forms **[6].** And this severe form (MAS) affects mainly children under 5, where it is responsible for 5 to 15% of deaths, or about 1 to 2 million each year **[7].** In 2009, 33.1% of orphans and children made vulnerable by HIV (OVC) from 6 to 59 months were malnourished **[6].** Yet in this sub-Saharan area, hospital management of severe acute malnutrition (SAM) among HIV / AIDS-infected individuals remains a challenge **[8]**. In Côte d'Ivoire, an earlier intra-hospital study in the same department showed a prevalence of 35.17% of cases of severe acute malnutrition and of 20.68% for moderate acute malnutrition **[9].** The acquired immunodeficiency syndrome (AIDS) aggravates the pandemic situation of malnutrition, which in turn worsens the prognosis of AIDS. The nutritional impact of HIV infection was perceived at the beginning of the epidemic as one of the dominant hallmarks of the disease, to the point of being an essential part of diagnosis and prognosis **[10].**

In Côte d'Ivoire, nutritional management of this co-morbidity has recently been the subject of very few studies. It is in this context that we undertook this work, which aimed to describe the main epidemiological, diagnostic, therapeutic and evolutionary aspects of HIV-infected and malnourished children in the CHUT Medical Pediatrics Department with a view to improving their survival.

Patients and methods

Frame

Our study took place in the pediatric department of the University and Hospital Center of Treichville. This service has a health staff trained in the management of acute malnutrition with a unit of hospitalization and dietetics. It operates as a center of nutritional rehabilitation internally (CRENI) since YEAR. In Côte d'Ivoire, the CRENIs are called the Therapeutic Nutrition Unit (UNT) by the National Nutrition Program (PNN) **[11]**.

UNT is responsible for the care of severely malnourished children with complications. Its mission is to conduct the acute phase or phase 1 and the transition phase.

Patients

This was a retrospective, cross-sectional, descriptive study conducted over a four-year period (January 1, 2010 to December 31, 2013) in the HIV unit of the pediatric ward of the University Hospital of Treichville. The study population consists of all children from 0 to 59 months in care and regularly followed for 12 months in the HIV unit of the pediatric department of the University Hospital of Treichville. Included were all cases of HIV-positive, malnourished children diagnosed on clinical, biological, treatment and follow-up arguments in the treatment unit. Not included in the study were all HIV-negative and malnourished children in this age group and children aged 0-59 months infected with HIV / AIDS treated and followed in the unit; but who were lost to sight or died before the review period; as well as children with a poorly informed or incomplete client file (no mention of weight and age at all visits, no mention of the balance sheet at D0, M6 and M12).

The 206 centimeter ShorrBoard measuring board was used to measure the height of the children, in both supine and standing positions. The SECA gmbh scale is used to measure the weight of children over 2 years old with an accuracy of 100g and the ADE model 116800 scale to take the weight of children under 2 years old.

The Weight (P) / Height (T) Nutritional Status Table for children under five according to WHO 2005 was used to diagnose the nutritional status of the child using the Weight-Height Index (Z-score weight-height).

For the diagnosis of AIDS, the following HIV tests were performed: ELISA, Western Blot and PCR.

The required sample size was calculated using the following MARK LORENTZ formula:

n = Ɛ2 P (1- P) / i2 with P: estimated prevalence of the studied variable (P = 3.7%) [EDS III 2012] **[6],** i: margin of error at 5% and Ɛ: level confidence level (standard value = 1.96), ie at least 57 patients. All the files of the children meeting the inclusion criteria were retained until the necessary staffing levels (consecutive recruitment) were reached.

Methods

Inclusive children underwent clinical examination with weight gain and height measurements. Then, the pediatrician performed the clinical examination, while completing the questionnaire developed for the data collection. After the clinical diagnosis, two nurses performed two blood tests: one on an EDTA tube and the other on a dry tube. Finally, the blood samples are

deposited in a cooler and sent to the central laboratory for analysis.

The weighing method, with tare function, allowed the weight gain of bedridden or turbulent children. Waterlow's classification was used to assess the nutritional status of children. The size and weight obtained made it possible to calculate the weight for height (P/T) index to search for emaciation or acute malnutrition. This index is expressed in "Z-score". This represented a difference in the child's measurement relative to the reference median divided by the standard deviation (SD) of reference. This method classified the study population into four nutritional status groups. Thus, if the P / T index is at: Z-score <- 3 ET (severe acute malnutrition); -3 AND ≤ Z-score <-2 ET (moderate acute malnutrition); -2 AND ≤ Z-score <-1.5 ET (nutritional status at risk) and -1.5 AND ≤ Z-score (good nutritional status).

The assessment of nutritional status and AIDS was done at inclusion (M0), at 6 months (M6) and at 12 months (M12).

Nutritional and medical care was carried out according to the national guidelines of the National Nutrition Program (PNN) made available to health staff in 2010 and this in accordance with the well-coded management protocol based on the recommendations of the WHO **[11] [12]**.

Depending on the clinical stage of AIDS, nutritional status and age; patients were placed on ready-to-use therapeutic food (RUTF) (Plumpy'nut), therapeutic milks F75 (75kcal / 100ml) and F100 (100kcal / ml) as recommended by WHO **[11] [12] [13].** Infants under 6 months of age were treated with first-age milk. The malnourished had received an average of 6 meals a day spaced 4 hours apart.

Therapeutic milk F75 is used in so-called stabilization phase during which the recommended daily intake is 100 kcal / kg / day. This phase can last 2 days to a week. It is intended to stabilize the weight and especially the vital functions during the first days and to accustom the child to recharge itself. F100 therapeutic milk is used in phase 2 of renutrition. It is recommended to bring 200 kcal / kg / d during this second phase which allows a weight gain. More and more often children pass directly from F75 to RUTF or in the absence of complications, treated directly with RUTF. It was done in hospital or outpatient when there were no complications.

Children who had complications had been included according to the PNN criteria defining severe malnutrition according to age, namely:

• Children less than 6 months old or weighing less than 3 kg who had a P-T <-3 z-score or bilateral edema or weight loss.

• Children from 6 months to 59 months of age who had P / T <-3 and / or PB <115 mm and / or bilateral edema.

Routine medical treatment was administered including folic acid (5 mg once taken), vitamin A in case of marasmus (100,000 IU for infants 6 to 11 months of age and 200,000 IU for children over 12 months) and an antifungal for 7 days. Systemic antibiotic therapy and other therapies were based on clinical presentation **[11].**

The exit criteria for the UNT were a positive appetite test and at least 90% control of the amount of therapeutic milk prescribed, resolution of complications, and total swelling of edema for Kwashiorkors. Phase 2 rehabilitation was done in an outpatient therapeutic feeding unit (UNTA) after discharge.

After screening each child for nutritional status, children were allocated to each nutritional status group according to the coding of clinical parameters. Subsequently, this distribution or distribution was used to establish the correlation between the clinical parameters and the Z-scores of the nutritional status of the study population. A survey form has been developed for data collection and reporting.

The survey cards were completed using client files and registers.

The data was entered on the Word computer software and then analyzed on Excel, epi info, epi data. The results are presented in tabular form. The analysis was descriptive and consisted of calculating numbers, averages and proportions.

The ethical rules (agreement of the scientific medical director and the head of department, anonymity, destruction of the investigation cards after their exploitation) were respected and no conflict of interest was declared.

Results

Epidemiological Characteristics

During the study period, we worked on 349 individual patient files. But we selected 69 files (our study

population). The 69 patients accounted for 19.77% of the active file (69/349). The average age was 23.5 ± 17.25 months [extreme 3-59 months]. The age group [36-59 months] was the most affected with 31.88%. The patients were 35 boys (51%) and 34 girls (49%). There was a male predominance with a sex ratio of 1.02. All our children (100%) came from a low socio-economic background. At admission 60.86% of the patients (42/69) were at the family meal and 48% had a weight of less than 10 kg.

Clinical and Immunological Features

The anthropometric characteristics at admission according to the Weight / Height ratio of HIV-positive children with acute malnutrition are summarized in **Table 1**. The prevalence of wasting was 59.32%, including 40.58% for severe acute malnutrition (28 /69) and 18.84% for moderate acute malnutrition. Marasmus was the dominant clinical form (100%). No child in our cohort presented kwashiorkor or mixed form.

Table1. *Distribution of Children by Nutritional Status by Weight / Height at Admission*

P/T ratio	Effective(n= 69)	%	
≤ −3	28	40,58	Severe acute malnutrition
[− 3 ; − 2 [	13	18,84	Moderate acute malnutrition
[− 2 ; − 1,5 [	6	8,70	Nutritional status at risk
[− 1 ,5 ; 1 [	22	31,88	Good nutritional status

40.58% of patients were categorized as C (CDC classification) **(Table 2)** and CD4 <15% in 30 patients.

In our study, infectious localizations were dominated by respiratory infections (23/69), ie 33.33% of the cases followed in the order of digestive (17.4%), cutaneous (4.35%) and meningeal (1.45%). Respiratory infections were distributed as follows: ENT infection (20.29%) and primary tuberculosis infection (13.04%) **(Table 3).** At admission, almost half of the patients (30/69) had a CD4 count of less than 15%, or 43.48% of the cases.

Table 2. *Distribution of children by stage of CDC classification*

Clinical stage	Effective (n = 69)	Percentage (%)
Category N	3	4,35
Category A	14	20,29
Category B	19	27,54
Category C	28	40,58
Unspecified	5	7,25

Table3. *Distribution of children according to pathological antecedents*

Antecedents	Effective (n=69)	Percentage(%)
ENT infections	14	20.29
Tuberculosis	9	13.04
Diarrhea	6	8.70
Digestive candidiasis	6	8.70
Dermatosis	3	4.35
Featureless	3	4.35
Meningitis	1	1.45

Therapeutic and Evolutionary Characteristics

90% of patients (62/69) were observing their antiretroviral therapy (ARV) versus 10% (7/69). We found a low completeness of treatment (20.29%).

At admission: The majority of patients (35/69) were on family meals (50.72%) and those who received ready-to-use therapeutic foods (RUTF) (plumpy'nut) (24/69) or 34.78% of cases and a milk formula called F75 (6/69) (8.70%). 96% of patients received nutritional advice. At 6 months: The majority of patients (46/69) were on family meals (66.67%) and those who received Plumpy'nut (21/69) or 30.43% of cases and no child took the F75. All patients (100%) received nutritional counseling. Good nutritional status accounted for 59.42% of the cases, severe acute malnutrition (15.94%) and moderate acute malnutrition (13.04%) **(Table 4)**. The evolution was satisfactory in 68.12% of cases. 66.67% of the patients were at the family meal and 30.43% were under Plumpy'nut. All patients (100% of cases) received nutritional counseling.

At 12 months of follow-up, 75.36% of the children (52/69) had a good nutritional status, 8.70% moderate acute malnutrition and 2.90% severe acute malnutrition **(Table 4).** The evolution was satisfactory in 75.36% of the cases. 63.77% of the patients were at the family meal and 21.74% were under Plumpy'nut. All patients (100% of cases) received nutritional counseling. CD4 count ≥ 25% decreased from 21.74% to 56.52% after 12 months of follow-up **(Table 5).**

Table 4. *Distribution of children according to nutritional status according to the weight / size ratio at M0 and after the therapeutic and nutritional PEC (M6 and M12).*

		Admission (M0)		M6		M12	
Type of malnutrition	**Ratio P/T**	**N= 69**	**%**	**N= 69**	**%**	**N= 69**	**%**
MAS	≤ −3	28	40,48	11	15,94	2	2,90
MAM	[− 3 ; − 2 [	13	18,84	9	13,04	6	8,70
ENR	[− 2 ; − 1,5 [	6	8,70	8	11,59	8	11,59
BEN	[− 1 ,5 ; 1 [	22	31,88	41	59,42	52	75,36
Overweight		0	0	0	0	1	1,45

Table5. *CD4 rate at admission and after 12 months of follow-up (n = 69)*

	Admission (M0)		M12	
Rate CD4	**N= 69**	**%**	**N= 69**	**%**
≥ 25 %	15	21,74	39	56,52
[1 5; 24 [	24	34,78	24	34,78
< 15	30	43,48	6	8,7

Discussion

This retrospective and descriptive work done in the HIV unit of the pediatric department of the University Hospital of Treichville aims to describe the main epidemiological, diagnostic, therapeutic and evolutionary aspects of HIV-positive children who have been treated and followed up in the medical pediatrics department of the to improve their survival. Like any retrospective study, we have noted limitations to our work that are: the medical file misinformed or incomplete, the out-of-stock in therapeutic foods or drugs, the non-compliance with the protocol of nutritional care, the patients who died in early study and lack of precision on the time of care of malnourished patients. Despite these factors limiting the information sought, the findings of our research are strong, enriching and generate the following points of discussion:

Epidemiologically

The incidence of malnutrition in our cohort was 19.77% in the active file (69/349). Our results are slightly higher than those of Agbeko et al. (18.1%) in Sokode, Togo **[14]**. This difference is explained by the fact that our study included both moderate and severe acute malnutrition. While the Togolese study was circumscribed only to severe acute form.

In our study, the incidence of AIDS-malnutrition association was 59.32%. Our results are similar to those of Mwadianvita (60.2%) in Lubumbachi **[15]** and d'Almeida (60.9%) in Cotonou **[16];** But remains higher than those of several authors respectively Mutombo (40.5%) in Côte d'Ivoire **[17],** Yellanthoor (54.9%) in India **[18]**, Nalwoga (52%)

in Uganda **[19]** and lower than those of other authors: Sunguya et al. (63.9%) in Dar es Salaam in Tanzania **[20].** This finding is explained by a difference in methodology in these different studies.

There was a slight male predominance (51%) with a sex ratio of 1.02. These results are superimposable to those of the literature **[21], [22], [23], [24]**. We can evoke a recruitment bias or less systematic access to care for girls.

In our series the preferred age was between [12-24 months] (28.98%) and [36-59 months] (31.88%); with an average age of children of 23.5 ± 17.25 months [extreme: 3-59 months]. Indeed, as in the work of other authors **[23] [24] [25] [26],** our work noted a greater vulnerability of children in the age group [12-24 months]. It would be due in our context to a period of misdirected diversification, which would expose to a high risk of breaking the weight curve of infants under 2 years old. This is due to the inadequacy or inadequacy of the diet to the caloric needs of the child and repeated infections for an immune system barely developed and weakened for these children infected

with HIV / AIDS. These factors will combine to disrupt the pace of growth.

As for the age group 36 to 59 months, the predominance of wasting in these HIV-positive children is explained by the poor feeding behavior and under-nutrition of mothers, coupled with the physiological immunodepression induced by HIV / AIDS. the existence of opportunistic infections. The modest socio-economic level of our subjects perfectly reflects the hospital population of the pediatric ward.

Clinically and Biologically

Clinically, infectious localizations were dominated by acute respiratory infections (33.33%) followed by digestive (17.40%), cutaneous (4.35%) and meningeal (1.45%)).

The high frequency of respiratory infections during malnutrition is reported by many authors **[27] [28].**

This finding may be explained by precarious nutritional status **[29] [30]** and physiological immunodepression, which would cause a decrease in the immunity that explains repetitive infections **[31]**. The prevalence of acute respiratory insufficiency or failure (ARI = ARF) in children is related to both anatomic and other factors (nutritional status, serological status, type of diet and environment). The anatomical singularities are the adenoids in the back of the nasal fossae playing a role in the occurrence of rhinopharyngitis. Lung flexibility is lower in children and chest volume is reduced. The fatigability of the diaphragm quickly renders ineffective the coughing efforts that clear the respiratory tree, hence the occurrence of low ARI. Pulmonary defense mechanisms are related to the integrity of the ciliary mucosa and its functions. This is all the more marked in children less than 5 years old where immune cells in the alveolus cell allow the arrest of certain infectious agents, their elimination or their destruction.

Marasmus was the dominant clinical form (100%). None of our cohorts presented kwashiorkor or mixed forms. Thus the marasmic form appears as the clinical form most frequently associated with seropositivity. This finding could be due either to an excess mortality in HIV-positive kwashiorkors **[32]** or, in the event of early contamination (in utero or during delivery), the progression of the disease would be rather to marasmus. whose symptomatology is similar to the wasting syndrome observed in infected adults **[33].**

Unlike marasmus, kwashiorkor shows a decrease in essential fatty acids **[34]**. The composition of essential fatty acids in breast milk could play a role in mother-to-child transmission and explain, moreover, the prevalence of marasmus in emaciated children.

Biologically, 40.58% were classified in category C of the CDC classification and the CD4 count was less than 15% in 30 patients, or 43.48%. This was the observation made by Choudhary in India **[35].** Other authors, like Diack in Senegal **[36]** and Kariyo **[37]** in Burundi, respectively report in their series 57,14% and 84% of severe deficit. Our results are similar to those of Folquet A. M. et al with a rate of 42.79% **[38].** An important meta-analysis provided accurate data on the evolutionary risk associated with different levels of CD4 or viral load as a function of age **[39].**

It confirms that the risk threshold of an opportunistic infection is higher in the first years of life: thus, the risk of AIDS at 12 months becomes significant for CD4 values of less than 15% for 5 years, for the 2 -5 years (20%), for 1-2 years (30%) and for less than 1 year (35%). This difference is also noted for plasma viral load.

Therapeutic and Evolutionary

Due to the double vulnerability of children due to physiological immunodepression and malnutrition, the management was global and included a food distribution (RUTF (Plumpy'nut)) and milk pre paration (F75) for nutritional rehabilitation, ARV treatment, treatment of comorbidities and nutritional counseling. At the end of the study, after 12 months of follow-up, the evolution was satisfactory in 75.36% of the cases. 63.77% of the patients were at the family meal and 21.74% were under Plumpy'nut. All patients (100% of cases) received nutritional counseling and the CD4 count ≥ 25% increased from 21.74% to 56.52%. This was a particularly effective approach in these emaciated HIV-positive children. This finding has been made by some authors with nutritional rehabilitation by Plumpy'nut **[40]**.

However, after these 12 months of follow-up, failures were represented by 2.90% of children (2/69) who had severe acute malnutrition (SAM) and 8.70% of moderate acute malnutrition (MAM) (6/69). And all 8 children (100%) in therapeutic and nutritional failure

had a CD4 count <15. This was due to nutritional and therapeutic nonobservance, as well as the existence of comorbidity and metabolic disorders. This nutritional non-compliance could be explained by the possible sharing of RUTF with other children in the household as described by Bahwere et al. **[41]**, resulting in insufficient energy intake for these emaciated HIV-positive children. But this could also result from a clinical improvement and therefore from a cessation of follow-up by the mother. The latter considered her child "cured" despite a nutritional state still insufficient from a medical point of view **[42]**.

As for the non-observance of antiretroviral treatment, several reasons were mentioned by the parents or guardians of our cohort of children, despite the advice of therapeutic education: family and psychological problems, stigmatization, numerous drug intake. This finding has been made by several authors in the literature **[43]**.

These patients were hospitalized in the department for a better therapeutic and weight follow-up and the management of intercurrent infections and metabolic disorders that would have missed at home, pledge of a therapeutic success. The risk of death would be increased when intercurrent pathologies and metabolic disorders are not taken into account **[44].**

Thus, improving the nutritional status of emaciated HIV-positive children is multifactorial, depending on both the quality of the diet and the quality of the medical treatment. Hence the need to organize a holistic treatment (antiretroviral treatment (TARV), treatment of co-morbidities and nutritional rehabilitation) in the treatment of HIV-positive children.

Conclusion

In the hospital setting, one in two HIV-positive children is emaciated and has a P-T score of less than -2 SD with a clear predominance of marasmus, an immunological collapse and a multifocal infectious comorbidity dominated by acute and digestive respiratory infections. Taking into account this anthropometric and immunological profile with ready-to-use therapeutic foods (RUTF) and therapeutic milks-F75 combined with antiretroviral treatment (ARV) shows a globally satisfactory clinical and immunological evolution. The benefit is reflected in the good nutritional status and recovery of CD4 lymphocytes, which improves the quality of life of these HIV-positive children. The battle is far from over, this supposes the reinforcement of the preventive measures based on the therapeutic and nutritional education of the populations concerned, specifically on the good therapeutic observance and the improvement of the standard of living.

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