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Abstract:

In Mauritania, as in many developing countries, malnutrition in children under five years is a public health problem. One of the strategies for preventing and combating this scourge is the early anthropometric assessment of nutritional status.

Child malnutrition is conventionally assessed by three indicators of nutritional status made up of anthropometric measurement indices, namely wasting (weight/height), stunting (height/age) and underweight (weight-height/age). However, these indicators are criticized for underestimating the prevalence of malnutrition because they overlap.

The main objective of our study is to assess the nutritional status of children through these aforementioned indices using MICS 2015-2016 data from Mauritania.

The results show that of all the children studied (8927): *50.50% are boys, 49.50% are girls;

* 43.71% reside in urban areas and 56.29% in rural areas;

* the average age of the children is 31.9 months ± 15.5 months;

* average size is 86.8cm±11.9cm;

* the average weight is 11.35 kg ± 2.95 kg.

Thus we deduce that malnutrition in Mauritanian children is characterized by prevalence of 29.58% stunting, 25.81% underweight and 14.91% emaciation.

Regarding the correlations of malnutrition with risk factors, we noted that the prevalence of child malnutrition is significantly related to age and area of residence, while the male and female sex

of the children surveyed was higher in the middle rural than in urban areas. The age and level of education of mothers play a key role in child malnutrition.

Based on our results, we propose a series of economic and social policy measures that would take into account all of these factors and contribute to improving the nutritional status of children aged 0 to 5 years in Mauritania.

Keywords: Children, Anthropometric indices, Nutritional status, Malnutrition, Mauritania.

1.INTRODUCTION

Malnutrition is one of the most important health and well-being problems of young children. It results as much from an inadequate diet in quantity, quality and use as from the consequences of disease, hygiene or living conditions [1].

According to the WHO definition, malnutrition is characterized by «a pathological condition resulting from the deficiency or excess, relative or absolute, of one or more essential nutrients, whether this condition manifests itself clinically or is only detectable by biochemical, anthropometric or physiological analyzes ».

It is the result of both an inadequate diet and a poor sanitary environment. Inadequate feeding practices refer not only to the quality and quantity of food given to children, but also to the stages of its introduction.

While worldwide it is estimated that 55 million children under 5 suffer from acute malnutrition, including 19 million severe cases, the vast majority of cases are concentrated in only 36 countries in Sub-Saharan Africa and southern Central Asia.

And among the 10 million deaths observed each year worldwide in children under 5, malnutrition is associated with more than 50% of these deaths [2].

Malnutrition poses a threat to Africa’s sustainable development, as it prevents a significant portion of its youth from reaching their full potential. It is associated with almost half of deaths in children. In Mauritania, the SUN "Scaling up nutrition" civil society movement has been active since 2017 and initiates advocacy and awareness-raising actions with political decision-makers in order to put nutrition at the heart of public policies and make the right investments. We recommend involving the SUN civil society movement and valuing the achievements. By 2030, end hunger and ensure that everyone, especially the poor and those in vulnerable situations, including infants, have year-round access to healthy, nutritious and sufficient food [3].

Like several countries in the Sahel, Mauritania is one of the poorest countries in the world with a health situation characterized by the persistence of high levels of infant and maternal mortality and an epidemiological profile marked by the double presence of infectious and

nutritional problems with significant nutritional imbalances and a strong presence of perinatal pathology [4].

During the last decade, the underweight rate of children under five has remained high in Mauritania, around 30%, without significant changes (MICS2015-2016). This situation is worrying given the consequences of retarded physical and mental growth of children who present a risk for the development of future generations. The nutritional well-being of the poor should not be seen simply as a consequence of development but rather as one of its preconditions. The resulting strategic option is that fighting malnutrition, and therefore hunger, amounts to fighting poverty and problems related to undernourishment and micronutrient deficiencies.

The supply of drinking water and the low levels of care and monitoring - evaluation, particularly of the health of the mother-child couple, are endogenous factors of malnutrition. In all these areas, possibilities for preventive intervention exist, which is why a political will commensurate with the challenges of the identified nutritional problems is more than desirable [5]. In the health sector, the government has deployed to over the past fifteen years, significant efforts and undertaken reforms to bring health services closer to the populations and fight against disease through the development and implementation of the National Health Development Plan (NHDP) to the period (2012-2020). This situation explains the low level of improvement in nutrition indicators, making it difficult to achieve the Millennium Development Goals (MDGs) and those of the World Assembly of health in 2012. The Multisectoral Nutrition Strategic Plan (MNSP) of Mauritania (2016 - 2025) is intended to be a guiding framework for all stakeholders, for the implementation of specific and nutrition-sensitive interventions and in order to provide a concerted response to the direct and underlying causes of malnutrition [6].

The interest aroused by our present study is therefore to assess the nutritional status of children under 5 years of age in Mauritania using all the anthropometric indices mentioned above calculated from MICS 2015-2016 data from Mauritania.

2. Material and Methods

1.1. Source of Data

Data for this study are based on a Multiple Indicator Cluster Survey (MICS5) conducted in Mauritania during the years 2015-2016. The data was used to calculate the anthropometric indices mentioned above and which were used to assess the nutritional status and estimate the situation of children and women in Mauritania at the national, regional level, in the area of

residence. In addition, certain socio-demographic characteristics of the households were also collected [7].

2.2. Sampling:

The study involved 8927 children aged 1 to 59 months, including 5025 subjects from rural areas and 3902 from urban areas. Children are randomly selected when they visit maternal and child health offices.

2.3. Socio-economic and demographic level:

Data on socio-economic and demographic level were collected using a questionnaire. Several variables were collected to characterize the mothers of the children surveyed, including age, household size, number of children, occupation, level of education, occupation of head of household and type of housing.

2.4. Anthropometric measurements

Three anthropometric indices were used to assess the nutritional status of children: weight-height, weight-age, height-age. Only the weight-height index gave good indications and was retained for the rest of our study. It has the advantage of examining the short-term effects of malnutrition and measuring the prevalence of acute, moderate and/or severe global malnutrition. This index has been used in two forms: weight/height, in children under 5 years old, and weight/height in children aged 0 to 5 years [8]. Data were entered and analyzed using SPSS software (version 10). The association between potential risk factors and malnutrition is measured using a logistic regression model. The difference was considered significant for $p \leq 0,05$.

2.5. Nutritional status of individuals

Anthropometric measurements were taken to determine the nutritional status of the children. Child malnutrition was defined by stunting (height-for-age Z-score (H / A) <-2) or wasting (weight-for-height (W/ H) Z score <-2) or underweight (Z-score weight for age (W/ A) <-2) [9].

2.6. Statistical analyzes

Child stunting, underweight and wasting were defined as height-for-age z score <-2, weight-for-age ratio z score <-2, weight-for-height z score <-2, according to WHO growth standards. Data analysis was performed using SPSS software (version 10). The significance level was set at 0,05.

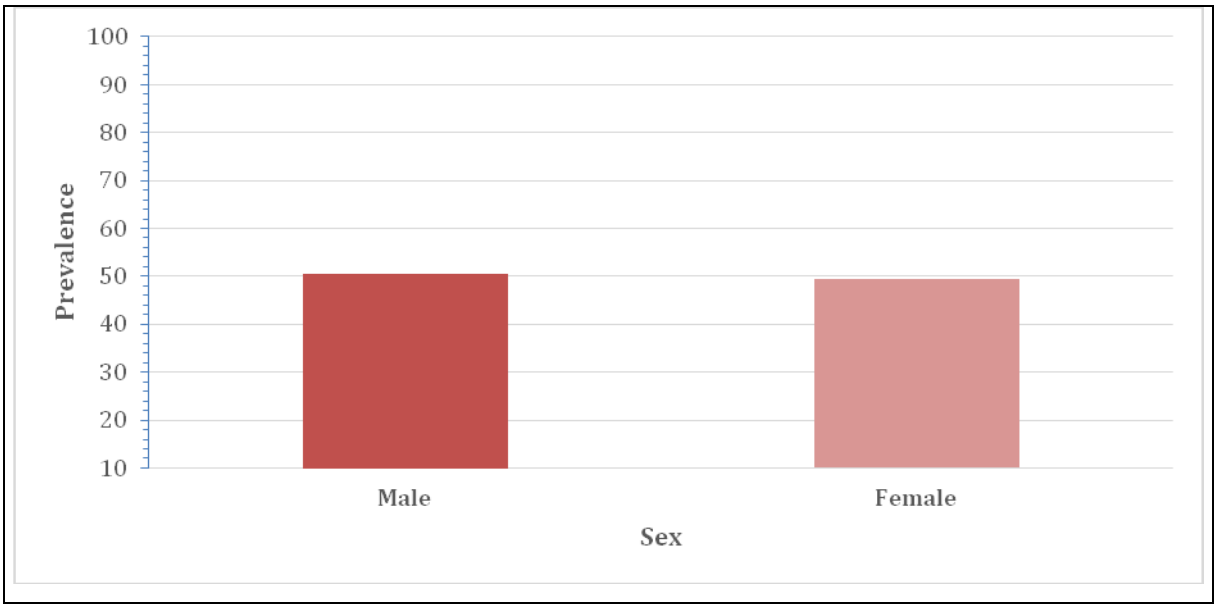
3. RESULTS

The demographic data collected shows that all of the children studied (8927), 50.50% are boys and 49.50% are girls (**Table 1**). The male children were slightly more important than the female sex, i.e. 50.50% against 49, 5%.

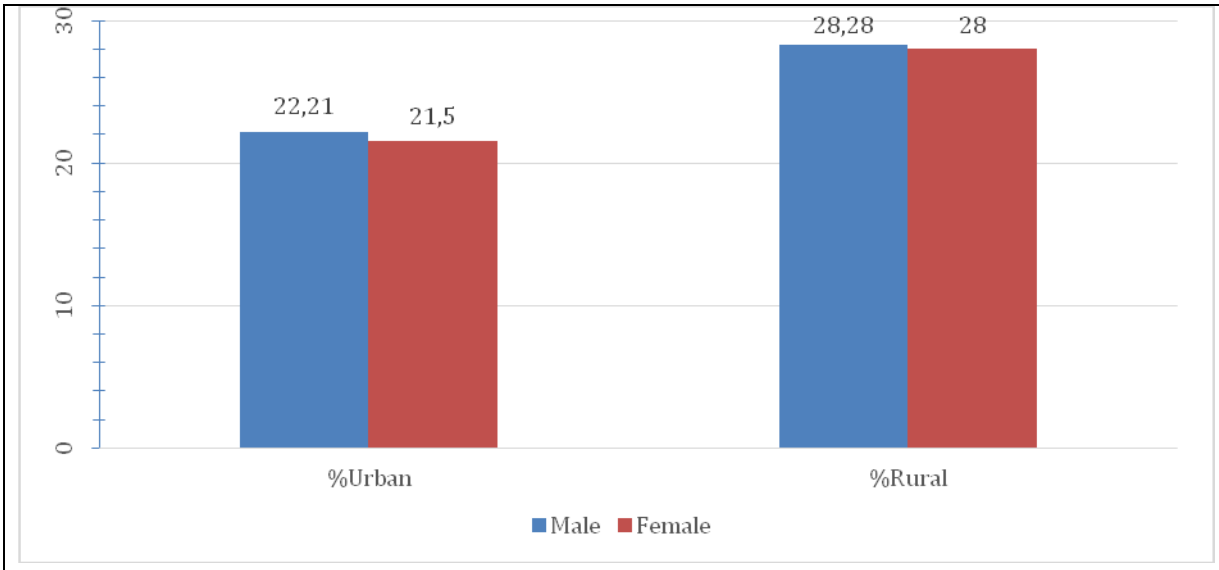
Table 1: Distribution of children by sex and by place of residence.

Sex	Place of residence				Total	
	Urban		Rural			
	N	%	N	%	N	%
Male	1983	22.21	2525	28.28	4508	50.50
Female	1919	21.50	2500	28.00	4419	49.50
Total	3902	43.71	5025	56.29	8927	100.00

Regarding the distribution of children according to place of residence, rural areas represented more than 56% of the children surveyed. The male and female sex of the children surveyed was greater in rural than urban areas.



Graph1: Distribution of children studying by sex.



Graph2: Place of residence

Table 2: Representation of anthropometric parameters and indicators of children's nutritional status by place of residence.

anthropometric parameters and indicators	Place of residence					
	Urban		Rural		Total	
	mean	E type	mean	E type	mean	E type
Age (months)	31.56	15.73	32.26	15.35	31.95	15.52
Weight	11.61	3.04	11.14	2.86	11.35	2.95
Height	87.11	12.08	86.63	11.92	86.84	11.99
Z score (W/H)	-0.85	1.12	-1.15	1.03	-1.02	1.08
Z score (H/A)	-0.87	1.50	-1.18	1.55	-1.04	1.54
Z score (W/A)	-1.24	1.17	-1.65	1.11	-1.47	1.15

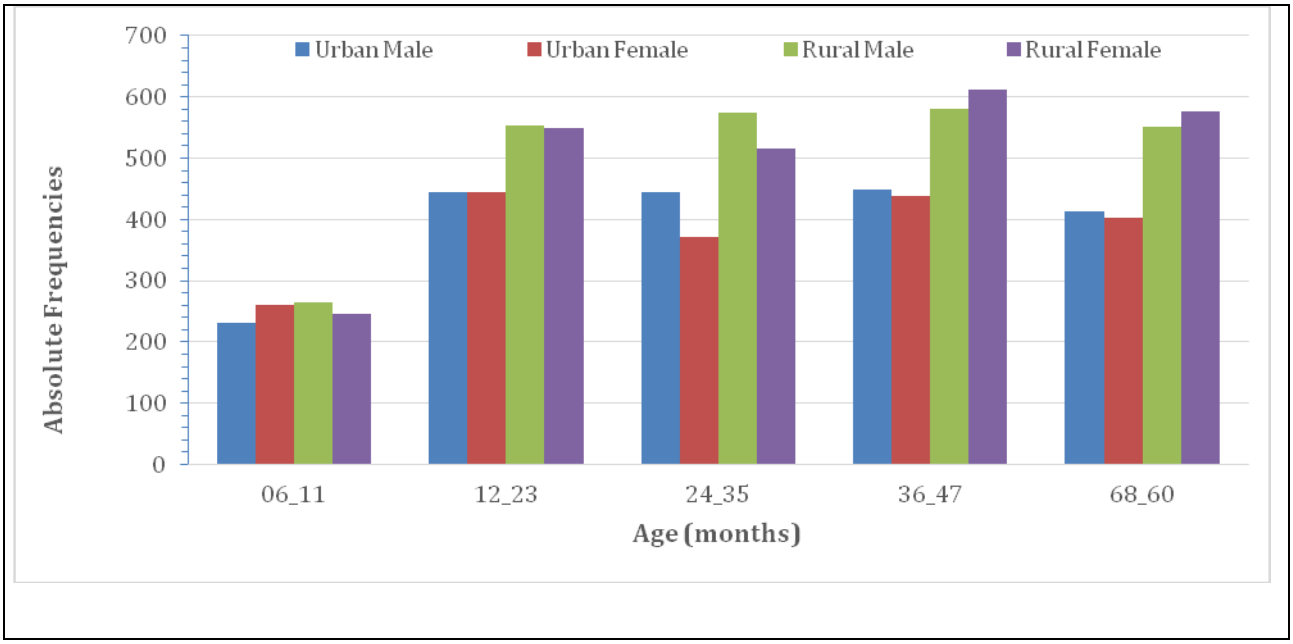
The average age of the children is 31.95 months ± 15.52 months. The average weight of the children is 11.35 kilograms ± 2.95 kilograms. The average height of the children is 86.84 centimeters ± 11.99 centimeters (**Table 2**).

The WHO Anthro software is used to determine the Z-score of weight / height, weight / age and height / age for each child in order to assess the nutritional status of children. According to WHO standards the average weight / height Z-score is of -1.02 ± 1.08, the Z-score for height / age is -1.04 ± 1.54, and that for weight / age is -1.47 ± 1.15 (**Table 2**).

The distribution of children by age group is shown in (**Table 3**, **Graph 3**). According to these results, the age group between 36-47 months is the most represented (23.3%), followed by the age group between 12-23 months which represents 22.3% of the sample.

Table 3: Distribution of children by age according to place of residence.

	Urban		Rural		Total			
Age	Male	Female	Male	Female	Male	Female	N	%
6-11	232	261	264	246	496	507	1003	11,2
12-23	445	445	554	550	999	995	1994	22,3
24-35	444	371	575	516	1019	887	1906	21,4
36-47	449	439	581	611	1030	1050	2080	23,3
48-60	413	403	551	577	964	980	1944	21,8
Total	1983	1919	2525	2500	4508	4419	8927	100,0



Graph 3: Distribution of children by age and place of residence

The prevalence of malnutrition among children according to their socio-demographic characteristics, of which 29.58% are stunted, 29.81% are underweight and 14.91% are wasted (**Table 4**).

According to this table the prevalence of malnutrition among male children of which 31.74% are stunted, 27.69% underweight and 16.56% wasted. And female children of which 27.38% are stunted, 23.89% are underweight and 13.24% are wasted.

According to **table 4** and **Graph 3**, the 6 to 11 months age group (86.44%) is the most affected by protein-energy malnutrition. The prevalence of protein-energy malnutrition is significantly higher for the 3 forms of malnutrition; stunting, wasting and underweight in rural and urban areas. Our results do not demonstrate a statically positive association of the prevalence of malnutrition by sex.

The level of education and the age of the mothers played an important role in the nutritional status of the children in our study ($p < 0.05$). However, household size, occupation of head of household and number of children were not associated with child malnutrition in our sample ($p > 0.05$) (Table 4).

Table 4: Prevalence of malnutrition among children according to their socio-demographic characteristics.

		Size for age (H/A) (%)		Weight for size (W/H) (%)		Weight for age (P/A) (%)	
		Zscore ≥ -2	Zscore < -2	Zscore ≥ -2	Zscore < -2	Zscore ≥ -2	Zscore < -2
Sex	Male	68.26	31.74	72.31	27.69	83.44	16.56
	Female	72.62	27.38	76.11	23.89	86.76	13.24
	Pr	0.000		0.000		0.000	
Age group	6-11	86.44	13.56	78.86	21.14	79.90	20.10
	12-23	70.36	29.64	72.98	27.02	82.55	17.45
	24-35	63.75	36.25	72.06	27.94	86.40	13.60
	36-47	66.68	33.32	72.92	27.08	87.72	12.28
	48-60	72.74	27.26	76.48	23.52	86.27	13.73
	Pr	0.000		0.000		0.000	
Age of Mother	<20	69.50	30.50	72.73	27.27	81.25	18.75
	20-34	70.10	29.90	74.13	25.87	85.68	14.32
	plus 34	71.03	28.97	74.45	25.55	84.52	15.48
		0.614		0.777		0.046	
Level 'instruction; of the mother	No	69.47	30.53	69.69	30.31	80.88	19.12
	Quranike/ Mahadra	66.08	33.92	71.91	28.09	85.63	14.37
	Primary	69.97	30.03	74.11	25.89	85.58	14.42
	Secondary +	79.36	20.64	85.73	14.27	90.70	9.30
	Pr	0.000		0.000		0.000	
place residence	Urban	75.53	24.47	80.36	19.64	88.02	11.98
	Rural	66.45	33.55	69.40	30.60	82.81	17.19

	Pr	0.000		0.000		0.000	
Well-being index	The poorest	63.31	36.69	67.09	32.91	82.05	17.95
	Second	66.60	33.40	66.85	33.15	81.26	18.74
	Medium	70.12	29.88	73.75	26.25	83.59	16.41
	Fourth	74.04	25.96	79.11	20.89	88.85	11.15
	The richest	80.53	19.47	87.62	12.38	91.53	8.47
	Total	70.42	29.58	74.19	25.81	85.09	14.91
	Pr	0.000		0.000		0.000	
	Pr : p-value or observed threshold for a significance level of 0.05 and ns : not significant						

4. Discussion:

Obviously, child malnutrition is not a simple problem. Multiple determinants involved in its appearance, which may be direct, such as food and health, or indirect, such as the socio-economic level of the family, the nutritional and educational status of the mother, the availability of drinking water and sanitation of the environment [10].

The analysis of the nutritional status of children under five in our study showed that the prevalence of malnutrition in children is 29.58% are stunted, 25.81% underweight and 14.91% wasted. Similar results have been observed in other regions of Mauritania. In addition, national data reveal very similar figures with 27.9% stunting, 24.9% underweight and 14.8% underweight-Emaciation [14].

Based on these results, it could be seen that stunting is the most common consequence of malnutrition in children. Stunted growth occurs when a child does not receive the amounts of calories needed for bone tissue growth and weight gain over a period of time. It has serious repercussions on health and the economy [15]. In girls, it increases the risk of maternal mortality due to poor growth in pelvic size, and contributes to the development of intrauterine growth retardation [16]. Undernourished children, with reduced lean body mass and basal metabolic rate, have an increased risk of building up fat in their bodies as adults [17].

Malnutrition among children affects girls and boys, whereas the male and female sex of the children surveyed was greater in rural than in urban areas. In fact, we confirmed in our study that the gender of children has no influence on the prevalence of malnutrition. This result has

also been shown by other studies carried out in certain regions [18]. This is due, according to data in the literature, to the fact that the nutritional needs of children under 5 years old are the same. We observed that the 36-47 months age group is most affected by protein-energy malnutrition (stunting and underweight), a result similar to other studies [18, 19,20]. This age group represents the most critical period for children. It is at this age that nutritional problems occur in most children. This result is reported by other studies [18, 21, 22]. In all developing countries, children in rural areas are more likely to suffer from hunger than those living in cities. According to the conceptual diagram of the determinants of malnutrition published by UNICEF [23], breastfeeding and complementary foods are among the immediate causes of malnutrition and infant mortality. It is known that from 6 months, breast milk alone is no longer sufficient to cover all the nutritional needs of infants to ensure their growth.

For this reason, WHO and UNICEF recommend the introduction of complementary foods in the diet of children at 6 months of age. However, according to the latest national population and family health survey [24], breastfeeding practices were not adequate as recommended. 27% of children were exclusively breastfed, only 76.4% of children between 6 and 11 months received solid or semi-solid supplements, and barely 40% received a diet that complied with WHO recommendations. The high prevalence of malnutrition at this age could therefore be explained by poor breastfeeding practices, and the lack or low nutritional value of complementary foods. That is, children benefit from complementary foods, but not of high quality. A child's diet should be appropriate for his age in terms of quality and quantity.

The second dimension of the causes of child malnutrition are factors related to households. The mother or caregiver plays an important role in feeding and caring for children. According to our results, the age of mothers is significantly correlated with chronic and acute malnutrition ($p = -0.000$). The younger the woman, the more her knowledge about the quality and nutritional value of food is insufficient, and as a result she adopts poor care practices for her children. On the other hand, the level of education of mothers also seems to be a determining factor in the nutritional status of children. This is how the more educated mothers ensure better nutrition for the well-being of their children. The results of the National Anthropometry Survey [23] confirm this observation by showing that the nutritional status of children improves in households where the mother has attended school.

For other household-related factors, including father's occupation, family size and number of children, we found no correlation with child malnutrition. This situation, which also emerges in certain previous studies [25, 26], does not agree with other data in the literature [15, 21] which rather conclude that the factors cited are determining factors of malnutrition.

malnourished is therefore in a situation of physical weakness which favors infections that can increase its risk of death or of developing chronic diseases in adulthood such as obesity, cardiovascular disease, and type 2 diabetes [27, 28]. In the presence of this information, by prioritizing this group of children, strategic programs to reduce malnutrition may show more dividends. Because the interventions will act at the same time on morbidity with malnutrition as an underlying cause as well as on the mortality of malnourished children.

5. Conclusion:

Malnutrition is a major health problem in the Sahel and Mauritania. The nutritional status of the mothers of the children, the place of residence, the ethnicity and the age of the children negatively influence the nutritional status of the children. Indeed, the causes are multifactorial and require joint interventions which imply integrated actions with certainly socio-health components but also of food security, education ... This imposes an intersectoral development policy beyond the fight against malnutrition Given the failure to achieve the Millennium Development Goals, decision-makers should take into account other relevant suggestions, such as those shown in this document, in the monitoring and care of failed children anthropometric. This could help combat more strategically the malnutrition raging in Mauritania in order to achieve the second target of the Sustainable Development Goals by 2030.

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