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Assessment of the Nutritional Status of Preschool Children in a Number of Nursery Schools in the Commune of Ratoma, Conakry, Guinea

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Abstract

Malnutrition in children under the age of 5 is a public health problem in Guinea, particularly in our schools, and has a negative impact on children's development. It is in this context that the present study on the evaluation of the nutritional status of pre-school children in nursery schools in the commune of Ratoma was carried out. A cross-sectional and descriptive study was carried out from 25 January to 02 March 2020 in ten (10) schools in the Commune of Ratoma, with a total of 402 children. Of the 402 children surveyed, 359 (89.30%) were in a normal nutritional state and 43 (10.69%) in a state of moderate acute malnutrition. Children aged 5 accounted for 51.16% of malnourished children, followed by 4-year-olds (23.25%), 3-year-olds (16.27%) and 2-year-olds (9.30%). There were 0 cases of malnutrition in Kabassan and Hadja Kany schools, and higher percentages in José Marty (18.60%) Santa Maria (16.27%) Wariah (16.27%) Hadja Habibata (13.95%) and Elhadj Naby and Safia (11.62%).

Keywords

Nutritional Status, Age, Pre-School, Ratoma

1. Introduction

The nutritional status of children is a global indicator of the well-being of children

and, indirectly, of their communities [1]. Malnutrition is a pathological condition caused by a deficiency or excess of one or more nutrients. Inadequate dietary intake can come from food of poor quantity (insufficient or excessive calorie intake) or poor quality (nutritional deficiencies or excess fat) [2]. According to estimates by the World Health Organisation, undernutrition accounts for a third of child mortality [3]. It can cause developmental delays in young people throughout childhood and adolescence, and can lead to poor performance and drop-out from school. Malnutrition in children under the age of 5 is a real public health problem. It results from acute or chronic deficiencies of calories, proteins or micronutrients. It is also the result of a combination of structural and conjunctural factors that determine the availability, accessibility and use of food. The universally recognised right to food is often hampered by political, economic and legal factors that determine the distribution of income and assets [4]. Adequate food and nutrition in early childhood are essential conditions for ensuring that a country has the resources it needs to achieve good health and, ultimately, sustainable development. According to United Nations estimates, 130 million children are underweight due to a lack of adequate food. Of these, 60 million suffer from acute malnutrition, which makes them extremely vulnerable to disease [5]. Acute malnutrition plays a significant role in millions of deaths of children under five every year. 25,000 people, mostly children, die every day from acute malnutrition. One-third of African children suffer from malnutrition. Of the 62 million people who die on average each year, 36 million, or 58%, die directly or indirectly as a result of nutritional deficiencies, infections or diseases in a context of undernourishment. In the developing world, 66 million school-age children go to school on an empty stomach, including 23 million in Africa [6].

In Guinea, 10% of children under the age of five suffer from acute malnutrition and 31% from chronic malnutrition. Anthropometric data for children under 5 show that there are still real nutritional problems in Guinea [7]. The wasting rate among 5-year-olds has risen from 9% to 11%, and the underweight rate from 20% to 23% [8]. The weight status of children under 5 rose from 23% to 24.4% between 1999 and 2002/2003 [9]. Despite the assistance of partners such as the WFP, WHO and Terre des Hommes, the malnutrition situation in Guinea is far from meeting standards. Although specific data on malnutrition in the Ratoma commune is limited, national statistics provide an overview of the nutritional situation in Guinea. According to a SMART survey conducted in 2022, chronic malnutrition affects 26% of children aged 6 to 59 months, a prevalence that has remained stable since 2015 [10]. Furthermore, in 2023, more than 750,000 children in Guinea suffered from chronic malnutrition, with boys being significantly more affected (28%) than girls (23%) [11]. With this in mind, this study aims to assess the nutritional status of pre-school children in the commune of Ratoma. Its aims are to determine their nutritional status, estimate the prevalence of malnutrition in certain nursery schools, identify the different forms of malnutrition encountered and propose recommendations for all.

2. Study Framework, Materials and Methods

2.1. Study Framework

This study was carried out in the commune of Ratoma, located to the north-west of the Kaloum peninsula, one of the five (5) communes of the city of Conakry. It covers an area of 62 km^2. The commune of Ratoma comprises 34 districts and 211 sectors with a population of 653934 people. It is bordered to the north by the Atlantic Ocean, to the south by the communes of Dixinn and Matam, to the west by the Atlantic Ocean and to the east by the commune of Matoto and the prefecture of Dubreka. Ratoma lies between latitude 9˚35' north and longitude 13˚39' west. It encompasses both agricultural urban areas and peri-urban areas that have been more or less taken over by the urbanisation process. The figure below shows the spatial distribution of the schools surveyed in the commune of Ratoma. Figure 1 presents the spatial distribution of schools surveyed in Ratoma commune.

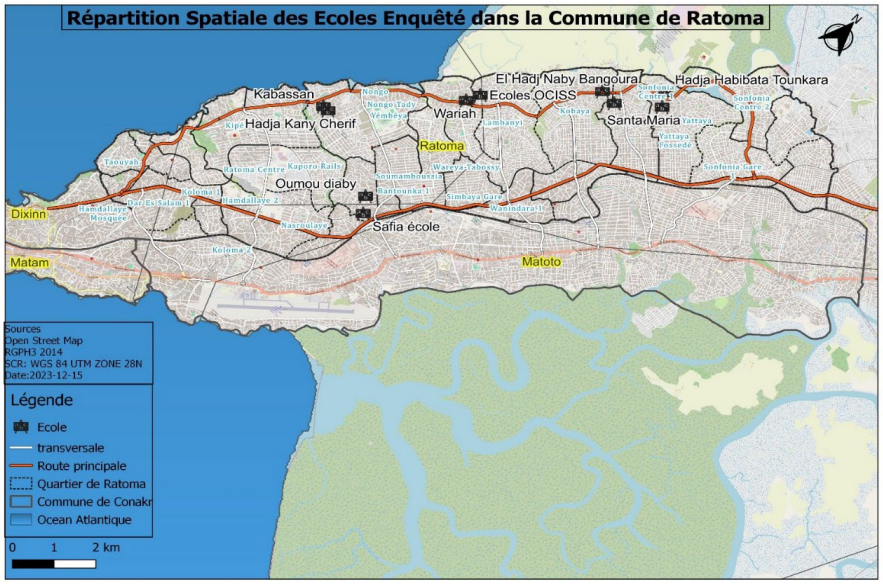

Figure 1. Spatial distribution of schools surveyed in Ratoma commune.

The study was carried out in 10 nursery schools in the commune of Ratoma, as shown in Table 1.

Table 1. List of schools studied schools.

N˚	School Names	Neighborhood
01	Hadja Habibata Tounkara School Group	Foulamadina
02	Santa Maria School Group	Foulamadina
03	El-hadj Naby Bangoura school group	Kobaya
04	osé Marty school group	Fossidè
05	School group The OCISS schools	Lambanyi

Continued

06	Wariah school group	Lambanyi
07	Oumou Diaby School Group	Coza
08	Safia School Group	Coza
09	Kabassan school group	Nongo
10	Hadja kany cherif school group	Nongo

2.2. Materials

The material used for this study includes the 2012 UNICEF reference register for cases of moderate and severe malnutrition, as well as the WHO weight/height reference file. It also includes the mission order from the Ratoma DCE and the survey form. In addition, various items of equipment were mobilised to measure anthropometric parameters, including a person weight (kg), a vertical measuring rod (cm) and a tape measure.

2.3. Methods

The nutritional status of children aged 2 to 4 is assessed using the strictly brachial/head circumference ratio (PB/PC), while that of children aged 4 to 5 is determined by the weight/height ratio (P/T). Brachial circumference (BP) is measured on the left arm, midway between the acromion and the olecranon, using a non-elastic tape measure. The head circumference (PC) is also measured using a tape measure. The children were weighed barefoot using an electronic scale, and their weight and height were compared with the P/T index established by the WHO. Height was measured using a vertical measuring rod for children over 2 years of age.

2.3.1. Type of Study

This is a descriptive cross-sectional study running from Wednesday 25 January to Thursday 02 March 2023 on a population aged 2 to 5 years.

2.3.2. Justification for the Selection of Schools and Sample Representativeness

In this study, the selection of nursery schools in the municipality of Ratoma was carried out using a rigorous approach aimed at ensuring the representativeness of the results.

1) Selection criteria for schools

The selection of schools was guided by several criteria to cover a diversity of situations and ensure conclusions that can be generalized to the entire municipality.

2) Geographical criteria:

The schools were selected in a way that covers different areas of Ratoma, including urban, suburban, and disadvantaged neighborhoods, to capture disparities in living conditions and access to health services.

3) Socio-economic criteria:

The sample includes both public and private schools to assess the influence of socio-economic levels on the nutritional status of children.

4) Accessibility and collaboration criteria:

The participation of institutions was a key factor in the selection. The selected schools expressed their willingness to collaborate by facilitating access to children and providing necessary administrative information.

5) Criteria based on pre-existing data:

Some schools were chosen due to previous reports of malnutrition or nutritional vulnerability, thus allowing for the analysis of trends and comparison with schools that had no such history.

6) Inclusion criteria

Children aged 2 to 5 years were included in this study at the maternal level in our study environment.

7) Exclusion criteria

Children aged 2 to 5 in nursery schools and in cases of refusal.

8) Study variables

The information collected was:

- **Socio-demographic parameters**: age, gender, place of residence, ethnicity, social status
- **Anthropometric parameters**: weight, height, age, head circumference, brachial circumference
- **Clinical parameters studied**: cardiovascular, pulmonary, digestive, mucosal, ENT, vaccination status, BCG scar, diet.
- **Anthropometric parameters** :

The weight of children aged two and over was measured using a person-weight scale. For height, a horizontal scale was used for children under three, while a vertical scale was used for those over three.

- **Nutrition**

In this study, the assessment of children's nutritional status is based on the calculation of the Z-score, which corresponds to the relationship between various variables such as weight/height, height/age and weight/age. Good nutritional status is defined by a weight/height Z-score greater than −1 standard deviation (SD). Moderate acute malnutrition is characterised by a weight/height Z-score of between −2 and −3 SD, while severe acute malnutrition corresponds to a weight/height Z-score of less than −3 SD. In parallel, chronic malnutrition, or stunting, is determined by a height-for-age Z-score of less than −2 on the standard curves. The study also takes into account the number of meals the child eats each day and the child's social situation.

2.3.3. Data Capture and Analysis

The data were entered and analysed using SPSS 20, EXCEL, WORLD 2016 software. WHO Anthro software was used to determine the nutritional status of the children.

2.4. Reliability of the Equipment Used

The reliability of the equipment used in this study is ensured by several factors:

- **Calibration and Standardization**: All measurement instruments, such as weighing scales and height measurement tools, were calibrated and standardized before the study began to ensure accuracy in data collection. Regular calibration checks were performed throughout the study to maintain precision.
- **Use of Validated Tools**: The tools used for measuring weight, height, and age are widely recognized and validated in the field of nutritional assessment. These instruments have been tested and proven to provide consistent and reliable measurements in similar studies.
- **Trained Personnel**: The measurements were taken by trained personnel who followed standard operating procedures to minimize human error. They were also trained to recognize any inconsistencies in measurement techniques and correct them immediately.
- **Quality Control** : A quality control process was implemented, including random checks and double measurements of a subset of children to verify the consistency and accuracy of the data collected.

3. Result

3.1. Breakdown of Samples Surveyed by School

Over 29 working days, we surveyed 402 children aged 2 to 5 who met our inclusion criteria in ten (10) nursery schools in the commune of Ratoma. Table 2 and Figure 2 display the distribution of the samples surveyed in each school.

Table 2. Breakdown of samples surveyed by school.

Schools	Number of people surveyed	Sex	
		Male	Female
Hadja Habibata Tounkara	85	45	40
Santa Maria	61	34	27
Elh Naby Bangoura	62	31	31
José Marty	62	31	31
Les écoles OCISS	20	12	08
Le Wariah	24	10	14
Oumou Diaby	22	10	12
Safia Barry	22	11	11
Kabassan	22	13	09
Hadja Kany Cherif	22	11	11
Total	402 (100%)	208 (51.74%)	194 (48.26%)

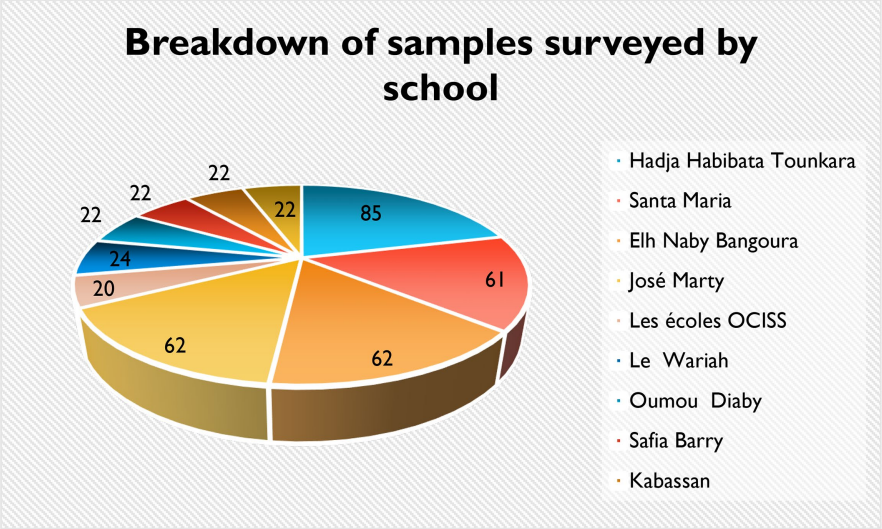

Figure 2. Breakdown of samples surveyed for each school.

Figure 3 presents the distribution of respondents by gender for each school.

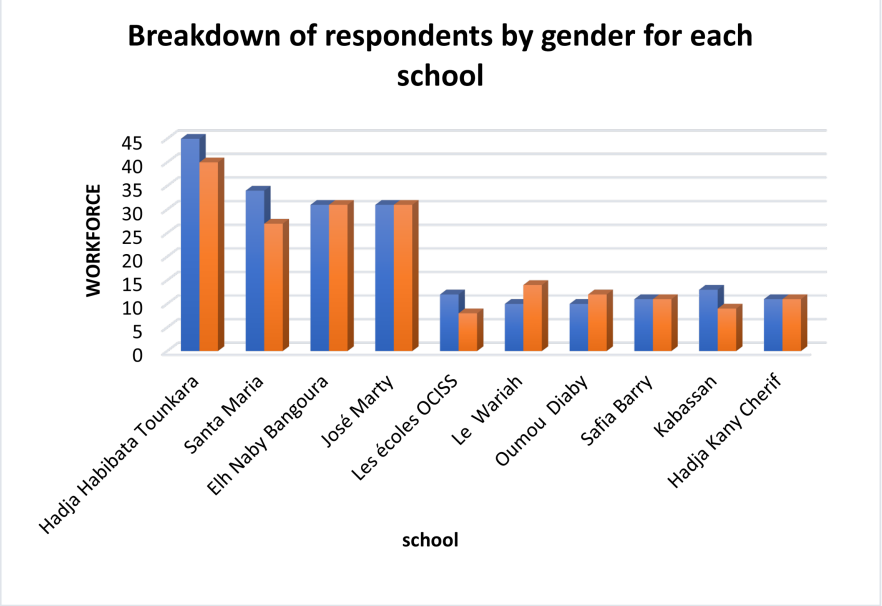

Figure 3. Breakdown of respondents by gender for each school.

Of the 402 children surveyed, 51.74% were male. **Table 3** shows the distribution of the number of children by age group.

3.2. Breakdown of surveys by age

Table 3 presents the breakdown of surveys by age.

Figure 4 presents the Distribution of respondents by age for each school.

The children's ages ranged from 2 to 5 years. Children aged 5 were the most frequently surveyed (41.79%), followed by children aged 4, 3 and 2 (28.10%, 24.62%

and 5.47% respectively). The table below shows the nutritional status of children aged 2 to 4.

Table 3. Number of children by age group.

Age (years)	Number of children	Percentage (%)
5	168	41.79
4	113	28.10
3	99	24.62
2	22	5.47
Total	402	99.98

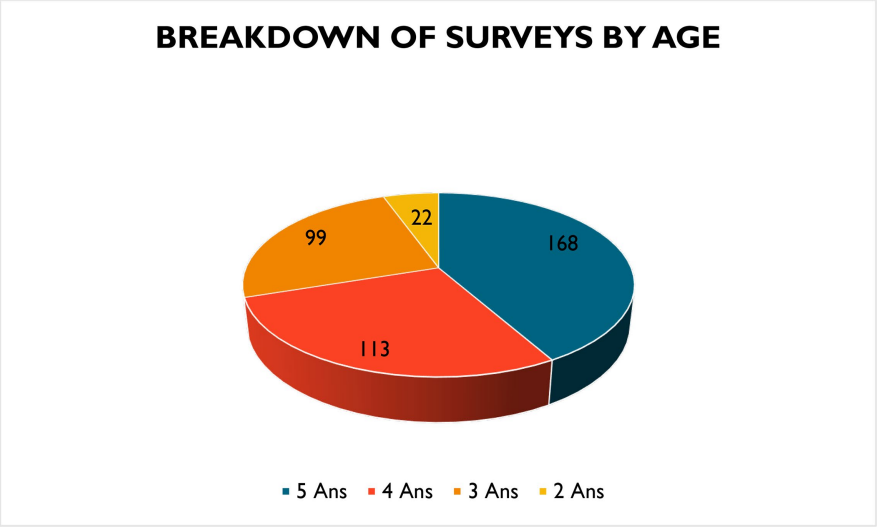

Figure 4. Distribution of respondents by age for each school.

3.3. Assessment of the Nutritional Status of Children

Table 4 presents the nutritional status of children aged 2 to 4 years.

Table 4. Nutritional status of children aged 2 to 4 years.

PB/PC	Number of children	Nutritional status
>0.31	213	Satisfactory
0.28 - 0.31	3	Mild malnutrition
0.25 - 0.27	18	Moderate malnutrition
<0.25	0	Severe malnutrition

Of the 234 children aged 2 to 4, 213 (91.02%) were in a satisfactory nutritional state and 11 children were in a state of slight or moderate malnutrition. There were no cases of severe malnutrition.

Table 5 presents the nutritional status of children aged 5 years.

Table 5. Nutritional status of children aged 5.

P/T	Number of children	Nutritional status
>80%	146	Normal
70% - 79%	22	Moderate malnutrition
<70%	0	Severe malnutrition

Of the 168 children aged 5, 146 (86.90%) were in a normal nutritional state, compared with 22 children who were moderately malnourished. There were no cases of severe malnutrition.

Table 6 presents the summary of children by nutritional status.

Table 6. Summary of children by nutritional status.

	Normal state	M A M	M A S	Total
Number	359	43	0	402
Percentage	89.30%	10.69%	0%	99.99%

M A M: Moderate malnutrition; M A S: Nutritional status.

Figure 5 presents the breakdown of children by nutritional status.

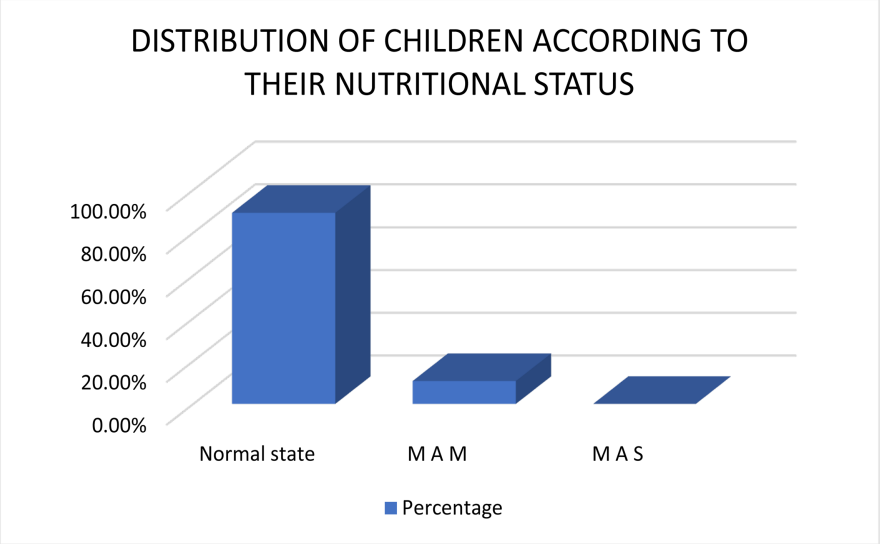

Figure 5. Breakdown of children by nutritional status.

Anthropometric measurements (weight, height, age, brachial circumference and head circumference) of 402 children revealed that 359 children (89.30%) were in a normal nutritional state and 43 children (10.69%) in a state of moderate acute malnutrition.

3.4. Distribution of Malnourished Children

Table 7 presents the distribution of moderate malnourished between the sexes.

Table 7. Distribution of moderate malnourished between the sexes.

	Garçon	Girl	Total
Number	19	24	43
Percentage	44.18%	55.81%	99.99%

Figure 6 presents the distribution of malnourished children by gender.

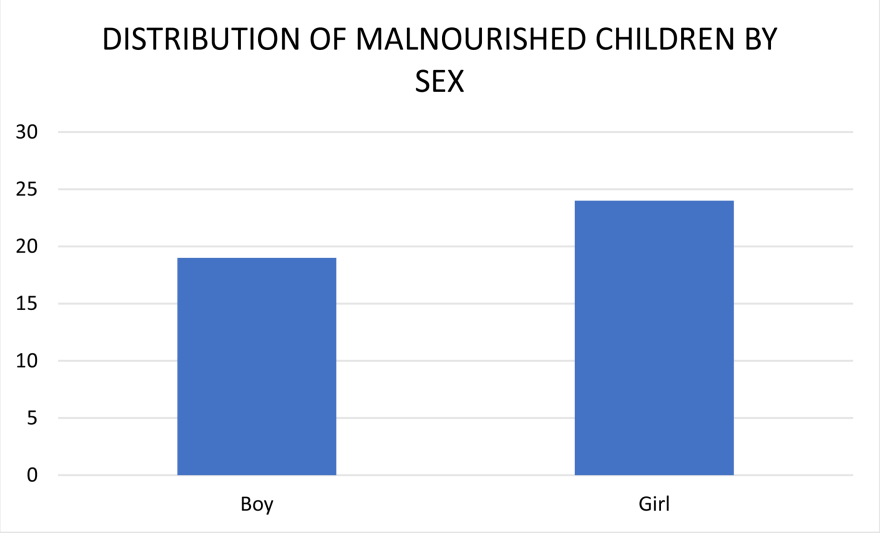

Figure 6. Distribution of malnourished children by gender.

Our study revealed a predominance of females: 24 cases, or 55.81%, compared with 19 cases of males, or 44.18%. Sex has no influence on the occurrence of malnutrition; it is simply used to indicate the population of children of one sex suffering from malnutrition compared with those of the opposite sex.

Table 8 and Figure 7 present the distribution of malnourished in the 10 schools surveyed.

Table 8. Distribution of malnourished in the 10 schools surveyed.

Schools	M A M	Percentage (%)
Hdja Habibata Tounkara	6	13.95
Santa Maria	7	16.27
Elh Naby Bangoura	5	11.62
José Marty	8	18.60
Les ecoles OCISS	1	2.32

Continued

Le Wariah	7	16.27
Oumou Diaby	4	9.30
Safia école	5	11.62
Kabassan	0	0
Hadja Kany Cherif	0	0
Total	43	99.95

M A M: Moderate malnutrition.

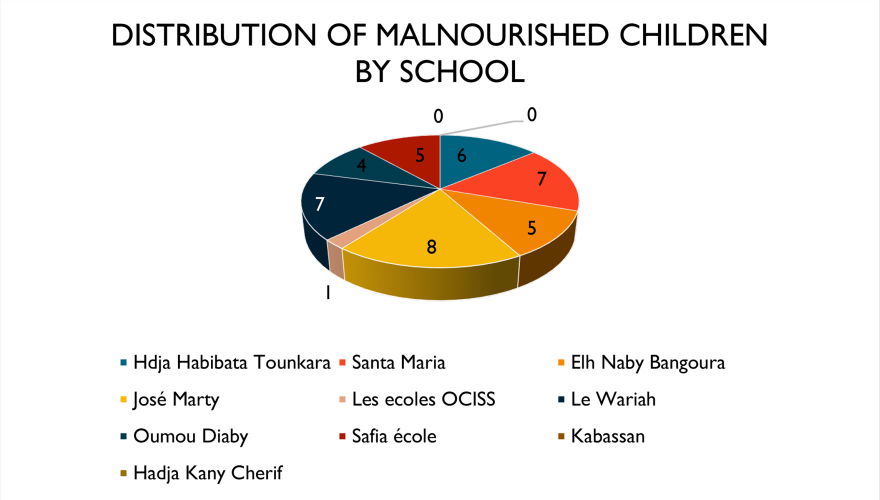

Figure 7. Distribution of malnourished children by gender.

It is true that the sample/enrolment ratio is not the same in the schools visited; however, there were 0 cases of malnutrition in Kabassan and Hadja Kany schools, and higher percentages in José Marty (18.60%); Santa Maria (16.27%); Wariah (16.27%); Hadja Habibata (13.95%); Elhadj Naby (11.62%) and Safia (11.62%).

The Kabassan school, which had a high percentage of children surveyed (64.70%) after Oumou Diaby (78.57%), did not record any cases of malnutrition, whereas schools such as José Marty, Wariah and Safia, which had a low percentage of children surveyed, recorded cases of malnutrition.

Table 9 presents the distribution of malnourished children by school and age group.

Children aged 5 account for more than half of malnourished children. There were 51.16% of cases among 5-year-olds, followed by 23.25% of 4-year-olds, 16.27% of 3-year-olds and 9.30% of 2-year-olds. Children aged 2 to 4 represented a cumulative percentage of 48.82%.

A predominance of females was also reported overall, with 24 cases (55.81%) compared with 19 cases (44.18%) in males.

Une prédominance féminine a également été rapportée dans l'ensemble avec 24 cas soit 55,81% contre 19 cas de prédominance masculine soit 44.18%.

Table 9. Répartition des enfants malnutris par école par tranche d'âge.

Schools	M A M	Age Group (Years)			
		5	4	3	2
Hadja Habibata Tounkara	6	5	0	0	1
Santa Maria	7	6	0	1	0
Elh Naby Bangoura	5	3	2	0	0
José Marty	8	3	3	0	2
Les écoles OCISS	1	0	0	0	1
Le Wariah	7	2	3	2	0
Oumou Diaby	4	3	0	1	0
Safia école	5	0	2	3	0
Kabassan	0	0	0	0	0
Hadja Kany Cherif	0	0	0	0	0
Total	43	22	10	7	4

M A M: Moderate malnutrition.

4. Discussion

The study in question, which focused on assessing the nutritional status of children aged between 2 and 5, involved a sample of 402 children. Specific results were obtained, but these differ from the conclusions of the study conducted by Compaoré in 2006, where a rate of 63.6% was observed [12]. This discrepancy may be explained by several factors, including the type of study and the context in which it was conducted. Methodologies and contexts can influence the results obtained: differences in the population studied (sample size, socio-economic characteristics of participants, etc.), the measuring instruments used, and the criteria for assessing nutritional status can all contribute to these variations. In addition, the geographical and temporal framework of the studies, as well as public health conditions at the time of each study, may also play a determining role in the differences observed. The results of this study, which show a lower malnutrition rate among children aged 2 to 5 years compared to the study by Compaoré (2006), can be explained by several factors. In fact, the methodological differences, particularly the measuring tools used and the criteria for assessing nutritional status, may partly explain this discrepancy [13]. Moreover, improvements in socio-economic and health conditions, as well as better access to healthcare and nutrition, may have contributed to better outcomes in our study. These factors, combined with geographical and temporal variations, can significantly influence the study results, highlighting the importance of considering the specific context of each study when interpreting the findings [13].

The results obtained in this study, where boys represent 51.74% of the children studied, show a notable difference compared to those observed by Courpotin and Delpeuch, who found a proportion of boys of 65.4% and 65%, respectively [14] [15]. This variation can be explained by several methodological and contextual factors, such as differences in sample size, the age range of the children studied, and the geographical and socio-economic context of the research.

First, the sample size in this study may play a significant role. A smaller sample, like the one used here, could make the results more sensitive to fluctuations due to factors such as the natural variability in the sex distribution in smaller groups of children. In comparison, Courpotin and Delpeuch worked with larger samples, which could explain the higher proportion of boys observed in their studies [14] [15].

Next, the age range of the children studied could also influence the sex distribution. Doumbia and Golden, in their research, may have included groups of children of different ages, which could explain differences in sex distribution based on the demographic structure of each age group [16] [17]. This study specifically examined children aged 2 to 5 years, and this segmentation may have an impact on the observed proportion of boys and girls.

Moreover, geographical and socio-economic differences between the studies must be taken into account. Courpotin and Delpeuch conducted their research in different contexts, where social and economic factors may have influenced the sex distribution based on local conditions. For example, cultural differences or public health practices may have an influence on the demographics of the samples studied. In this sense, the geographical context of this current study, in terms of location and access to healthcare, could also play a role in the observed difference.

In this study, the majority of children were 5 years old, representing 41.79% of the sample, with an average age of 3.97 ± 0.87 years. This result differs significantly from that of the Hobbs study, where the mean age was 1 year [18]. This discrepancy may be explained by differences in the age groups studied.

In this study, the majority of children (94.1%) had at least three meals a day, while only 5.9% had fewer than three meals a day. This result is relatively similar to that of Kanté's 2008 study, where 79.1% of children had more than three meals a day, while 16% did not have enough [19]. This similarity could suggest general trends in children's eating habits in similar contexts. However, it is important to note that although the results are close, differences remain, particularly in the proportion of children having fewer than three meals a day. This variation can be attributed to a number of factors, such as differences in socio-economic background, family practices or even the geographical region of the studies, which could influence eating habits and access to food [20].

This study found that the prevalence of acute malnutrition in children was 10.70%, with all cases classified as moderate acute malnutrition and none as severe acute malnutrition. This result is notably lower than that observed by Lokonon, who found a 27% prevalence of acute malnutrition, including 10.7% severe cases [21].

The significant difference between the two studies could be attributed to several contextual and methodological factors. These include differences in the populations studied, the criteria used for evaluating malnutrition, and the periods during which the studies were conducted. The contextual factors, such as local healthcare systems, nutritional programs, and public health initiatives, may also contribute to differences in prevalence. Additionally, variations in study design, such as sample size, age range, and data collection methods, could lead to different results.

Regarding age, this study revealed that children aged 4 to 5 years were twice as likely to suffer from acute malnutrition, although the difference was not statistically significant ($p = 0.419$). This contrasts with the findings of Mariko, who identified children aged 12 to 23 months as the most affected by acute malnutrition, with a statistically significant difference ($p = 0.025$) [22]. These age-related discrepancies may be influenced by the specific demographic characteristics of the target population in each study. In the current study, the higher prevalence among children aged 4 to 5 years could be attributed to factors such as diet diversification, socio-economic status, and potential changes in caregiving patterns as children grow older. In contrast, Mariko's study might have focused on a population with different feeding practices or health conditions, making younger children more vulnerable to malnutrition.

As for gender, the study found that 51.74% of male children were affected by acute malnutrition, compared to their female counterparts. This result is lower than the 58.3% prevalence observed in the Mukalay study, but the difference was statistically insignificant ($p = 0.186$) [23]. Although the current study suggests a slightly higher prevalence of acute malnutrition in boys, the difference is not large enough to be considered statistically significant, pointing to the possibility that other factors, such as socio-economic or environmental conditions, may be influencing the results. Moreover, gender differences in malnutrition rates can be subtle and context-dependent, varying according to the specific settings and populations studied.

5. Conclusion

Nutritional assessment using simple anthropometric measurements is a means of assessing the nutritional and clinical status of pre-school children in some nursery schools in the commune of Ratoma. At the end of our study, we obtained 10.70% of moderate acute malnutrition. Pre-school children are exposed to malnutrition, hence the need for nutritional monitoring to reduce the prevalence to 0% and improve their living conditions.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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