

## Prevalence and Factors Associated with Deficiency Malnutrition in the Health District of Guédiawaye, Senegal

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### ABSTRACT

**Introduction:** Deficiency malnutrition poses a real public health problem, especially in developing countries. The objective of this study is to assess: (a) the prevalence of deficiency malnutrition in its various forms in children aged 6 - 59 months living in Guédiawaye and (b) its determinants.

**Materials and Methods:** This descriptive and analytical cross-sectional study took place from September 1 to October 30, 2020 throughout the district of Guédiawaye in community. The study population consisted of children aged 6 - 59 months. Sampling with no survey was carried out and the total sample consisted of 603 subjects.

**Results:** Twenty-nine point three percent (29.3%) of the children were acutely malnourished, 20.4% chronically malnourished, and 25.5% were underweight. Early breastfeeding was performed in 62.7% of children and 97.1% had received exclusive breastfeeding for up to 6 months. The factors associated with acute malnutrition were: the number of children  $\geq 3$  (pvalue = 0.001), non-consumption of vegetables (pvalue = 0.020), non-consumption of meat / offal / poultry (pvalue = 0.032), consumption of condiments / spices (pvalue = 0.000), presence of fever during the last weeks preceding the survey (pvalue = 0.010), non-washing of hands when leaving the toilet (pvalue = 0.010) and incomplete immunization status (Pvalue = 0.00). The factors associated with chronic malnutrition were female sex (pvalue = 0.003), non-consumption of meat / offal / poultry (pvalue = 0.001), presence of diarrhoea during the last two weeks preceding the survey (pvalue = 0.021) and incomplete vaccination status (Pvalue = 0.000). The factors associated with underweight were: uneducated father (pvalue = 0.005), number of children  $\geq 1$  (pvalue = 0.028), lack of dietary diversification at 6 months (pvalu = 0.042), non-consumption of meat / offal / poultry (pvalue = 0.000), the presence of diarrhoea during the last weeks preceding the survey (pvalue = 0.001), and incomplete vaccination status (Pvalue = 0.000).

**Conclusion:** The prevalence of deficiency malnutrition, whatever its form, remains high among children in Guédiawaye. Promoting good dietary practices, improving hygiene conditions and monitoring nutritional status in immunization units could help fight malnutrition.

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## Keywords

Malnutrition, Children, Guédiawaye, Senegal.

## Introduction

Malnutrition poses a real public health problem, especially in developing countries. Deficiency malnutrition is believed to be directly or indirectly associated with a third of child deaths in the country, compared to 45% of these deaths globally. In addition, the economic consequences of malnutrition represent annual losses equal to 11% of gross domestic product (GDP) in Africa and Asia, according to the “2016 World Nutrition Report” [1].

In Senegal, significant gains have been made in the fight against malnutrition, making Senegal one of the countries with one of the lowest stunting prevalence in Sub-Saharan Africa. Between 2010 and 2017, the prevalence of stunting decreased from 27% to 17%. The same trend is observed with regard to the prevalence of underweight as its level dropped from 18% to 14%. On the other hand, in the same period, there is practically no change in the prevalence of wasting (10% against 9%) [2]. The challenges therefore are to manage to keep these prevalences down by implementing several strategies but also to manage to change the indicators concerning wasting. To do this, a good knowledge of the prevalence of the various forms of deficiency malnutrition and their determining factors is a prerequisite.

The objective of this study is to assess: (a) the prevalence of deficiency malnutrition in its various forms in children aged 6 - 59 months living in Guédiawaye and (b) its determinants.

## Materials and methods

This is a descriptive cross-sectional study with an analytical aim that took place from September 1 to October 30, 2020 throughout the Guédiawaye district in community. This health district stretches over 3.90 km from north to south and 7.5 km from east to west, covering an area of 28 km<sup>2</sup>. It is located north of the Dakar region, in the Niayes area. The general population census estimates the total population of the district at 360,360 inhabitants in 2016, i.e. an average density of 12,688 inhabitants per km<sup>2</sup> against 5,404 inhabitants per km<sup>2</sup> for the Dakar region and a national average density of 65 inhabitants per km<sup>2</sup>. Thus, Guédiawaye is the most densely populated area nationally.

The ENSANR (national food security, nutrition and resilience survey) methodology was used in this study. The ENSANR is a quantitative and stratified sample survey, carried out according to the SMART model (Standardized Monitoring and Assessment of Relief and Transition) and the guidelines of the Standardized Expanded Nutrition Survey - SENS-Version 1.3, March 2012). It is a fast, standardized and simplified survey method [2]. The study was carried out on a sample of ordinary households residing in the department of Guédiawaye. The target population for the survey of the prevalence of deficiency malnutrition and morbidity were children under 5 years of age. That for Infant and Young Child Feeding (IYCF) had concerned infants 6-23 months

old. The surveys relating to socioeconomic characteristics, food consumption, hygiene and immunization concerned the households drawn at the level of each stratum. In calculating the sample size, data from the Executive Secretariat of the National Food Security Council (NFSC) collected during the national food security, nutrition and resilience survey (ENSANR/NFSNRS) in February 2019, was used [2]. The total sample included 603 children in the Dakar region. The chosen sampling method is systematic two-stage cluster random sampling. The first stage consisted in selecting neighbourhoods within the geographical area of the district of Guédiawaye and the second stage in selecting households within the drawn neighbourhoods. In each selected household, all children aged 6-59 months were included in the survey, even if they are from different mothers (the case of polygamous families, for example). Children aged 6 - 59 months not from sampled households and refusals were not included in the study. Data collection was carried out by two previously trained investigators. Each investigator was accompanied by a ‘bajenou ngox’ (neighborhood godmother) to facilitate the interview. All mothers or caregivers of children aged 6 - 59 months were asked to reply to a questionnaire.

The parameters studied were: socio-demographic characteristics (sex, number of uterine children of the mother, spacing interval between births, position in sibling, address), family data (mother's marital status, mother's level of education, mother's income-generating activities, household size), child data (anthropometric characteristics of the child that allow us to define 3 types of deficiency malnutrition: acute malnutrition or wasting, chronic malnutrition or stunted growth and underweight), feeding behaviour (*tokhantal*, i.e. holy water given before breastfeeding), breastfeeding, dietary diversification, weaning, artificial formula milk, milk powder from shops, pure unpasteurized cow's milk, cow's curds, cereals, vegetables, fruits, meat, fish, sweet products, condiments / spices, seppi (portion of the family dish)), hygiene data (washing hands when leaving the toilet, before preparing meals and before feeding the child), health data (illnesses in the last 15 days fever, ARI, diarrhoea) and immunization status data according to the Expanded Programme on Immunization (up-to-date, incomplete or unknown).

Data collection on nutritional status was performed in households by requesting information on the age of children and then measuring the weight and height of children under 6 - 59 months of age in all households in the sample. The weight was measured with an electronic double weighing scale (SECA type). The height was measured with a measuring rod. Children under the age of two were measured while lying on the board, while those over two were measured while standing. The ages of the children were collected from an administrative document or calculated based on the calendar of special events. In accordance with WHO standards, cases of acute chronic malnutrition and underweight were defined respectively according to the weight-for-height, height-for-age and weight-for-age indices.

Data entry was done using CS pro software and analysis using SPSS (Statistical Package for Social Sciences) version 21 software.

**Table 1:** Classification of types of malnutrition.

Degree of malnutrition	Acute malnutrition or wasting (Weight / Height)	Chronic malnutrition or stunted growth (Height / Age)	Underweight (Weight / Age)
Global	W/H < - 2 Z-score	H/A < - 2 Z-score	W/A < - 2 Z-score
Moderate	- 3 Z-score ≤ W/H < - 2 Z-score sans œdème	- 3 Z-score ≤ H/A < - 2 Z-score	- 3 Z-score ≤ W/A < - 2 Z-score
Severe	W/H < - 3 Z-score and/or oedema	H/A < - 3 Z-score	W/A < - 3 Z-score

The qualitative variables were described in terms of numbers, percentage of data entered. Quantitative variables were described in terms of average. A bivariate analysis with the different forms of deficiency malnutrition as dependent variables was first performed. The independent variables were: characteristics of the children, data on the mother, feeding behaviour, hygiene, health and immunization. The statistical tests used were the Chi-square test for the percentage comparison and the Student's test or ANOVA for the comparison of averages. The difference was statistically significant when the p value was strictly less than 0.05.

Then a multivariate analysis was performed, in which all the variables with a p value less than 0.25 were retained to model the different forms of malnutrition by logistic regression. It was carried out by top-down modeling. The adjusted Odds Ratio (OR) with their 95% confidence interval were determined for each variable retained in the final model.

Consent was obtained from the individual parent prior to the survey.

## Results

### Characteristics of the study population

The survey covered 603 children. The 6 - 12 month age group was more representative at 34.8%. There was a male predominance of 57.2%. Two hundred and forty-four children, or 40.6%, occupied the second or third rank of their siblings. The spacing interval between births was greater than 24 months in 58.5% of cases. The prevalence of acute malnutrition stood at 29.3% or 17.4% in the severe form and 11.9% in the moderate form. The prevalence of chronic malnutrition was 20.4%, ie 8.6% in the severe form and 11.8% in the moderate form. The prevalence of underweight was 25.5 or 11.9% in the severe form and 13.6% in the moderate form.

### Feeding behaviour data

The percentages of early breastfeeding, exclusive breastfeeding and artificial feeding were 62.7%, 79.1% and 12.9%, respectively. The mean age of diversification was 5.9 months ± 1.4 and that of weaning 19.7 months ± 4.5. Vegetables and fruits were introduced at 8.8 months ± 4.2 and 9.8 ± 4.5 respectively. The mean age of introduction of seppi was 9.3 ± 4 months.

**Table 2:** Characteristics of the study population.

Child data	Number	Frequency
<b>Age</b>		
<12 months	210	34.8
12-23 months	180	29.9
≥24 months	213	35.3
<b>Sex</b>		
Female	258	4.8
Male	345	57.2
<b>Sibling rank</b>		
1 <sup>st</sup>	241	40.0
2 <sup>nd</sup> -3 <sup>rd</sup>	244	40.6
4 <sup>th</sup> and above	118	19.6
<b>Spacing interval between births</b>		
≤24 months	154	41.5
>24 months	217	58.5
<b>Underweight (Weight / age)</b>		
None	449	74.5
Moderate	82	13.6
Severe	72	11.9
<b>Chronic malnutrition (Height / age)</b>		
None	480	79.6
Moderate	71	11.8
Severe	52	8.6
<b>Acute malnutrition (Weight / height)</b>		
None	426	70.7
Moderate	72	11.9
Severe	105	17.4

**Table 3:** Feeding behaviour.

Feeding	N (%)	Mean age of introduction (Months) ± SD
Early breastfeeding	378 (62.7)	-
Exclusive breastfeeding	477 (79.1)	-
Artificial feeding	78 (12.9)	-
Diversification	563 (93.4)	5.9 ± 1.4
Weaning	237 (39.3)	19.7 ± 4.5
Formula (Sold in pharmacies)	205 (34.0)	4 ± 2.4
Milk powder from shop	312 (51.7)	8.8 ± 5
Pure unpasteurized cow's milk	24 (4.0)	11.8 ± 6.7
Cow's curd	370 (61.4)	12.2 ± 6
Tokhantal (holy water given before breastfeeding)	278 (46.1)	1,4 ± 1.6
Cereals (Sorghum, millet, corn)	535 (88.7)	6.3 ± 2.1
Vegetables	452 (75.0)	8.8 ± 4.2
Fruits	431 (71.5)	9.8 ± 4.5
Legume/Nut	321 (53.2)	11.7 ± 5.7
Roots/Tuber	454 (75.3)	10,3 ± 5.9
Meat / Offal / Poultry	282 (46.8)	16.4 ± 7.2
Fish / Seafood	389 (64.5)	13.8 ± 7.2
Milk and other dairy products	397 (65.8)	10.8 ± 6.6
Oil / Fat / Butter	311 (51.6)	12.4 ± 6.4
Condiments / Spices	169 (28.0)	17.5 ± 6.4
Sugar or sweet products	411 (68.2)	8.9 ± 4.5
Seppi (portion of the family dish)	339 (56.2)	9.3 ± 4

### Data on the existence of a disease, hygiene and immunization

In the last two months before the survey, 32.7% of the children had presented with diarrhoea, 57% with fever and 32% with acute respiratory infection (ARI). Hand washing before preparing meals, before feeding the child and when leaving the toilet stood at 88.2%, 87.4% and 98.7%, respectively. Immunization status was complete in 77.8% of cases.

**Table 4:** Illness, hygiene and vaccination.

Illnesses in the last 2 weeks	Number	Frequency
Yes	197	32.7
No	406	673
<b>Fever in the last 2 weeks</b>		
Yes	344	57.0
No	259	43.0
<b>ARI in the last 2 weeks</b>		
Yes	193	32.0
No	410	68,0
<b>Hygiene</b>		
<b>Mother washing her hands before preparing the child's meals</b>		
Yes	532	88.2
No	71	11.8
<b>Hand washing before feeding the child</b>		
Yes	527	87.4
No	76	12.6
<b>Hand washing when leaving the toilet</b>		
Yes	595	98.7
No	8	1.3
<b>Immunization</b>		
Complete	469	77.8
Incomplete	133	22.1
Does not know	1	0.2

### Factors associated with different forms of malnutrition

The factors associated with acute malnutrition were: number of children  $\geq 3$  (pvalue = 0.001), non-consumption of vegetables (pvalue = 0.020), non-consumption of meat / offal / poultry (pvalue = 0.032), consumption of condiments / spices (pvalue = 0.000), presence of fever during the last weeks preceding the survey (pvalue = 0.010), non-washing of hands when leaving the toilet (pvalue = 0.010) and incomplete immunization status (Pvalue = 0.000).

The factors associated with chronic malnutrition were female sex (pvalue = 0.003), non-consumption of meat / offal / poultry (pvalue = 0.001), presence of diarrhoea during the last two weeks preceding the survey (pvalue = 0.021) and incomplete immunization status (Pvalue = 0.000).

The factors associated with being underweight were uneducated father (pvalue = 0.005), the number of children  $\geq 1$  (pvalue = 0.028), lack of food diversification at 6 months (pvalue = 0.042), non-consumption of meat / offal / poultry (pvalue = 0.000), presence of diarrhoea during the last weeks preceding the survey (pvalue = 0.001), and incomplete immunization status (Pvalue = 0.000).

**Table 5:** Factors associated with deficiency malnutrition.

Factors associated with underweight	Final model	
	OR aj [CI at 95%]	P value
Education		0.005
Yes	0.53 [0,34-0.81]	
No	1	
Number of children aged 5-14		0.028
$\leq 1$	0.59 [0.37-0.94]	
$> 1$	1	
Diversification at 6 months		0,0.2
Yes	0.45 [0.21-0.97]	
No	1	
Meat / Offal / Poultry		0.000
Yes	0.38 [0.24-0.60]	
No	1	
Diarrhoea in the past 2 weeks		0.001
Yes	2.11 [1.35-3,28]	
No	1	
Child's immunization status		0.000
Complete	0.334 [0.21-0.56]	
Incomplete	1	
<b>Factors associated with chronic malnutrition</b>		
Sex		0.003
Female	0.48 [0.30-0.79]	
Male	1	
$< 1$	0.51 [0,29-0.90]	
$\geq 1$	1	
Meat / Offal / Poultry		0.001
Yes	0.45 [0.28-0.73]	
No	1	
Diarrhoea in the past 2 weeks		0.021
Yes	1.72 [1.08-2.72]	
No	1	
Child's immunization status		0.000
Complete	0.22 [0.13-0.38]	
Incomplete	1	
<b>Factors associated with acute malnutrition</b>		
Number of children		0.001
1 - 2 children	0.50 [0.33-0.76]	
3 children and more	1	
Vegetables		0.020
Yes	0.54 [0.32-0.91]	
No	1	
Meat / Offal / Poultry		0.032
Yes	0.56 [0.34-.095]	
No	1	
Condiments/Spices		0.000
Yes	3.52 [2.06-5.99]	
No	1	
Fever in the last 2 weeks		0.016
Yes	1.71 [1.11-2.65]	
No	1	
Hand washing when leaving the toilet		0.010
Yes	0.05 [0.001-..48]	
No	1	
Child's immunization status		0.000
Complete	0.37 [0.23-0,61]	
Incomplete	1	

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## Comment

This study took place in the health district of Guédiawaye and aimed to assess (a) the prevalence of deficiency malnutrition in its various forms in children aged 6-59 months living in Guédiawaye and (b) its determinants.

Thus, the prevalence of stunting, wasting and underweight were higher than those found in the 2017 continuous demographic and health survey in Senegal, which were respectively 17%, 9% and 14% [4]. These observed differences could be explained by the variations that exist in the prevalence of nutritional status in Senegal between regions. The 2017 Continuous Demographic Health Survey in Senegal reveals that the prevalence of stunting varies significantly between regions, from a minimum of 7% in the Dakar region to 32% in Kolda [4]. The health district of Guédiawaye- framework of this study- is part of the department of the same name located in the suburbs of Dakar. This locality is characterized by a population density higher than the national average and the existence of a more sustained precariousness. This could favour these prevalence rates that are higher than the national average. Several data in the literature establish the link between undernutrition and poverty [5,6]. Similarly, the rates of early breastfeeding and exclusive breastfeeding were higher than those found in the 2017 Continuous Demographic and Health Survey in Senegal, which were 34% and 42%, respectively. The mean age of diversification was  $5.9 \pm 1.4$  and that of weaning  $19.7 \pm 4.5$ . These dietary practices were not associated with acute malnutrition in this study. These results corroborate those found in other studies [7-11]. Non-consumption of vegetables (pvalue = 0.020), non-consumption of meat / offal / poultry (pvalue = 0.032) and consumption of condiments / spices (pvalue = 0.000) were associated with acute malnutrition; non-consumption of meat / offal / poultry (pvalue = 0.001) with chronic malnutrition and the absence of food diversification at 6 months (pvalu = 0.042), non-consumption of meat / offal / poultry (pvalue = 0.000) with underweight. The use of seppi, a practice well established in Senegalese society, has also not been associated with any form of malnutrition. This should encourage the promotion of food practices based on local traditions. The poor conduct of weaning and diversification as noted by several authors are therefore strongly implicated in the occurrence of malnutrition [12-14]. For optimal growth, development and health, infants should be breastfed exclusively for the first six months of life: this is a general public health recommendation. Subsequently, to meet changing nutritional needs, infants should be given safe and nutritionally adequate complementary foods, while continuing to breastfeed until two years of age or more, according to the IYCF of the WHO, UNICEF [15].

Female gender was associated with chronic malnutrition (pvalue = 0.003). Other studies have found this same male predominance [16-20].

The number of children  $\geq 3$  was associated with acute malnutrition (pvalue = 0.001) the high number of children under 5 years of age

was found as a predictor of child malnutrition in several studies [21-23]. The increase in the number of children in the family is a heavy burden on household resources especially on food and finances, thus reducing the time and quality of care received by each child [23,24]. Father's lack of education was associated with being underweight (pvalue = 0.005). This raises the issue of the knowledge and involvement of fathers in good feeding practices in our societies. In this study, not washing hands when leaving the toilet was associated with acute malnutrition (pvalue = 0.010). Likewise, the presence of diarrhoea in the last weeks preceding the survey was associated with chronic malnutrition and underweight with pvalue of 0.021 and 0.001, respectively. These results are similar to those of several studies carried out in Senegal [25], Ethiopia [1-26] as well as in other countries [27-30]. This could be explained by the fact that diarrhoea is accompanied by decreased appetite, decreased absorption of nutrients from the digestive tract and metabolic disturbance [31] thus creating a real vicious circle of diarrhoea-malnutrition and more generally infection-malnutrition. Poor nutritional status increases the severity, duration and incidence of diarrhoeal episodes. Hand washing is an important hygienic action which helps prevent the transmission of skin germs and which therefore has implications for the health of all household members and in particular that of children. Incomplete immunization status is linked to malnutrition regardless of its form in this study. Other studies of populations of malnourished children report low immunization coverage rates [32,33]. WHO cites immunization as one of the most profitable investments in the field of health? It helps to fight and eliminate potentially fatal infectious diseases and it is estimated that more than 2 to 3 million deaths per year are prevented [34]. A strong recommendation for monitoring immunization status in malnourished children as well as the nutritional status of children in immunization units should be made.

The study took place in only one district, which could be a limitation. A multicentric case-control study could better assess the prevalence of malnutrition and its determinants.

## Conclusion

The prevalence of undernutrition in all its forms remains high in the district of Guédiawaye. The factors associated with these different forms of malnutrition are related to poor feeding practices, poor hygiene, certain socio-economic factors such as the lack of education of fathers and incomplete immunization status. Promoting good dietary practices, improving hygiene conditions and monitoring nutritional status in immunization units could help combat malnutrition.

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