

Evaluation of the Nutritional Status of Children Aged 6 - 59 Months in Nurseries and Kindergartens in the Municipality of Ratoma

Diallo Ibrahima Sory^{1,2*}, Diallo Sory², Yacoub Goudja Rahma², Conté N'fanly², Bah Elhadj Mamoudou³, Sow Sadou², Diallo Alpha Amadou⁵, Cissé Moussa², Matthias RK⁴ and Sy Telly³

¹Department of Medecine, Pediatrics Chair, Gamal Abdel Nasser University, Conakry, Republic of Guinea

²Institute of Nutrition and Child Health, Conakry, Republic of Guinea

³Gyneco-Obstetrics Chair, Gamal Abdel Nasser University, Conakry, Republic of Guinea

⁴Department of Women, Mother and Child, Lausanne, Switzerland

⁵Strategic Development Office, Ministry of Health Republic of Guinea

***Corresponding Author:** Diallo Ibrahima Sory, Department of Medecine, Pediatrics Chair, Gamal Abdel Nasser University, Conakry, Republic of Guinea.

Received: October 31, 2019; **Published:** December 10, 2019

Abstract

Introduction: Malnutrition affects physical growth, intellectual development, and consequently health and later productivity in life. Globally in 2011, about 165 million or 26% of children under 5 years of age were stunted; 101 million were underweight or nearly 16%; and 52 million were moderately or severely wasted. The objective of this study was to assess nutritional status by looking for possible acute malnutrition or overnutrition and to identify some socio-demographic factors that influence the nutritional status of pre-school children in the 15 nursery schools in the commune of Ratoma.

Methods: This is a descriptive and analytical prospective study of 348 children enrolled in 15 kindergartens during the period from 5 January to 05 February 2016. The „averages” used in this study are the standard reference values NCHS/WHO weight/height. The data were entered and analyzed using SAS software.

Results: In this study, we recorded 18 cases of acute malnutrition, or 5.17 percent. Moderate acute malnutrition (MAM) was the most frequent form with a prevalence of 4.02% compared to 1.15% of severe acute malnutrition (SAM). The proportion of overweight children was 1.20% compared to 0.6% of obese children. The prevalence of overweight was higher among girls (n = 4/348 [1.15%]) than boys (n = 2/348 [0.57%]).

Conclusion: Guinea, like many developing countries, remains affected by children's nutritional problems. All efforts should therefore be made to raise awareness among mothers, children and teachers about the concept of a balanced diet and the practice of intra- and extra-school sports activities.

Keywords: Evaluation; Nutritional Status; Ratoma; Kindergarten

Introduction

Malnutrition is defined by the World Health Organization (WHO) as a medical condition resulting from the deficiency or excess, relative or absolute, of one or more essential nutrients. Whether this condition is clinically manifested or only detectable by biological, anthropometric, or physiological analyses [1]. Malnutrition affects physical growth, intellectual development, and consequently health and

later productivity in life [2]. In a well-nourished population, there is a reference distribution of height and weight for children under five years of age. Undernourishment and over-nutrition in a population can be measured by comparing children to a reference population. The reference population is based on WHO growth standards. Globally in 2011, about 165 million or 26% of children under 5 years of age were stunted; 101 million were underweight or nearly 16% and 52 million were moderately or severely wasted [3]. According to the EDS-Guinea (2016), the prevalence of global acute malnutrition was 8% among children aged 0 - 5 years. For chronic malnutrition, it was 34.7% nationally and 20.7% in the city of Conakry. Four (4%) of children under five years of age are overweight and the prevalence of overweight is higher among boys than girls (5% versus 3%) [4]. In Guinea, obesity is emerging at a time when undernutrition is still a major burden, especially among disadvantaged groups in the population. The coexistence of overnutrition and/or undernutrition is a real problem for Guinean health services, which are not well prepared for this trend. However, a bibliographical search showed us that work dedicated to this problem is quite rare and that none has been conducted in Guinea. To overcome this deficiency, we have set ourselves the objectives of assessing nutritional status by looking for possible under-nutrition or over-nutrition and identifying certain socio-demographic factors that influence the nutritional status of pre-school-age children in the 15 nursery schools in the commune of Ratoma.

Materials and Methods

Framework of the study

The Commune of Ratoma was used as a study framework for our survey. It is one of the five municipalities in the Conakry special area with an area of 62 km² and a density of 8650 inhabitants per km². It has a total population of 653,334 inhabitants, including 387,055 women and 118,907 children aged 0 to 5. The municipality has 340 nursery schools, including 70 crèches and 25 day-care centers. The public health sector has eleven (11) structures, including nine (9) integrated health centres, two (2) community medical centres (CMCs) and 259 pharmacies. The main activities are: trade, crafts, agriculture, hotels and fishing.

It is limited: To the north by the Atlantic Ocean and the prefecture of Dubréka, To the south by the municipality of Dixinn, To the east by the commune of Matoto and To the west by the Atlantic Ocean.

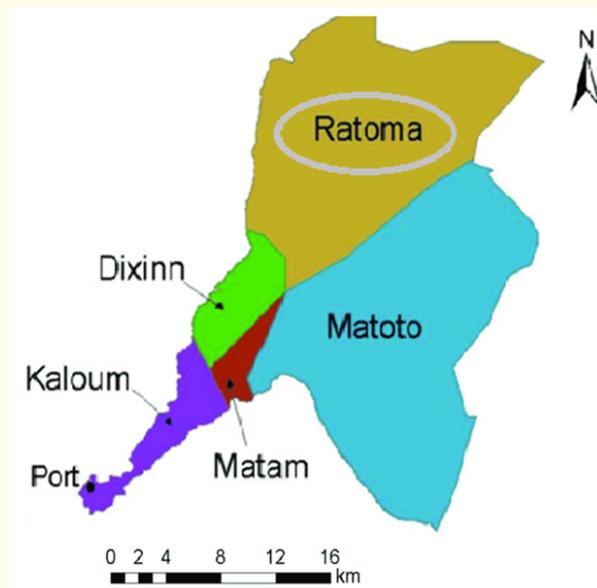


Figure 1: Geographical map of the municipality of Ratoma.

Methodology

This is a descriptive and analytical prospective study of 348 children enrolled in 15 kindergartens during the period from 5 January to 05 February 2016. For the selection of the 15 school groups from 340, we used simple random sampling based on the random selection method. The sample size of 348 was obtained by the following formula:

$$N = \frac{z^2 pq}{i^2}$$

n = Required sample size;

Z = (1,96); for a 95% confidence grade;

D = 5% margin of error;

P = (5,8%) the prevalence of acute malnutrition in the city of Conakry;

q = (1-p), expected prevalence of undernourished children,

i = Absolute precision desired, expressed as a fraction of i = (2.5%) the degree of precision.

To be included in the study, children would have to be aged 0 to 5 years old and enrolled in one of the 15 selected schools. The “averages” used in this study are the standard reference values NCHS/WHO weight/height. Children whose weight-for-height was greater than two standard deviations (-2ET) below the median of the reference population were classified as moderately or severely emaciated, while those who were more than three standard deviations (-3ET) below the median were considered severely emaciated. Those whose weight-for-height was greater than two standard deviations (+2ET) above the median of the reference population were considered to be overweight and obese children (P/T above +3 SD). It should be noted that WHO growth standards do not present figures expressed as a percentage of the median. WHO recommends using the classification system expressed in z-score or standard deviation which is comparable across ages and sizes for the different indicators [5]. The child’s age was determined from the date of birth recorded on the birth certificate or given by the parents. In children under 2 years of age, height was measured in a lying (lying) position using a horizontal measuring rod placed on a stable, flat surface such as a table. For those over 2 years of age, height was measured in an upright position. For weighing, we used the UNISCALE scale (designed by UNICEF) with tare function and an accuracy of 0.1 kg (100g). Data were collected daily in the selected school groups through structured interviews between interviewers and carers of children aged 0 - 5 years. The data were collected from a survey sheet containing socio-demographic data on the mother-child relationship, anthropometric measurements and child feeding. The data were entered and analyzed using SAS software. The chi² test in varied single analysis was used to look for an association between the different factors and the nutritional status of children.

Results

Age	SAM (≥ - 3 z-score)	MAM (≤ -3 and ≥-2 z-score)	Eutrophic (≤-2 z score)	Overweight (≥ +2 z score)	Obesity (≥+3 z score)	Staff numbers
6 - 17	-	-	15 (100%)	-	-	15
18 - 29	-	1 (3,4 %)	26 (89,65%)	1 (3,4 %)	1(3,4 %)	29
30 - 41	1 (0,9 %)	6 (5,7 %)	98 (92,45 %)	1(0,9 %)	-	106
42 - 53	3 (2,4 %)	6 (4,9 %)	113 (91,86%)	1(0,81%)	-	123
54 - 59	-	1 (1,4 %)	72 (96,0 %)	1(1,4 %)	1 (1,4 %)	75
Total	4	14 (4,02%)	324 (93,10%)	4 (1,15%)	2 (0,57%)	348

Table 1: Prevalence of acute malnutrition and overnutrition by age of children.
SAM: Severe Acute Malnutrition; MAM: Moderate Acute Malnutrition.

The prevalence of malnutrition increases with age to 50% (9/18) in the 42 - 53 month age group and then decreases to 1.14% in children aged 54 - 59 months. The average age was 42 ± 12.04 months with a minimum of 6 months and a maximum of 5 years. The average weight was 15 ± 2.79 . The average size was 99.5 ± 9.37 .

Sex	Malnutrition	Eutrophic	Overweight	Obesity	Staff Numbers	Odds ratio
Male	10 (6, 17%)	150 (92, 59%)	2(1, 23%)	-	162	OR = 1,46 [0,56-3,80]
Female	8 (4, 30%)	174 (93,54%)	-	4(2, 15%)	186	
Total	18 (5, 17%)	324 (93,10%)	2(0, 57%)	4 (1, 15%)	348	

Table 2: Distribution of acute malnutrition and overnutrition by gender.

The sex distribution shows a male predominance (6.17%), but the difference observed was not statistically significant ($p = 0.431$); OR = 1.46 [0.56 - 3.80]. The proportion of overnutrition was 1.72 per cent. Girls were more concerned ($n = 4/348$ [1.15%]) than boys ($n = 2/348$ [0.57%]).

Characteristic	Malnutris	Eutrophic	Staff numbers	Odds ratio	p-value
Age					
15-30 years	10 (4,31%)	222 (95,69%)	232	OR= 0,61[0,23-1,8]	p = 0,304
> 30 years	8 (6,90%)	108 (93,10%)	116		
Level of study					
Schooled	7 (4,80%)	139 (95,20%)	146	OR = 0,87[0,33-2,31]	p = 0,786
No schooling	11 (5,45%)	191(94,55%)	202		
Marital status					
Married	14 (4,86%)	274 (95,14%)	288	OR = 0,71[0,22-2,54]	p = 0,565
Single	4 (6,67%)	56 (93,33%)	60		
Profession					
Occupied	13 (4,83%)	256 (95,17%)	269	OR = 0,75[0,34-4,55]	P = 0,730
Not occupied	5(6,33%)	74 (93,67%)	79		

Table 3: Risk factors for malnutrition by social-demographic characteristics of mothers.

The various statistical tests carried out (Table 3) did not find a link between the occurrence of malnutrition and the following social-demographic factors: the mother's age ($p = 0.304$), education level ($p = 0.786$), marital status ($p = 0.565$) and occupation ($p = 0.730$).

The majority of children ($n = 310/348$ [88.8%]) had received 3 or more meals per day. Children who received less than 3 meals per day ($n = 38/348$ [7.9%]) are 1.7 times more likely to suffer from wasting than those who received more than 3 meals per day (OR = 1.68 [0.46 - 6.11]).

Table 4 shows that nearly 68.96% of children had received a meal containing meat or fish on the day before the survey. Only 11.49% had consumed fruit and 5.75% had received vegetables. Among dairy products, yogurt was the most consumed food by children (83.9%). For semi-solid foods, cereal-based porridge was the most consumed (27%).



Figure 2: Distribution of malnourished people by number of daily meals.

Types Foods	Staff numbers	Percentage
Fruits, vegetables, animal proteins		
Fruits	40	11,49
Poisson	211	60,63
Vegetables	20	5,75
Eggs	48	13,79
Meat	29	8,33
Type of spray liquid		
Rice	42	12,0
Sorghum	13	3,7
Millet	45	13,0
Wheat	25	7,2
Cereal Mixture	94	27,0
Corn	27	7,8
Boiled + curdled milk	23	6,6
Thick slurry	16	4,6
Light porridge	22	6,3
None None	41	11,7
Dairy Products		
Yoghurt	292	83,9
Cheese	73	20,9
Fresh cow butter	13	3,7
Fresh milk	14	4,0
Others	55	15,8
Water source		
Faucet	158	45,4
Fountain	163	46,8
Well	15	4,3
Mineral water	12	3,4

Table 4: Percentage of children who received the different types of foods on the day before the survey.

Discussion

Children's nutritional status reflects their overall health. When children have access to sufficient food, are not exposed to repeated diseases and are well cared for, they reach their growth potential and are considered well nourished. During this study, we recorded 18 cases of acute malnutrition, or 5.17 per cent. Moderate acute malnutrition (MAM) was the most frequent form with a prevalence of 4.02% compared to 1.15% of severe acute malnutrition (SAM). Our results are lower than those observed in Benin (7.4%) including 4.3% of SAM [6], but higher than those found in Morocco (2.27%) including 0.45% of SAM [7]. According to the WHO, this low rate observed in the Moroccan study is consistent with that found in a healthy and well nourished population [8]. In Guinea, the Demographic and Health Survey (2016) found a national global acute malnutrition rate of 8%, of which 3% were in the form of SAM. This rate of leanness was four times higher than that expected in a healthy and well nourished population (2.3%) and thirty times higher for the severe form (0.1%) [4]. However, it should be stressed that wasting or thinning indicated by the weight - height index is the result of insufficient nutrition during the period preceding observation, it may also be the result of diseases that have caused weight loss (severe diarrhea, anorexia associated with disease for example), which indicates acute malnutrition that often occurs in emergency situations [9]. Analysis of socio-demographic characteristics shows that the prevalence of leanness was higher among male children (6.17%) than female children (4.30%), the difference observed was not statistically significant ($p = 0.431$). Our results are consistent with those found by BENHIMA [7]. The prevalence of malnutrition increases with age to 50% (9/18) in the 42 - 53 month age group and then decreases (1.14%) from 54 - 59 months. The high rate of MAM (Table 1) in this age group could be explained by the fact that Guinean children start eating with adults at around 24 months on average, which means that they often do not receive the amount of food necessary to cover their needs. Rovillé-Sausse, in his survey, observed that children of African origin, born and living in France start eating with the older ones around 14 months on average. He also established that the real problems of iron deficiency begin with this sharing [10]. The distribution of maternal characteristics shows that children from out-of-school mothers were more affected (5.45%) by malnutrition, but we did not find a link between the mother's level of education and the occurrence of wasting ($p = 0.786$). Benhima H in her study made the same observation in Morocco, children whose mothers were not educated were more malnourished than those whose mothers had an education level [7]. The benefits of literacy, especially for women, are well known; greater participation in the labour market, improved health and nutritional status of children and their families, all factors that contribute to reducing poverty and improving future prospects [4]. The various statistical analyses also did not show a link between wasting and the following factors: maternal age ($p = 0.304$), marital status ($p = 0.565$) and occupation ($p = 0.730$). Overweight or obesity is one of the manifestations of malnutrition and is a serious and an emerging problem. In this study, we recorded 1.72% cases of overnutrition. Girls were more concerned than boys (1.15% versus 0.57%), but the difference observed was not statistically significant ($p = 0.431$). Yessoufou A., *et al.* had found 13.1% overweight children and 11.7% obese [6]. In the Benhima H study, a quarter of the children (25.45%) were obese. Boys were more affected by obesity than girls: (27.67% versus 23.14%), a sex ratio of 1.24. According to him, this high proportion of overnutrition is due to children's excessive consumption of sweet and fatty foods [7]. In France, the obesity rate among children is 10% compared to 30% in the United States [11,12]. In general, it is increasing in developing countries and/or countries that have adopted a Western lifestyle. In Guinea, nationally, 4% of children under five are overweight [4]. This phenomenon is more and more frequent in our country and is mainly the result of overeating and similar to what is happening in industrialized countries. Advertisements and supermarkets encourage people to consume sweet and fatty products at any time of the day and children like to spend hours in front of their TV or computer screens instead of exercising physically. The physiopathological particularity in children is the ability of adipose tissue to proliferate during the gestational period and the first year of life, with an obesity called "hyperplastic", with an increased number of adipocytes; this ability to proliferate gradually decreases and disappears during adolescence. Secondly, obesity will be mainly due to the cell fat overload that characterizes "hypertrophic" obesity in adults [12]. However, the risk of an obese child becoming an obese adult remains moderate. The causes are the same as in adults and are dominated by excessive and prolonged food intake. The intervention of a genetic factor is proven by the fact that children whose parents are both obese have an 80% chance of being obese in turn compared to only 40% if only one of the parents is obese [12]. Management is often difficult, especially since some fat children have a correct energy intake. The child may suffer from his or her condition. He may be the target of mockery or rejec-

tion by his classmates and subsequent complications are far from negligible: high blood pressure, diabetes, respiratory disorders, orthopaedic disorders [13]. With regard to children's feeding practices, it appears from table that 68.96% of children had received a meal containing meat or fish, 83.9% dairy products, 27% porridge made from cereal mixture. This is very encouraging because fish and meat are characterized by their contribution of protein of biological value (VB). The quality of a protein is called "biological value". It is determined by its amino acid composition. The higher its biological value, the greater the ability of the protein to fulfill its role [14]. Fish provide 15 to 25 grams of protein per 100 grams of the same biological value as meat. The daily need for proteins in children represents 10 to 15%. The ratio between caloric intake and protein intake is important (when caloric intake decreases, protein synthesis also decreases) this ratio should be 30 kcal/1g protein [12]. In this study, only 11.49% of children had received fruit compared to 6% for vegetables. Our observations are contrary to those of BENHIMA H, who found in her study that the majority of children consumed vegetables on a daily basis and, above all, represented the bulk of the family meal [7]. The low consumption rate of fruits and vegetables in our series is due to their high prices on the Guinean market. It should be stressed that vegetables are very important in children's diets because they provide minerals such as iron, magnesium, potassium, calcium, etc.; but also fibres, carbohydrates and vitamins. The first characteristic of vegetables is that they contain a very large amount of water: 85 to 95%. As a result, they generally have the advantage of providing relatively little calorie [15]. The majority of children (88.8%) received 3 or more meals per day compared to 11.2% for those who received less than 3 meals per day. Analysis by the number of meals, shows that children who received less than 3 meals per day (7.9%) were 1.7 times more likely to suffer from wasting than those who received more than 3 meals per day (OR = 1.68 [0.46 - 6.11]). French experts recommend the four-meal rule, but do not force it because preschoolers are very physically and intellectually active. They therefore need a fairly high caloric intake. Caloric intake will be distributed on the basis of 4 meals, as in children over 5 years of age, and breakfast should always have a prominent place [12,16].

Conclusion

Guinea, like several developing countries, remains affected by children's nutritional problems. This study shows that under-nutrition and over-nutrition are a real public health problem in the nursery schools of the commune of Ratoma. If nothing is done, the coexistence of these two forms of malnutrition will in the long run pose a real problem for Guinean health services because they are not well prepared for this evolution. All efforts should therefore be made to raise awareness among mothers, children, school health and education staff about good nutritional practices, as well as the practice of intra- and extra-school sports activities.

Bibliography

1. Derrick B and Mr D Jilliffe. "Assessment of the nutritional status of populations". World Health Organization Geneva (1969).
2. De Onis M. "Comparison of the World Health Organisation (WHO) child growth standards and the national center of health Statistics/WHO international growth reference: implications for child health programmes". *Public Health Nutrition* 9.7 (2006): 942-947.
3. UNICEF. "Improve child nutrition: An imperative and achievable objective for global progress". United Nations Children's Fund (2013).
4. Ministry of Planning and International Cooperation (Guinea), Demographic and Health Survey (DHS) (2016).
5. World Health Organization (WHO). "Management of severe malnutrition: manual for use by doctors and other health workers in management positions". Geneva, World Health Organization (1999).
6. Yessoufou Abdou Yessofofou., et al. "Nutritional status of children under 5 years of age received at the Vaccination Unit of the Hounsouko Health Centre in Porto-Novo (South Benin)". *International Journal of Biological and Chemical Sciences* 10.4 (2016): 1517-1524.
7. Benhima Hanane. "Assessment of the nutritional status of children in the city of SAFI". Doctoral thesis, Cadi AYYAD University (Morocco) (2008).

8. WHO. "Use and interpretation of anthropometry". Report of the expert committee. Geneva (1995): 508.
9. Michel CL. "Nutrition in developing countries". Editions Lavoisier (2004): 516.
10. Rovillé-Sausse F and Sossah F. "Iron in the diet of children of sub-Saharan origin. (Survey in Val-de-Marne, FRANCE)". *Antropo* (2001): 53-60.
11. Patricia Fischer-Ghanassia and E Ghanassia. "Endocrinology-Nutrition". Vernazobres-Grego 6th Edition (2012): 458-459.
12. Cristian C and V Liégeois. "Physiopathological bases of dietetics". Editions Médicales Internationales (2000).
13. Balzano E. "Health guide for children aged 0-14 years". Editions Flammarion (2010): 426.
14. Jean-Jacques Altman., et al. "The diabetes ledger". Editions Eyrolles (2013): 106-107.
15. Laurence B and Bérengère M. "Nutrition-Alimentation de l'Enfant". Studyrama Publishing (2012): 48-49.
16. Bocquet JL., et al. "Infant and Young Child Feeding Practical implementation". *Archives de Pédiatrie* 10 (2003): 76-81.

Volume 15 Issue 1 January 2020

©All rights reserved by Diallo Ibrahima Sory, et al.