

# Impact of the Nutritional Status of the Schoolchildren of Yopougon, Town of the District Abidjan (Côte D'Ivoire) on Their School Performance

Zahe Kollet Yao Aimé Sylvere<sup>1,\*</sup>, Méité Alassane<sup>1</sup>, Ouattara Howélé<sup>2</sup>, Dally Theodor<sup>3</sup>, Kouame Koffi Gustave<sup>1</sup>, AKÉ-Tano Odile<sup>4</sup>, Kati-Coulibaly Séraphin<sup>1</sup>

<sup>1</sup>Laboratory Nutrition and Pharmacology, UFR Biosciences, University Félix Houphouët-Boigny, Abidjan, Côte d'Ivoire

<sup>2</sup>UFR Biologic Sciences, University Péléforo Gon Coulibaly, Korhogo, Côte d'Ivoire

<sup>3</sup>UFR Environnement, University Jean Lorougnon Guédé, Daloa, Côte d'Ivoire

<sup>4</sup>National Institute of Public Health, Abidjan, Côte d'Ivoire

## Email address:

zaheime@yahoo.fr (Z. K. Y. A. Sylvere), almeite@yahoo.fr (M. Alassane), ouattarahowe@gmail.com (O. Howélé), dalayco@yahoo.fr (D. Theodor), aboudoukoffi@rocketmail.com (K. K. Gustave), odileake@yahoo.fr (AKÉ-Tano O.), katicoulibalys@yahoo.fr (Kati-Coulibaly S.)

\*Corresponding author

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**Abstract:** This study was to evaluate the impact of nutritional status on the academic performance of pupils from two schools in Yopougon, a town of Abidjan district the largest city in Côte d'Ivoire. For this purpose, anthropometric measures such as weight and height measured in these schoolchildren were allowed to calculate their Body Mass Index (BMI) and to make a classification of BMI obtained according to age and sex. The mathematical scores, text operations and the class average were identified. The values were exploited statistically through SPSS software (version 20). Malnutrition concerns girls and boys. It has allocated 10.13% girls and 10.13% boys. As for overweight or obesity, 0.84% and 5.06% for boys and girls respectively were affected. However, no correlation existed between nutritional status and the various school performances. Thus, forms of malnutrition concerned by our study do not influence school performance.

**Keywords:** Nutritional Status, Anthropometry, Students, School Performance, Côte d'Ivoire

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## 1. Introduction

Malnutrition still remains a public health problem in poor countries [1]. Knowing the nutritional status of children is the best indicator of their well-being [2]. Thus, the school children, because of their easy accessibility and learning age, are a target strategic, so a responsive group and at risk, but also a good vehicle for preventive measures up to other segments of the population [3]. Some studies show that children of this age group are also vulnerable to malnutrition. Thinness affects 36% of African schoolchildren, 34% of those in Southeast Asia against 6 at 14% for their friends in Latin America, Eastern Mediterranean and Western Pacific.

The prevalence of overweight and or obesity is 26 %, 13% and 7% respectively in Latin America, Southeast Asia and Africa [4]. 9.7% of children 10 to 17 years in Malaysia suffer from undernutrition and 5.7% are obese [5].

In Ivory Coast, [6] in their study on the prevalence of malnutrition among children aged 5 to 11 years attending school canteens in Abidjan, found 15.5% of this age group suffering of undernutrition. A study by [7] in Abidjan (the economic capital of Côte d'Ivoire) about 2038 students from primary and secondary schools, whose average age was 12.7 ± 3.6 years, gave a prevalence of thinness 39%, 4% overweight and obesity 5%. School performance, expressed as the return to school is conditioned by the health status of

the particular child nutritional status and neurocognitive development level but also by demographic and socioeconomic characteristics [8, 9]. Malnutrition can thus disrupt physical growth, morbidity, mortality, cognitive development, reproduction and physical ability to work [10, 11]. The nutritional intake of deficit related to hunger in children could lead to disabilities in school performance compared with other children [12]; this handicap can be aggravated by chronic absenteeism whose consequence is the abandonment or return of the child [13]. However, in Ivory Coast, few studies have established the direct link between malnutrition among school children and school performance. The present study was undertaken to evaluate the different forms of malnutrition among schoolchildren of Yopougon (District of Abidjan in Côte d'Ivoire) and its interactions with school performance.

## 2. Materials and Methods

### 2.1. Study Population

The study population consists of student's courses means of two primary schools in Yopougon in Abidjan district. This study involved 237 schoolchildren aged 8 to 14 years. Both schools have summers selected randomly. Permission was given by the Ministry of National Education and Technical Education (MENET).

#### Inclusion criteria

Included in this study, primary school children in 5 and 6<sup>th</sup> presents in these schools since the beginning of the school year.

#### Exclusion criteria

Excluded from this study, children who refused to participate in the survey.

### 2.2. Methods

A cross-type investigation referred descriptive and analytical took place from December 2015 to February 2016.

#### 2.2.1. Data Collection

The student at school had completed an individualsurvey card concerning sociodemographic characteristics about their family.

The information gathered concerning the age, sex, ethnic group, religion, nationality, family size, number of siblings of the child, the number of children under 5 years, rank sibling,

parental occupation and level of parental education.

#### 2.2.2. Measures Anthropometric Parameters

Anthropometric measures have summer based on the standard method of WHO and the United Nations Fund for Children [14]. Weight was measured using a SOEHNLE type of electronic scales with a range of 180 kg with an accuracy of 100 g. Height was measured using a locally made measuring rod with 0.1 cm accuracy. BMI for age and sex was defined from the classification of [15, 16] and modified for children 0-18 years.

$$\text{BMI} = \text{weight (kg)} / \text{height (m}^2\text{)} \quad (1)$$

#### 2.2.3. Student Performance Evaluation

The academic performance of school children were evaluated from notes in mathematics, exploitation of text and composition of average. Three performance levels were selected by the method of [11] and adapted to the requirements locales. The level of school children is considered strong for the rating than 12/20 and an average of over 6/10; the average level for scores between 12 and 10/20 and an average of between 6 and 5/10 and low for scores below 10/20 and an average of less than 5/10.

#### 2.2.4. Statistical Analysis

Data were entered and analyzed by SPSS software (version 20). Comparisons of different proportions, and means were performed by the Student t test and chi-square test two. A probability threshold (p) less than 0.05 were chosen for all the significance statistics data. The G test or log Likelihood R.2.10.1 Windows software test ratio was used to compare the different observed proportions.

## 3. Results

### 3.1. Characteristics of the Study Population

A total of 237 students from two primary schools in the municipality of Yopougon had participated in this study. This workforce is 49.8% of boys and 50.2% girls. Sex Male / Female ratio (H / F) is 0.97. The average age of the study population was  $11.00 \pm 0,087$ ans with extremes ranging from 8 to 14 years. The average age is higher in boys (11.11) than girls (10.90), but no significant difference ( $p > 0.05$ ) was observed between the average ages (Table 1).

Table 1. Average age by gender of respondent sample.

	Mean	p-value	standard error of the mean	Minimum	Maximum
Boys (N=118)	11.11		±0.120	9	14
Girls (N=119)	10.90	0.225	±0.125	8	14
Total (N=237)	11.00		±0.087	8	14

N = actual populations studied

The majority (73.84%) of students has got a brother less than five years and 5.48% three brothers under five. 55, 70% of mothers of children have not attended school. Non-educated mothers were 28.27% and 27.43% respectively for

schoolchildren boys and girls. 21.51% of school boys had primary level and more mothers against 22.78% of school girls who had mothers who left school at this level (Table 2).

60.75% of schoolchildren had primary level and fathers.

These primary fathers, 30.79% were fathers of boys and 29.26% those girls. The father-of-school rate was 39.25% with rates of school fathers of boys and girls 18.99% and 20.26% (Table 2).

61.19% of schoolchildren were under five siblings, 37.97% had five to nine sisters, and only 0.84% of them had a number of brothers and sisters than nine (Table 2).

**Table 2.** Demographics characteristics of schoolchildren investigated.

	Modalités	boys	girls	Total
Number of children less than five years in the family	0-1	89 (37,55 %)	86 (36,29 %)	175 (73,84 %)
	2	24 (10,13 %)	25 (10,55 %)	49 (20,68 %)
	3 and more	5 (2,11 %)	8 (3,37 %)	13 (5,48 %)
Number of siblings	<5	75 (31,65 %)	70 (29,54 %)	145 (61,19 %)
	5-9	42 (17,72 %)	48 (20,25 %)	90 (37,97 %)
Education level of father	10 and more	1 (0,42 %)	1 (0,42 %)	2 (0,84 %)
	Primary and more	73 (30,79 %)	71 (29,96%)	144 (60,75 %)
Education level of mother	Noun educated	45 (18,99 %)	48 (20,26 %)	93 (39,25 %)
	Primary and more	51 (21,51 %)	54 (22,78 %)	105 (44,29%)
	Noun educated	67 (28,27 %)	65 (27,43 %)	132 (55,70 %)

### 3.2. Anthropometric Parameters and Nutritional Status of Schoolchildren

#### 3.2.1. Anthropometric Parameters

The total average weight of all school children is  $35.87 \pm 7.95$  Kg and the maximum average weight among girls is  $37.12 \pm 8.56$  Kg and boys  $34.62 \pm 7.10$  Kg. A difference significant weight between girls and boys was observed ( $p = 0.015$ ). As for his size, mean was of  $145.99 \pm 9.35$  cm in girls and  $143.82 \pm 13.49$  cm in boys. The average size of the girls was not significantly different ( $p > 0.05$ ) from that of boys. Mean BMI was  $16.88 \pm 2.31$  kg / m<sup>2</sup>; it is  $17.30 \pm 2.60$  kg / m<sup>2</sup> for females and  $16.46 \pm 1.87$  Kg / m<sup>2</sup> in boys. The average BMI of girls was not significantly different ( $p = 0.005$ ) than that observed in boys (Table 3).

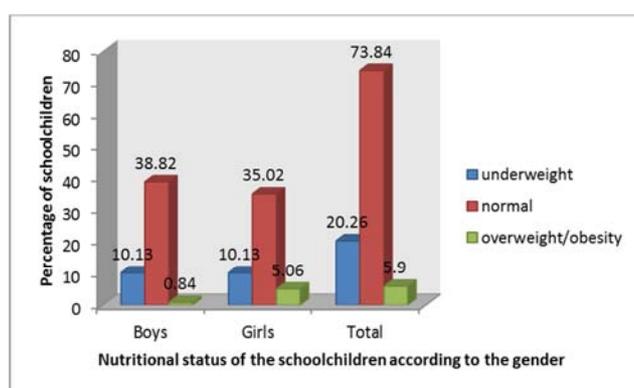
**Table 3.** Anthropometric parameters of the investigated sample.

SEX	WEIGHT (Kg)	HEIGHT (cm)	BMI (Kg/m <sup>2</sup> )
BOYS (N=118)	$34.62 \pm 7.10$	$143.82 \pm 13.49$	$16.46 \pm 1.87$
GIRLS (N=119)	$37.12 \pm 8.56$	$145.99 \pm 9.35$	$17.30 \pm 2.60$
Total (N=237)	$35.87 \pm 7.95$	$144.91 \pm 11.62$	$16.88 \pm 2.31$
p-value	0.015 <sup>S</sup>	0.150 <sup>NS</sup>	0.005 <sup>S</sup>

N = actual populations studied; p-value is given by comparing the values obtained for girls and boys; S: Statistically different to p value < 0.05, NS: not statistically significant for p value > 0.05.

#### 3.2.2. Nutritional Parameters of Schoolchildren

Underweight affects 10.13% of boys and 10.13% girls and overweight / obesity affects 0.84% of boys and 5.06% girls. (Fig. 1)



**Figure 1.** Nutritional status of children by gender (chi-square = 7.602, df = 2, p = 0.022).

Among school children aged 8-10 years, underweight and overweight / obesity affects respectively 2.95% and 0.42% of boys against 2.11% and 2.53% of females. At their elders from 11 to 12 years, 5.06% and 0.42% of boys and 5.48% and 2.11% respectively a girls underweight and overweight / obesity. Among those 13 to 14 years, overweight / obesity is not observed in boys against it is observed in 0.42% of girls. Also, 2.53% of girls had underweight. Statistical analysis revealed no significant difference between boys malnourished deficiency and normal ( $p = 0.629$ ) and between overweight / obese and normal ( $p = 0.799$ ). On the other hand, it was a significant difference ( $p = 0.03$ ) between the number of girls and malnourished deficiency that normal girls. The number of girls are overweight / obese are not significantly different from normal girls ( $p = 0.905$ ). (Table 4)

**Table 4.** Nutritional status of children by age and sex.

Age	Sex					
	Boys		Girls			
	normal	Underweight	Overweight/obese	normal	Underweight	Overweight/obese
8-10 years	30 (12.66%)	7 (2.95%)	1(0.42%)	36 (15.19%)	5(2.11%)	6(2.53%)
11-12 years	50 (21.09%)	12 (5.06%)	1(0.42%)	40(16.88%)	13(5.48%)	5(2.11%)
13-14 years	12 (5.06%)	5 (2.11%)	0(0.0%)	7(2.95%)	6(2.53%)	1(0.42%)
p-value		0.629	0.799		0.03	0.905

P-value is given by the comparison of normal values compared with those abnormal (underweight or obese overweight) by sex

### 3.3. Distribution of Students According to Their Academic Performance and Gender

Analysis of the results shows that 115 school children is 25.74% of the girls are listed strong mathematical against 22.78% of boys, 93 gold 18.14% showgirls and 21.10% boys are weak rated. None significant differences were observed ( $p > 0.05$ ) between the performance of boys and girls. Also, no significant difference was observed ( $p > 0.05$ ) between the different text operating performance between show girls and

boys. However, more showgirls are quoted strong (27.43%) than boys (25.32%). As for the average, more girls than boys have an average considered strong. The rate of girls is considered strong 29.54% against 24.47% of boys considered fort. 8.02% of girls and also 8.02% of boys are considered as medium with regard to their class average while 12.65% girls and 17.30% boys are considered low. However, statistical analysis shows no significant difference ( $p > 0.05$ ) between these average performances (Table 5).

Table 5. Distribution of students according to their academic performance and gender.

School performances	mathematical		p-value	Exploitation of text		p-value	Average class		p-value
Sex	B	G		B	G		B	G	
High	54 (22.78%)	61 (25.74%)	0.670 <sup>NS</sup>	60(25.32%)	65 (27.43%)	0.771 <sup>NS</sup>	58 (24.47%)	70 (29.54%)	0.49 <sup>NS</sup>
Average	14 (5.91%)	15 (6.33%)	0.904 <sup>NS</sup>	13(5.49%)	18 (7.59%)	0.560 <sup>NS</sup>	19 (8.02%)	19 (8.02%)	1 <sup>NS</sup>
Less	50 (21.10%)	43 (18.14%)	0.636 <sup>NS</sup>	45(18.99%)	36 (15.18%)	0.514 <sup>NS</sup>	41 (17.30%)	30 (12.65%)	0.394 <sup>NS</sup>

P-value is given by comparing the proportions of boys compared with that of the female. G = Boys; F = Girls  
S: Statistically different to p value < 0.05, NS: not statistically significant for p value > 0.05.

### 3.4. Distribution of Children According to Their Nutritional Status and School Performance

In this population, 50% of schoolchildren suffering from undernutrition had an average rated as "strong", 54.86% of normal children and 57.14% of obese were also sides 'strong'. Statistical analysis revealed no significant difference ( $p > 0.05$ ) between the percentages of normal, malnourished deficiency and overweight / obese at the "strong" mode. However, respectively 33.33%, 30.27% and 14.29% of malnourished, normal and obese sides were "weak". This difference between the different proportions is significant ( $p < 0.05$ ). As for math scores, 49.14%, 47.91% and 42.86% respectively of malnourished, normal and obese had scores that were classified as "strong". No significant differences were observed between the percentages of malnourished, normal and overweight / obese ( $p > 0.05$ ) at the "strong" mode. At the "medium" mode in mathematics, overweight schoolchildren are the most numerous (28.57%) and normal (12%) and then malnourished deficiency (8.33%).

A significant difference was observed between the percentage of students overweight / obese and normal ones and the schoolchildren malnourished deficiency ( $p < 0.05$ ) in the "low" mode. In this rating category "weak" in mathematics, were classified malnourished 43.75%, 38.86% and 28.57% normal obese. Regarding the notes in text setting, performance evaluation indicates that 50% of malnourished, 54.86% normal and 50% obese were above 12/20. In the classification of rating considered as 'average', listed schoolchildren malnourished deficiency were the most numerous (14.58%), then obese (14.29%) and normal (12.57%). Normal schoolchildren, malnourished and obese Notes "weak" were almost identical to the percentages: these percentages were 33.71%, 35.42% and 35.71% respectively for normal, malnourished and obese. At these different modalities "strong", "medium" and "low" in text setting, the percentage of normal schoolchildren, was not significantly higher ( $p > 0.05$ ) from the percentage of malnourished and the percentage of overweight / obese. (Table 6)

Table 6. Distribution of children according to their nutritional status and school performance.

SCHOOL PERFORMANCES	TERMS	Nutritional status			P-value
		Normal (175)	Underweight (48)	Overweight/Obesity (14)	
school performance averages	Strong	96(54.86%)	24(50%)	8(57.14%)	0.153 <sup>NS</sup>
	Medium	26(14.86%)	8(16.67%)	4(28.57%)	0.039 <sup>S</sup>
	Low	53(30.27%)	16(33.33%)	2(14.29%)	0.005 <sup>S</sup>
academic performance in Mathematics	Strong	86(49.14%)	23(47.91%)	6(42.86%)	0.192 <sup>NS</sup>
	Medium	21(12%)	4(8.33%)	4(28.57%)	0.007 <sup>S</sup>
	Low	68(38.86%)	21(43.75%)	4(28.57%)	0.061 <sup>NS</sup>
Student performance in text exploitation	Strong	94(54.86%)	24(50%)	7(50%)	0.181 <sup>NS</sup>
	Medium	22(12.57%)	7(14.58%)	2(14.29%)	0.604 <sup>NS</sup>
	Low	59(33.71%)	17(35.42%)	5(35.71%)	0.337 <sup>NS</sup>

S: Statistically different to p value < 0.05, NS: not statistically significant for p value > 0.05.

### 3.5. Correlation between School Performance and Malnutrition

The matrix indicates (Table 7) that there is no correlation

between malnutrition and the various academic performance in mathematics students ( $p > 0.05$ ), text operations ( $p > 0.05$ ), and the average ( $p > 0.05$ ). However, other variables such as number of children under five years is negatively correlated

to the class average ( $r = -0,129$ ;  $p < 0.05$ ) and the age group is correlated positively middle class ( $r = 0.224$ ;  $p < 0.05$ ), the

text of exploitation in note ( $r = 0.224$ ;  $p < 0.05$ ) and the mathematical note ( $r = 0.212$ ;  $p < 0.05$ ).

**Table 7.** Pearson correlation between school performance with different demographics and malnutrition.

	Number of children under 5 years	sex	age class	Mother's education level	father's education level	family size	nutritional status	Average class	Note text Operation	Notes in Mathematics
Number of children under 5 years	1	0.036	-0.027	-0.009	-0.013	0.265**	-0.041	-0.129*	-0.121	-0.121
sex		1	-0.075	0.022	-0.023	-0.008	0.087	0.109	0.064	0.063
age class			1	-0.142*	-0.016	0.099	-0.166*	0.224**	0.224**	0.212**
Mother's education level				1	0,421**	-0.112	0.001	0.046	0.042	0.021
father's education level					1	-0.084	0,047	0,092	0,078	0,034
family size						1	-0.028	0.073	0.039	0.030
nutritional status							1	0.060	0.012	0.029
Average class								1	0.885**	0.807**
Note text Operation									1	0.708**
Notes in Mathematics										1

## 4. Discussion

The assessment of nutritional status was conducted among schoolchildren in Yopougon. The average age of this population was  $11 \pm 0,087$  years. The average age is actually, according (17), at the age of students in average prices (CM). In this study through, there were as many girls (119) than boys (118), which addresses the United Nations Program Development Goals [18] claiming an accessto primary education for all. The measured anthropometric parameters provided information on an average BMI in this population was  $16.88 \text{ kg} / \text{m}^2$  with an average weight of 35.87Kg. However, girls showed a slight domination at the weight could be explained by a high consumption of energy-dense foods [19] and decreased physical activity.

Regarding the nutritional status of this population, deficiency malnutrition affects 20.25% and overweight / obesity affects 5.92% of the population. These results are similar to those [20] which had found a rate of undernutrition, population of classified normal and overweight / obesity 27.9% respectively, 64.6% and 7.5%. However, these results are contrary to those of [17] who, in his study on the nutritional status of school children living in urban and peri-urban areas in the Ouagadougou region. He had revealed a relatively low rate of undernutrition was 13.7% and overweight / obesity 2.3%. This problem of malnutrition by high deficiency, in the context of this study could be due to a contracted early malnutrition which was not actually corrected. Food diversification and the safety of the environment would be the key influencing the nutritional status of schoolchildren [11].

Regarding the distribution of children according to their academic performance by gender, 22.78% of boys and 25.74% girls were "strong" side to the note Mathematical against 21.10% of boys and 18.14% of girls who were sides

"weak». For the class average, 29.54% and 24.47% respectively for girls and boys had been classified as «strong" against 12.65% and 17.30% next "weak". The girls appear more successful than boys but this difference was not significant ( $p > 0,05$ ). This observation was also reported by [9] in Morocco, in a study on the socio-demographic and anthropometric characteristics related to school performance in a rural school in the city of Kenitra.

Pearson correlation test indicates no correlation between school performance and nutritional status of schoolchildren. These results are consistent with [9] which work was not found the malnutrition ace has causal effect on school performance multiple after regression analysis. This correlation may not be explained in this study, that the majority of students surveyed did not suffer from severe malnutrition [9]. Statistical analysis revealed, for cons, the age group is positively correlated with the class average ( $r = 0.224$ ;  $p = 0.001$ ), the mathematics of grade ( $r = 0.212$ ;  $p = 0.001$ ), the note text of operation ( $r = 0.224$ ;  $p = 0.001$ ) and negatively correlated with nutritional status ( $r = -0.166$ ;  $p = 0.011$ ). These results are consistent with those of [21]in their work that found a positive correlation between age and academic performance.

## 5. Conclusion

The prevalence of malnutrition in this study population is 20.26% of undernutrition and 5.9% obese using BMI as a measuring instrument. It is also present in the group of girls and boys. However, the results of this study indicate that the nutritional status does not influence school performance. Only age was a factor influencing and school performance and nutritional status of schoolchildren. For more visibility in the results, it would be interesting to extend the study in all elementary students used other indicators of nutritional status. Nevertheless, it is important for the authorities to take

over as soon as possible the problem of obesity which is present alongside undernutrition whose charges are already heavy.

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