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Malnutrition and Anemia in the District of Abidjan (Côte d'Ivoire): Case of Children Aged 6 to 59 Months Received for Consultation at the Anyama General Hospital in 2019

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Abstract | **Original Research Article**

Background and Objectives: Stunting and anemia constitute a real public health problem. Perfect control of this scourge will allow many children to reach the age of 5. The fight against child malnutrition necessarily requires understanding the deep and underlying causes. It is with this in mind that this present work is carried out among children attending the Anyama General Hospital. The aim is to assess the nutritional status of children aged 6 to 59 months. ***Methods and Study Design:*** This was a prospective and analytical cross-sectional study, covering the period from September to November 2019. The study involved 137 children aged 6 to 59 months who were seen in consultation and/or hospitalized in the pediatric department of Anyama General Hospital (District of Abidjan, Côte d'Ivoire). ***Results:*** The most common reasons for hospitalization among the children surveyed were anemia (89.1%) and malaria (67.9%). The most commonly observed type of malnutrition was stunting with a prevalence of 38.7% of cases. Approximately 23.4 and 15.5% of children with stunting suffered from moderate and severe forms respectively. Anemia was present in 89.10% of children according to the hemoglobin level with respectively 53.3% in severe form, 21% in mild form and 14.6% in moderate form. ***Conclusions:*** The prevalence of anemia is above the national threshold. Stunted growth and anemia are a scourge that must be combated in synergy with all health stakeholders.

Keywords: Malnutrition, Anemia, Children, Anyama General Hospital, Côte d'Ivoire.

INTRODUCTION

Children under 5 in low- and middle-income countries are at risk of not reaching their developmental potential (Gil *et al*., 2020). This unfortunate observation is mainly caused by malnutrition which occurs very early before the age of 5 years (Black *et al*., 2017). Malnutrition is a pathological condition resulting from the relative deficiency or excess of one or more essential nutrients. This condition may manifest clinically or may be detected following biochemical, anthropometric or physiological analyses (Khan *et al*., 2017). Despite its remarkable economic performance, Africa is the continent with the highest rate of malnutrition, especially malnutrition due to deficiency. Indeed, according to WHO (2023), approximately 22% of African children under 5 years old are malnourished. For most West African countries, child malnutrition is one of the major public health problems. Malnutrition is one of the leading causes of death in young children and one of the main reasons for pediatric hospitalization (Alflah & Alrashidi, 2023). It contributes to stunted growth and the worsening of infectious diseases in children. The most common nutritional disorder is the deficiency of microelements such as iron. In the most advanced stages, iron deficiency leads to anemia, the prevalence of which was estimated in 2012 at 75% in children under 5 years old living in Côte d'Ivoire (Asobayire *et al*., 2001). This prevalence proves that anemia is a real scourge which threatens the lives of Ivorian children. While this prevalence does not reflect the nutritional status of children across the entire national territory, it does reflect the scale of this scourge. According to Mohajan (2022), the fight against child malnutrition necessarily involves understanding the root and underlying causes. In the specific case of the city of Abidjan, the work of Esse (2014) and Kouamé (2017) has already made it possible to describe the nutritional profile of children received in the pediatric departments of Bingerville General Hospital (Abidjan, Côte d'Ivoire) and the Treichville University Hospital (Abidjan, Côte d'Ivoire).

The aim of this study is to assess the nutritional status of children aged 6 to 59 months. This involves drawing up the sociodemographic, economic and cultural profiles of malnourished and anemic children received for consultation and/or hospitalized in the pediatric department at Anyama General Hospital.

MATERIALS AND METHODS

Site of the study

The present study took place at the pediatric department of Anyama General Hospital (Abidjan, Côte d'Ivoire). This service includes three (03) consultation units, one (01) hospitalization unit with seventeen (17) beds, one (01) vaccination and weighing unit and one (01) nutrition and dietary demonstration unit.

Type and period of the study

This was a cross-sectional study with a prospective and analytical aim, covering the period from September to November 2019.

Study population

The study involved 137 children aged 6 to 59 months who were seen for consultation and/or hospitalized in the pediatric department of Anyama General Hospital (Abidjan, Côte d'Ivoire).

Inclusion criteria

All children aged between 6 and 59 months whose parents signed the consent form for blood sampling were taken into account. All children involved in the study should be exclusively received at the pediatric department of Anyama General Hospital during the months of September and November 2019.

Non-inclusion criteria

Children whose parents refused to sign the consent form and those who were hospitalized or underwent nutritional rehabilitation one month before the start of the survey were not taken into account.

Material used

An electronic scale of the brand SECA 874U (German) with a maximum capacity of 150 kg was used to measure the mass of the children. A two-meter SHORE-type height measuring rod was used to determine the height of children over one meter tall. As for those who are less than one meter tall, their sizes were determined using a 100 cm long SECA brand tape measure. An individual survey form, hospitalization records and medical records of hospitalized children made it possible to collect sufficient information on the children.

Determination of socio-demographic, socio-economic, cultural, dietary and clinical profiles

The child's sex, age and that of his mother, place of residence and the size of the household to which he belongs constitute the variables retained for the determination of sociodemographic characteristics. At the socio-economic level, the information collected concerns the daily food budget allocated to the household, the type of housing as well as the presence or absence of electricity in the child's household. Information on sociocultural characteristics concerns the mother's educational level, nationality, ethnic group and religion. Dietary characteristics were assessed based on the breastfeeding method chosen by the mother during the first six months of the child's life and the age of dietary diversification in the child. For medical history, two variables were retained: the child's weight at birth and the number of hospitalizations the child had had since birth.

Determination of the nutritional status of the children

The nutritional status of the children was revealed through the measurement of anthropometric parameters such as sex, age, weight and height. These parameters were used to calculate the weight-for-height (W/H), height-for-age (H/A) and weight-for-age (W/A) indices [11].

Determination of the biological diagnosis of anemia

In practice, the blood count, referred to as (NFS) Blood Formula Count, is carried out by taking capillary blood from the child's elbow crease. The blood collected is placed in a dry purple tube containing an anticoagulant of the EDTA (Ethylene Methyl Acetic) type. After collection, the tube is then shaken to prevent the formation of microclots. This blood is placed in an automated cell counter (Coulter Electronics, Luton, Bedfordshire, UK) with standard calibration, according to the manufacturer's instructions for analysis of human blood [12]. The measured values concern the number of red blood cells (RBC), the hemoglobin (Hb) level, the mean corpuscular volume (MCV), the mean corpuscular hemoglobin concentration (MCHC). These hematological constants made it possible to determine the etiology of normochromic normocytic anemia with a normal MCHC and a normal MCV, hypochromic microcytic anemia with a low MCHC and a low MCV and normochromic macrocytic anemia with a normal MCHC and a high MCV.

Data entry and analysis

Data entry and analysis were carried out using spss software version 24.0 and ENA (Emergency Nutrition Assessment) version 2018 and a chi-square test was performed for data analysis with a significance threshold of $p < 0.05$. The curves and histograms were made with GraphPad Prism 7 software.

Ethical considerations

The study was conducted only after authorization from the management of Anyama General Hospital. The research protocol as well as the questionnaire were assessed by the head of the Pediatrics Department of the said hospital. The survey was conducted only after obtaining the consent of the mother

or the child's companion. The parents were reassured about the confidentiality of the data.

RESULTS

Sociodemographic, socio-economic and cultural profiles of the children surveyed

The children surveyed were 55.47% boys and 44.53% girls (Table 1). Most of them (35.0%) were between 36 and 59 months old (Figure 1A). Their mothers were mostly (59.9%) between 20 and 29 years old (Figure 1B) and lived with their children in households consisting of an average of four (4) people (Tableau 1). Most of the children (63.50%) lived in common courtyards (Table 1) and came from the commune of Anyama in 49.6% of cases (Table 1). Most of them lived in households with mothers who were mostly uneducated (53.3%) and who had an average daily budget of 1500 FCFA for feeding family members (Table 1). The children were predominantly (90.51%) Ivorian (Figure 2A) and belonged to the Akan and Northern Mandé ethnic groups at 40.1 and 31.4% respectively (Figure 2B). The children's mothers were mostly Christian at 51.82% (Figure 2C).

Clinical and dietary profiles

The most frequent reasons for hospitalization among the children surveyed are anemia and malaria with 89.1% and 67.9% respectively (Table 2). Most presented recurrent clinical signs such as fever and skin and plantar pallor with respective rates of 88.3% and 86.1% (Table 2). Regarding the dietary profile, 49.2% of the children surveyed were exclusively breastfed. This group of children is followed by 48.2% of those who benefited from mixed breastfeeding during their first months of life (Table 2). However, it should be noted that the majority of mothers (54.02%) admitted to initiating food diversification before the infant was six months old (Table II).

Prevalence of malnutrition and anemia

Three types of malnutrition are detected in children aged 6 to 59 months received for consultation and/or hospitalized at Anyama General Hospital. The most common type observed is stunting with a prevalence of 38.7% of cases. Approximately 23.4 and 15.5% of children with stunting suffer from its moderate and severe forms respectively. Underweight is second with a prevalence of 21.2%. Its moderate and severe forms are expressed at prevalences of 11.7 and 9.5% respectively for its moderate and severe forms. Acute malnutrition is the least represented at a prevalence of 18.2% (Table 3).

Among children admitted to Anyama General Hospital, anemia is present at 89.10% according to the hemoglobin level with respectively 53.3% in severe form, 21% in mild form and 14.6% in moderate form (Table 4). This anemia is dominant according to the VGM in the microcytic and normocytic form with a prevalence of 63.5% and 30.7% of cases respectively. (Table 4). According to the MCHC, the hypochromic form is dominant with a prevalence of 59.12%. The least dominant is the normochromic form with 40.88% (Figure 3).

DISCUSSION

According to the present study, 18.2% of the children surveyed are wasted, with 10.9% and 7.5% suffering from moderate and severe forms respectively. This prevalence is significantly higher than the critical value of 15% reported by WHO (2000), to that of 6% describing the level of acute malnutrition in children under five years old living in Cote d'Ivoire (MICS, 2016) and to that of 5.22% relating to the level of malnutrition at the Bingerville General Hospital (Esse, 2014). However, this result remains lower than that expressed by Adebo *et al.,* (2018) in Benin and by Kouamé (2017) in the Pediatrics Department of the University Hospital of Treichville (Abidjan, Cote d'Ivoire). The systematic diagnosis of nutritional status was carried out in a hospital among children hospitalized or who came for consultation, obviously for reasons of illness. This reason could explain the high prevalence of malnutrition compared to that of the general population of children under five years old. The majority of children lived in households comprising an average of 3 to 4 individuals and spent an average of 1500 FCFA or more than 2 Euros/day. The household size reported in this study is below the statements of Riquet *et al.,* (2017) who stated that in Côte d'Ivoire, households are composed of at least 5 people. The main reason for this observation is linked to the fact that 46% of Ivorians live in overcrowded families and spend less than 2 euros/day (Borgen Project, 2017). Consequently, large families hardly ever visit hospitals and turn to traditional medicine. In this study, children aged between 6 and 11 months are the most affected by malnutrition with 80% of cases. This result remains higher than that of Morgaye (2010) in Chad which is 39.70% in this age group of 6 to 11 months. This could be explained by the fact that either the supplements associated with breast milk are insufficient to cover the nutritional needs of children, or by the fact that during illness, many children do not eat while they are sick and this in the long run degrades their nutritional status in the following months.

The Children whose mothers live in common courtyards and those whose mothers do not attend school are the most affected by acute malnutrition. This result is consistent with those of Kouamé (2017) who showed that acute malnutrition is more pronounced among families living in precarious conditions. The low level of education of a mother is in the majority of cases detrimental to the health of the child as supported by the work of Esse (2014), children in this study who were exclusively breastfed before the age of six months were less affected by acute malnutrition. Breastfeeding saves lives and promotes physical and mental health throughout childhood and beyond childhood (Sankar *et al.,* 2018). Recommendations for exclusive

breastfeeding during the first six months of an infant's life are not being met. In fact, only 23.5% of mothers in Côte d'Ivoire practice exclusive breastfeeding (MICS-Côte d'Ivoire, 2016). Early or inappropriate diversification is a factor in the occurrence of malnutrition. These results are similar to those of Zahe *et al.,* (2016). Out of 121 children with fever, 20 (16.6%) suffered from acute malnutrition. Also out of 118 children who were pale, 17 children or 14% were diagnosed positive for malaria. This is explained by the fact that during malnutrition there is an immune deficiency favorable to infectious diseases, hence the presence of fever and pallor in children. Regarding anemia, it was detected in 122 (89.10%) children, of whom 18 (14.8%) were acutely malnourished. There would therefore be a link between anemia, malaria and acute malnutrition. Indeed, during malaria, a child develops a lack of appetite which deteriorates nutritional status and hemolysis of red blood cells which leads to anemia. In this study, microcytic anemia was the most widespread (63.5% of cases) within the population of children surveyed.

The study reveals that anemia is present in 122 children or 89.10%, 18 of these children have acute malnutrition or 14.8%. Of the 93 children who have malaria or 67.9%, 11 have acute malnutrition or 11.9%. There is a link between anemia, malaria and acute malnutrition with respectively p = 0.006 and p = 0.00. This is explained by the fact that during malaria, there is a lack of appetite (anorexia) which degrades the nutritional status and hemolysis of red blood cells which leads to anemia. These results are consistent with those of Morgaye (2010) in Chad and Kouamé (2017) in Côte d'Ivoire. These results are similar to those of Yessoufou *et al.,* (2015) and Adebo *et al.,* (2018) in Benin. Microcytic anemia results from an abnormality in hemoglobin synthesis in erythroblasts, mainly due to the unavailability of iron for hemoglobinosynthesis. This is why iron deficiency remains the main cause of microcytic anemia.

CONCLUSION

The prevalence of anemia among children seen in consultation at the pediatric department of the Ayaman General Hospital is above the national threshold. This anemia is also correlated with acute malnutrition. In view of these data, malnutrition therefore becomes a scourge to be fought in synergy with all the actors concerned, the use of these data would make it possible to contribute effectively to this fight in Anyama in the District of Abidjan (Côte d'Ivoire). It therefore seems wise to conduct a study to develop the profile of malnourished people in Hospitalization which takes into account anthropometric, clinical, sociodemographic, economic and dietary parameters, in order to reduce the high rate of malnutrition in hospitalization.

Table 1: Sociodemographic and socio-economic profiles of children

Sociodemographic characteristics		**Effectifs**	**Percentage (%)**
Gender of the children	Male	76	55.47
	Female	61	44.53
	Total	137	100
Household size	2	2	1.5
	3	41	29.9
	4	54	39.4
	5	16	11.7
	6	13	9.5
	7	6	4.4
	8	3	2.2
	10	2	1.5
	Total	137	100
Type of habitat	Villa	4	2.9
	Apartment	5	3.6
	Mud house	8	5.8
	common dwellings	87	63.5
	Low detached house	33	24.1
	Total	137	100
Origin of the children	*Anyama*	68	49.6
	Ebimpé	4	2.9
	Anyama-adjamé	8	5.8
	Ahouabo	4	2.9
	Yapokoi	1	0.7
	Azaguié-brida	1	0.7
	Tomassé	1	0.7
	Other localities	50	36.5
	Total	137	100

Food budget/day (FCFA)	1000	27	19.7
	1500	64	46.7
	2000	32	23.4
	2500	2	1.5
	3000	12	8.8
	Total	137	100
Mothers' educational level	Unschooled	73	53.3
	Primary	47	34.3
	Secondary	12	8.8
	Superior	5	3.6
	Total	137	100

FCFA : currency of the West African community ; 1 FCFA = 0,0015 Euro

Table 2: Clinical and dietary profiles of the children

Clinical and dietary characteristics		**Effectifs**	**Percentage %**
Reasons for hospitalization	Anemia	122	89,1
	Malaria	93	67,9
	Diarrhea	8	5,8
	Pneumonia	17	12.4
Clinical signs observed	Fever	121	88,3
	Pallor	118	86,1
	Dehydration	4	2,9
	Malnutrition	16	11,7
Distribution of the children according to breastfeeding method	Exclusive	68	49.6
	Mixed	66	48,2
	Artificial	3	2,2
	Total	137	100
Begining of food diversification	Before six (6) months	74	54,02
	After six (6) months	63	45,98

Table 3: Type of malnutrition in children

Type of malnutrition	**Absence of Malnutrition >-2 z –score**	**Presence of malnutrition**		**Total Prevalence**
		Moderate -3 < z score <-2	**Severe <-3 z score**	
Acute malnutrition (W/T)	112 (81,2%)	15 (10,9 %)	10 (7,3 %)	25 (18,2 %)
Chronic malnutrition (T/A)	84 (61,3%)	32 (23,4 %)	21 (15,3 %)	53 (38,7 %)
Global malnutrition (P/A)	108 (78,8%)	16 (11,7 %)	13 (9,5 %)	29 (21,2 %)

Table 4: Type of malnutrition in children

Type of anemia	**Effectifs**	**Percentage (%)**
Anemia according to hemoglobin level		
(9-11g/dl) Light	29	21.2
(8-9 g/dl) Moderate	20	14.6
(< 8 g/dl) Severe	73	53,3
(> 11 g/dl) Normal	15	10.9
Total	137	100
Anemia by Mean Cell Volume		
(80-95 fl) Normocytic	42	30.7
(< 80 fl) Microcytic	87	63.5
(> 95 fl) Macrocytic	8	5.8
Anemia by MCHC		
Hypochromic	81	59.12
Normochromic	56	40.88

MCHC: Mean corpuscular hemoglobin concentration

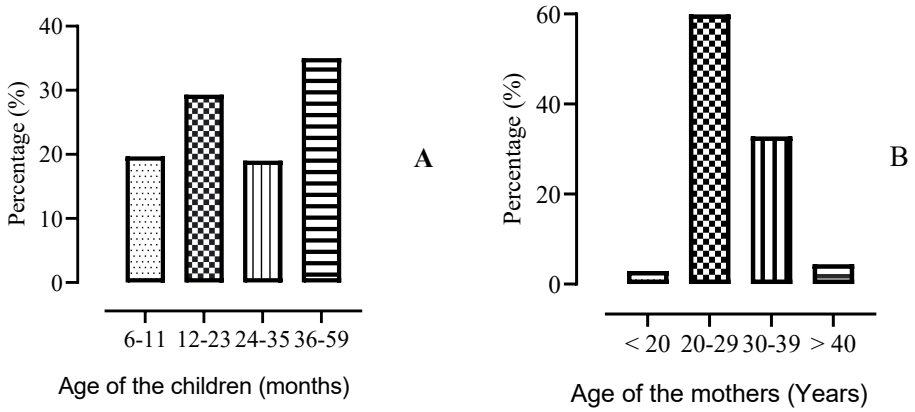

Figure 1: Ages of the children surveyed and their mothers

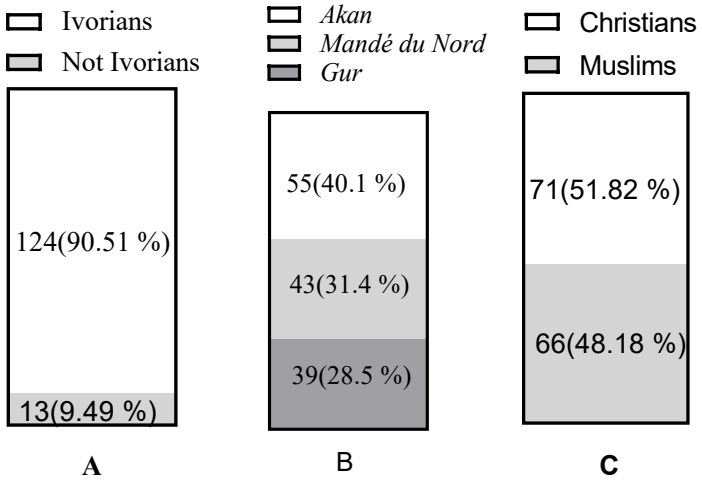

Figure 2: Nationalities, ethnic groups and religious affiliations of the children surveyed

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Contribution: Koffi Bruno KOKO conducted the study, collected data, wrote the manuscript.
Seguenan KONE
Contribution: KONE Seguenan did statistical analyses and helped with interpretation. He also read and approved the manuscript
Kouamé Hermann YEBOUE
Contribution: Kouamé Hermann YOBOUE helped with data collection, read and approved the manuscript
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Contribution: Brou André KONAN supervised the study and then read and approved the manuscript.

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