Prevalence and characterization of chronic malnutrition in children under five years of age in a hospital in Cuba

Abstract

Introduction: Malnutrition is a multifactorial pathological condition that affects the human organism systemically.

Objective: To determine the prevalence and characterization of malnutrition in children under five years of age.

Method: cross-sectional descriptive observational study in malnourished children under 5 years of age admitted to the San Miguel del Padrón Hospital between 2020 and 2022. The nutritional evaluation was done through the percentile tables of the Ministry of Public Health. Patient information was processed using computational methods.

Results: The prevalence of chronic malnutrition was 2.11%. Of the 247 children in the study, 78.14% had mild malnutrition, 58.30% were children of mothers under 20 years of age, 49.39% of upper secondary education and 46.56% of housewives. The single mother category and family dysfunction were present in 37.25 % and 63.56 %. The low economic per capita was present at 73.68%. 48.58 % corresponded to ages between 1-2 years and 55.06 % to males. 85.83% had a good birth weight. There was abandonment of breastfeeding before the third month in 65.99%. Complementation was incorrect in 83.81%. Anemia was the most frequent laboratory abnormality. The main causes of admission were febrile syndrome and bronchiolitis.

Conclusion: Most of the malnourished children presented nutritional limitation due to family dysfunction, low per capita economic and deprivation of breastfeeding and supplementation, conditions that can be prevented with health education programs.

Keywords: child malnutrition, risk factors, disease, child

Key points

a) Chronic malnutrition causes a delay in aging, is associated with poverty and poor nutrition practices, and is linked to a higher prevalence of illnesses.

b) The diagnosis of chronic malnutrition requires clinical, anthropometric and biochemical assessment, and is key to reducing the negative effects that it produces on immunity, neurocognitive development and survival.

c) The recovery of malnourished patients requires access to food, nutritional supplements and quality health services. Failure to do so puts the health of children and the survival of future generations at risk.

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Introduction

Malnutrition is a health problem in many countries around the world. Every year 3.5 million children die from this cause. Latin America has one of the highest rates of malnutrition worldwide.[1]

In 2021, in Latin America and the Caribbean, 40.6% of the population suffered from chronic malnutrition, and 14.2% were severely food insecure. The highest prevalence of hunger in the region corresponds to the Caribbean with 16.4%, and children under five years of age and women are the most affected.[2]

Malnutrition is defined as the imbalance between nutrient requirements and intake, which generates cumulative deficits in energy, proteins and/or micronutrients that can negatively affect growth and development, and induce physiological and metabolic changes that can alter the ability to respond. to pathological processes or imply the deterioration of the immune response.[3,4]

This pathological and non-specific condition has multifactorial etiology and affects the human organism systemically, with immediate, mediate complications and long-term sequelae that can be potentially reversible with timely, comprehensive, multidisciplinary management and maintained over time with intersectoral support.[5]

Chronic malnutrition (growth retardation) is the most frequent nutritional deficit in children from zero to 59 months in Latin America. This condition shows variations between countries and regions of the continent, with a prevalence of up to 48% in Guatemala and as low as 1.8% in Chile.[5]

This nutritional alteration is usually associated with situations of poverty and inequality. It produces a marked decrease in mental and productive capacities; and is linked to a higher prevalence of diabetes, cardiovascular diseases, problems with social adaptation and productive performance.[5,6]

The physical and neurocognitive damage caused by chronic malnutrition suffered during early childhood is irreversible, and affects individual and collective health and well-being in the short and long term. Its existence and progression over time is linked to genetic (biological) and dynamic (economic, psychological, sociocultural and environmental) factors.[5]

The first group of factors (biological) includes: low birth weight, prematurity, type of diet, recurrent acute infections, chronic or systemic diseases with general repercussions, intestinal parasitism, caloric-protein and micronutrient deficiency, iodine and vitamin A. In the second group, insufficient availability of food, environmental sanitation problems, lack of provision of safe water for human consumption, poor food and health care practices, poor quality of socio-health care, and others, are the main reported causes.[5–7]

In Cuba, according to the Food and Agriculture Organization of the United Nations (FAO) and the Pan American Health Organization (PAHO), undernourishment in children under five years of age is less than 2.5%.[8] This result is due to the child care programs promoted by the government and international entities, which include: free access to health programs with a comprehensive approach, disease control through vaccination, the fortification of highly consumed foods, and the distribution of supplements for the prevention of malnutrition and anemia in pregnant women and children.[9]

Despite the application of these strategies, childhood malnutrition continues to be reported in several provinces and regions of the country, related to incorrect nutritional practices, health problems and social conditions linked to the economic embargo , the crisis generated by the Covid-19 pandemic and the high and persistent inflation that the country has been experiencing for several years.[10–12]

This situation greatly makes access to quality food and diversification of the diet of many Cuban families impossible, and produces serious alterations in nutrition and health. In the group of people affected by this situation; Children behave as the most vulnerable population to get sick, develop infection and even die due to immune compromise secondary to poor nutrition.[4,11]

The San Miguel del Padrón Pediatric Teaching Hospital, in the analysis of hospital morbidity and mortality, has identified malnutrition as a risk factor for prolonged stay, unsatisfactory clinical evolution, sepsis and infant death. The research team, as a prior step to formulating policies to reduce child morbidity and mortality related to malnutrition, set the objective: to determine the prevalence and characterize pre-existing chronic malnutrition in children under 5 years of age.

Method

A prospective and cross-sectional descriptive observational study was carried out in children from one month to five years old diagnosed with chronic malnutrition at the San Miguel del Padrón Pediatric Teaching Hospital (Havana, Cuba) in the period 2020 - 2022.

This hospital institution is of second level of complexity, and is subordinate to the General Directorate of Health of Havana. It is located east of the capital, and serves the municipalities of San Miguel del Padrón, Regla, Cotorro, Guanabacoa; and a part of the population of Habana del Este, which due to geographical proximity goes to the hospital. It consists of 200 beds on the ward and 12 beds for the care of seriously ill patients. It is equipped with technology and human capital for specialized and comprehensive care for patients from clinics, emergency services, hospitalization and intensive care; and is certified by the national directorate of hospitals and medical care of the Ministry of Public Health of Cuba for the care of patients from one month to 18 years with clinical and surgical pathologies, for having its own surgical unit and specialists for these purposes.

Procedure

The clinical records were reviewed by the researchers participating in the project. To avoid information bias, a data collection questionnaire was used that contained the variables under study. During the documentary scrutiny process, stories that did not meet the previously established selection criteria were removed. The information obtained from the medical records was deposited in a database prepared in Excel, and the data was analyzed with the statistical package SPSS version 22.

The univariate analysis was performed using descriptive statistics, determining absolute and relative frequencies in the categorical variables.

Weight and height were evaluated in all children in the first 24 hours of admission, and a survey was completed with the data under analysis. In children under two years of age, weight (Kg) was determined using a plate scale, and in children over two years of age, a SECA double counterweight Roman scale (Homburg, Germany) was used. To measure height (cm), the Frankfurt plane was used with the infantometer (under two years of age) and the stadiometer (over two years of age), and the body mass index (BMI) was calculated (kg/m²).

For the nutritional evaluation of children between one month and two years, the weight-for-height index (P/T) was used, and in those over two years old, the (BMI) for age (BMI/E) and height was used. for age (T/E) between zero and five years.

The anthropometric figures and BMI obtained were located in the growth curves for Cuban children, described in the manual of Comprehensive Care of Children and Adolescents,[13] establishing two criteria: low height/age (height < -2 SD) and low severe stature (< -3 SD).

The universe was made up of 248 children, and the sample was made up of 247 cases that met the selection criteria.

Inclusion criteria: child from one month to five years old with a diagnosis of chronic malnutrition according to the percentile tables, whose father gave consent for inclusion in the study.

Exclusion criteria: refusal to be included in the study, children admitted to the intensive care unit, patients with incomplete recording of anthropometric data or with inconsistent data.

The variables under study were: intensity of malnutrition (mild, moderate, severe), mother's age (less than 20 years/over 20 years), educational level (secondary, high school, university), couple relationship (mother single, stable union, married), family relationship (functional/dysfunctional), occupation (housewife, student, worker), family per capita (adequate/low), age and sex of the child, birth weight (normal/low) , continuation of exclusive breastfeeding in the first semester of life (less than three months, four to six months and more than six months), dietary supplementation (correct/incorrect), laboratory alteration (low hemoglobin value and albumin) and cause of admission.

Secondary education was considered: completed basic secondary school, upper secondary: normal high school, technical high school or higher normal studies, and university education: bachelor's degrees, postgraduate degrees or other forms of higher education.

Low family per capita: economic income of less than a thousand pesos per family member.

Low birth weight: child weighing less than 2500 grams at birth.

The classification of supplementation was done according to the Nutrition Guides for Cuban children up to two years of age,[9] and considered two categories: correct supplementation: gradual process of introducing semi-solid foods after the sixth month, maintaining breastfeeding, with preventive use of iron and vitamins.

Incorrect supplementation: introduction of foods other than breast milk before the sixth month of life, non-use of iron and vitamin supplements for the prevention of anemia after the sixth month.

Anemia: decrease in the hemoglobin value for age and sex (minimum admissible value 10.9 g/dl): slight (10.0 to 10.9 g/dl), moderate (between 7.0 and 9.9 g/dl) and severe (value less than 7.0 g/dl).[9]

To calculate the prevalence of chronic malnutrition, the total population treated in the hospital during the period 2020 - 2022 (11,685 patients) was used, and the universe of malnourished children (247), using the formula:

$$\text{Prevalence} = \frac{\text{Total malnourished children}}{\text{Total population served}} \times 100$$

To classify chronic malnutrition according to intensity, the classification offered by Waterlow was used, which proposes determining the proportion of the child's height in relation to the expected height for age (% height for age in 50th percentile. This classification allows detecting chronic malnutrition with linear growth alteration (wasting), and establishes three categories: mild malnutrition (90 - 94%), moderate malnutrition (85 - 89%) and severe malnutrition (< 85%).

Table 2 Socio-demographic characteristics of the family

$$\text{Percentage of malnutrition} = \frac{\text{Actual height (cm)}}{\text{Size (cm) P50 for age}} \times 100$$

The results regarding the anthropometric evaluations and patient data were recorded in a database created in Excel and worked with computational methods. The unit of measurement used to treat the variables was the absolute number and the percentage.

Results

The prevalence of chronic malnutrition in the hospital during the study period was 2.11%. Of the 247 patients included in the study, 78.14% (n=193) had mild malnutrition, 19.03% (n=47) moderate malnutrition and 2.83% (n=7) severe malnutrition (Table 1).

Table 1 Intensity of malnutrition

Intensity of malnutrition	No.	%
Mild	193	78.14
Moderate	47	19.03
Severe	7	2.83
Total	247	100

Source: Clinical history.

58.30% (n=144) were children of mothers under 20 years of age, 49.39% (n=122) of high school education and 37.25% of single mothers (n=92). The housewife category and family dysfunction occurred in 46.56% (n=115) and 63.56% (n=157) respectively. Low per capita was present in 73.68% (n=182) of the families (Table 2).

	Variable intensity of malnutrition			
	Mild n=193 (%)	Moderate n=47(%)	Severe n=7 (%)	Total n=247 (%)
Mother's age (years)				
Under 20	103 (41.70)	37 (14.98)	4 (1.62)	144 (58.30)
More than 20	90 (36.43)	10 (4.05)	3 (1.21)	103 (41.70)
Educational level				
Secondary	65 (26.31)	18 (7.29)	3 (1.21)	86 (34.82)
Upper secondary	99 (40.08)	21 (8.50)	2 (0.81)	122 (49.39)
University	29 (11.74)	8 (3.24)	2 (0.81)	39 (15.79)
Couple relationship				
Single mother	70 (28.34)	19 (7.69)	3 (1.21)	92 (37.25)
Stable union	52 (21.05)	15 (6.07)	3 (1.21)	70 (28.34)
Married	71 (28.74)	13 (5.26)	1 (0.40)	85 (34.41)
Family relationship				
Dysfunctional	124 (50.20)	29 (11.74)	4 (1.62)	157 (63.56)
Functional	69 (27.93)	18 (7.29)	3 (1.21)	90 (36.44)
Maternal occupation				
Housewife	80 (32.39)	33 (13.36)	2 (0.81)	115 (46.56)
Student	39 (15.79)	10 (4.05)	1 (0.40)	50 (20.24)
Worker	74 (29.96)	4 (1.62)	4 (1.62)	82 (33.20)
Per capita family				
Adequate	32 (12.95)	28 (11.34)	5 (2.02)	65 (26.32)
Low	161 (65.18)	19 (7.69)	2 (0.81)	182 (73.68)

Source: Survey.

The study of the general characteristics of the children revealed that 48.58% (n=120) were between one and two years old. The average age was 18 months ± 1.2 months (one to five years). 55.06% (n=136) were male, and 85.83% (n=212) had normal weight at birth. There was early abandonment of exclusive breastfeeding before the third month of life in 65.99% (n=163). Diet supplementation was incorrect in 83.81% (n=207). In the laboratory alterations, low hemoglobin and albumin values occurred in 52.88% (n=101) and 41.88% (n=80) of the patients (Table 3).

Table 3 General characteristics of the patients

	Variable intensity of malnutrition			
	Mild n=193 (%)	Moderate n=47(%)	Severe n=7 (%)	Total n=247 (%)
Age (years)				
Minor 1	27 (10.93)	21 (8.50)	–	48 (19.43)
From 1 to 2	98 (39.68)	20 (8.09)	2 (0.81)	120 (48.58)
From 3 to 5	68 (27.53)	6 (2.43)	5 (2.02)	79 (31.98)
Sex				
Male	102 (41.29)	29 (11.74)	5 (2.02)	136 (55.06)
Female	91 (36.84)	18 (7.29)	2 (0.81)	111 (44.94)
Birth weight				
Low	27 (10.93)	6 (2.43)	2 (0.81)	35 (14.17)
Normal	166 (67.21)	41 (16.60)	5 (2.02)	212 (85.83)
Permanence of EBF (months)				
Less than 3	128 (51.82)	30 (12.14)	5 (2.02)	163 (65.99)
From 4 to 6	46 (18.62)	12 (4.86)	1 (0.40)	59 (23.89)
More than 6	19 (7.69)	5 (2.02)	1 (0.40)	25 (10.12)
Diet supplementation				
Correct	21 (8.50)	19 (7.69)	–	40 (16.19)
Incorrect	172 (69.64)	28 (11.34)	7 (2.83)	207 (83.81)
Laboratory alteration (n=191)				
Low hemoglobin value	61 (31.94)	33 (17.28)	7 (3.66)	101 (52.88)
Low albumin	44 (23.04)	29 (15.18)	7 (3.66)	80 (41.88)

Source: Clinical history.

When analyzing the intensity of the anemia (according to hemoglobin value), it was known that 67.33% of the patients who suffered from it (68/101) had moderate intensity, a condition that was observed mainly in children under one year of age, with neglect early breastfeeding and male sex.

95.14 % (n=235) of the children admitted to the hospital were due to acute infectious pathology. 34.01% (n=84) corresponded to acute febrile syndrome and 14.98% (n=37) to bronchiolitis (Table 4).

Table 4 Distribution of patients according to causes of admission

Causes of admission	No.	%
Acute febrile syndrome	84	34.01
Acute otitis media	15	6.07
Bronchiolitis	37	14.98
Pneumonia	29	11.74
Mouth-hand-foot syndrome	8	3.24
Urinary infection	9	3.64
Acute diarrheal illness	6	2.43
Meningoencephalitis	3	1.21
Dengue	21	8.5
Skin and soft tissue infection	6	2.43
Covid-19	17	6.88
Glomerular and tubulo-interstitial disease	3	1.21
Chronic pathology (n=9)		
Neurological	2	0.81
Respiratory	1	0.4
Cardiovascular	6	2.43
Total	247	100

Source: clinical history.

Discussion

The great variability in the prevalence of chronic childhood malnutrition described between countries and regions worldwide is due to the heterogeneity of the measurement instruments applied in the evaluation of patients,[4] and differences in the quality of social programs and health that operate within nations.[5,14]

In Cuba, publications on prevalence studies of child malnutrition in children under five years of age are scarce. The published series frequently have few patients, and correspond mostly to local studies carried out in health areas; which makes it difficult to establish a real prevalence for this age group between regions and institutions in the country.

In the study we present, the prevalence value of chronic malnutrition (2.11%) coincides with the 2023 FAO/PAHO report that documented less than 2.5% of undernourishment in Cuban children under 5 years of age.[1]

In Colombia, Marrugo-Fernández et al.[15] in 2022 reported a frequency of global malnutrition close to 2%, with 36% of children at risk of global malnutrition, related to food deprivation, sanitation problems, and low income.

In contrast, Alulema Moncayo et al.[16] in a study published in 2023, they found an incidence of chronic malnutrition of 20.3%, related to difficulty accessing health services [RR: 4.87; 95% CI: 1.89-12.55], and abandonment of breastfeeding before the sixth month [RR: 3.44, 95% CI: 2.14-5.55]. Hodgson et al.[17] in an investigation carried out in 9 Latin American hospitals, they reported 12.2% prevalence of

chronic childhood malnutrition and 15.6% risk of malnutrition in Cuban children under five years of age, related to situations in the family environment, diseases and conditions, medical in patients.

In the research presented, mild chronic malnutrition predominated. A result that coincides with a study carried out in Ecuador in 2022, in a sample of 157 infants between zero and six months in which this type of malnutrition predominated, related to abandonment of breastfeeding, working mothers and mothers from rural origins.[18]

Currently, numerous authors describe the reversible nature of malnutrition depending on the measures adopted and their quality.[4,6,10,19] For this reason, it is important to investigate vulnerable groups and impose preventive-curative treatment at all levels of health care.

In Cuba, the diagnosis and management of child malnutrition is part of the comprehensive health actions carried out by obstetricians, family medicine doctors and pediatricians of the Maternal and Child Care Program.[13] The active search for this condition in pregnant women and in the pediatric population in general allows early identification of patients at risk and adoption of specific measures for their correction;[9,13] reasons that could explain the predominance of mild chronic malnutrition observed in the study.

age and low educational level of the mother are risk factors described in the literature for poor nutritional status in the child.[6,11,15,20] In the study presented, more than half of the mothers were under 20 years old. Similar results were found by Guerra Domínguez et al.[21] in a study published in Bayamo in 2018, where 47.4% of the mothers were under 20 years old. Sharma et al.[22] In an investigation carried out with malnourished children under five years of age, they concluded that educating mothers on nutrition and vitamin intake can influence the nutritional status and prevention of malnutrition in children. Alulema et al.[16] in Ecuador and Marrugo-Fernández[15] in Colombia found a relationship between malnutrition and lower maternal age and low education.

Reviewed publications report that family education with emphasis on the mother represents a favorable opportunity for the adoption of appropriate feeding practices because it enables the empowerment of knowledge that is later expressed in decisions in favor of breastfeeding, general care and feeding. effective; and above all, in the timely recognition of nutrition and childhood problems.[11,14,19]

As a trend, children of adolescent mothers have a greater risk of low birth weight, delayed physical and emotional development, malnutrition and sudden death; and in couples where both parents are young, cases of physical abuse and neglect in their care are reported.[11,14,15] Hence, pregnancies at early ages are considered a risk condition; and are part of the permanent strategies of the health sector to modify the rates of malnutrition in children in several countries.[14,15]

The predominance of young mothers in children with malnutrition in the study presented was previously noted in other published series,[14,15] and reflects deficiencies in the control of reproductive risk; problem that must be addressed with effective intersectoral measures, focused on the characteristics of the population of each territory.

Other social determinants described in the literature as risk factors for child malnutrition are: the couple relationship and family dysfunction.[14,23–25] In this study, single mothers did not have significant differences in relation to other forms of couple relationships and family dysfunction occurred in 63.56% of children with malnutrition. Result that coincides with the report of Boah et al.[26] who described an association between malnutrition and family dysfunction, with an increase in malnourished people in families where women do not have autonomy and freedom to make independent decisions regarding the care and feeding of their children.

Currently, single mothers and family dysfunction are linked to problems in meeting general child care, fundamentally those related to breastfeeding, access to foods of high nutritional value, and protection of the child against illnesses and injuries. intentional.[11,14,15,24]

The existence of these circumstances in children in the study implies failures in the control of reproductive risk, and evidence that to correct child malnutrition it is necessary to strengthen the community work of doctors and the local government with adolescents.

In our study there was a slight predominance of the housewife mother over the rest of the forms of maternal occupation. Sánchez Hidalgo et al.[10] in a study carried out in Granma reports that the absence of a work relationship increases the probability of children presenting nutritional deficit eight times (OR 8.3810; p: 0.0000). In contrast, Luzingu et al.[27] in the Congo report that children of working mothers are at greater risk of malnutrition.

In relation to family per capita, Latin American studies describe that low economic income limits access to food, means to produce or buy it; access to drinking water and quality health services; poor sanitary and child care conditions; lack of access to education; incorrect dietary practices; and emotional factors that end in social maladjustment and frustration.[14,15]

Barrera-Dussán et al.[28] in a study carried out in Colombia in 254 children under five years of age demonstrated an association between chronic malnutrition and low economic income (p=0.004; RP=1.96 CI: 95% 1.22 - 3.15). Albuja-Echeverría et al.[24] in Ecuador and Shahid et al.[29] in Pakistan detailed the inverse relationship between household per capita and chronic childhood malnutrition, and explained that low economic resources limit the purchase of food, and with it, the adequate nutrition of household members.

In our research, low family per capita occurred in more than half of the cases; and produced mostly mild malnutrition. This situation denotes the need to include these families in the social programs that the government has for vulnerable groups; and also, facilitate access to dietary supplements for the nutritional recovery of children in food insecure conditions.

The predominance of infants between one and two years old, observed in the study, coincides with previous reports.[22] Fernández-Martínez et al.[11] in a national study carried out in the province of Artemisa, they reported 41.67% of malnourished children between one and two years of age, mostly of mild intensity.

In the Congo, research conducted by Lazingu et al.,[27] in which four provinces of the country participated and 3911 children aged between zero and 59 months, found that the mother's lack of education, employment status and the size of the child at birth are significant factors for malnutrition in the group from zero to 59 months.

The high percentage of malnourished children between one and two years old observed in our research could be an expression of the persistence of nutritional disorders of the intrauterine stage that are perpetuated during postnatal life as a result of intercurrences due to infectious diseases and inappropriate cultural feeding practices. (Early abandonment of breastfeeding, incorrect supplementation and non-use of nutritional supplements), factors already described in other Cuban and international research[9,10,30] as inducers of low weight, malnutrition and anemia in infants and children at an early age.

The literature indicates that the period from one to two years of age is critical for child growth and development due to situations such as the cessation of breastfeeding, the inclusion of the child in the family diet, the increase in energy expenditure due to the beginning of ambulation, and the accelerated growth rate, the high incidence of infectious diseases (digestive and respiratory) due to contact with fomites and the child's tendency to put objects in the mouth and the depletion of intrinsic reserves.[9,19,25]

The results obtained, in addition to denoting gaps in the health care process in the prenatal period and during the first two years of life, expose a serious health problem for this population group, given that the malnourished and anemic children described in the study had infections as the predominant cause of admission; and in ten of them, all under two years of age, there was a long hospital stay and unfavorable clinical results. Other authors also describe this behavior in the literature[17,20] and it should be included in the hospital's lines of research, and in institutional prevention and control actions to reduce infant morbidity and mortality.

Another risk factor associated with malnutrition is sex.[2] Previous works describe variability in the prevalence of chronic malnutrition with predominance in men.[19,24] In the study we present, there was a predominance of men, a result that coincides with the report of other authors.[10,19] Boah M et al.[26] described male predominance. Albuja Echeverría et al.[24] in a research carried out in Ecuador, they reported that men have a 3.1% probability of malnutrition compared to women. Luzingu et al.[27] in the Congo did not find differences regarding sex. In contrast, Alulema et al.[16] in Ecuador found 55.8% of women.

The predominance of malnutrition in male children in our research could be explained by the preponderance that infectious diseases have on this gender without a well-clarified cause, many of which establish synergism with malnutrition, and cause it to progress towards serious and fatal forms.

It should be noted that in the study, infections were the most cited cause as a reason for admission in both sexes, and that its link with malnutrition is described as a factor of poor prognosis and infant death. Hence, the importance of including children at nutritional risk in the sector's strategic lines.

Regarding birth weight, the results found coincide with the study carried out by Fernández-Martínez et al.[11] which describes a predominance of malnourished children with good birth weight. In contrast, Guerra-Domínguez et al.[21] in a study carried out in 2018 in the province of Granma, they found 71.1% of malnourished children with a history of low birth weight.

In relation to the permanence of breastfeeding in the first semester of life, 65.99% of the children in the study did not receive it after the third month. This erroneous practice has been pointed out as a risk factor for chronic malnutrition in previous publications.[31]

Alulema Moncayo et al.[16] described 50.0% of chronic malnutrition in children with early abandonment of breastfeeding. Fernández-Martínez et al.[11] described 51.6% of malnourished children who abandoned breastfeeding before the third month.

Although the research did not consider the causes of breastfeeding abandonment in the variables under study, it was collaterally known that the quality of specific prenatal counseling was not adequate. An aspect that must be addressed promptly in the sector's strategic lines to reverse the increase in child malnutrition observed in the study.

Reviewed publications report that breastfeeding has nutritional, immunological and stimulating advantages that make it superior to other milks used in infant feeding.[31-33] In the research presented, breastfeeding abandonment before the third month of life was present in 65.99%. A similar finding was found by Alulema Moncayo et al.[16] in Quito (Ecuador) in 2022. Fernández-Martínez et al.[11] in Mayabeque (Cuba) and Tuquerez et al.[18] in Ecuador described an inverse relationship between duration of breastfeeding and child malnutrition. Alulema et al.[16] in Ecuador, described 50% of malnourished children under five years of age due to abandonment of exclusive breastfeeding; condition that behaved as a high risk factor (almost three times more likely to experience chronic malnutrition compared to children who were exclusively breastfed [RR: 2.7; 95% CI: 1.23-5.91]; (P=0.012).

The immunological advantages of human milk include: the presence of antibodies. Lactoferrin, live cells and cellular products that prevent colonization of the upper respiratory tract by pathogenic bacteria and produce passive protection against respiratory syncytial virus (RSV), influenza virus. Coronavirus, group B streptococcus, pneumococcus, Haemophilus influenzae and others that explain the low frequency of infectious diseases and anemia in breast-fed children.[32,33]

studies on malnutrition and eating habits in Cuban children document that the permanence of breastfeeding is inversely proportional to the frequency and magnitude of malnutrition and anemia.[9,10,26] and that its continued use during the first semester of life is key to neurocognitive development and good nutritional status.[10,32,33] Behavior that was observed in the study carried out, and suggests management gaps in infant feeding that must be addressed with promotional activities on an individual and collective scale, both in primary care and in the hospital.

It has been proven that exclusive breastfeeding during the first semester of a child's life offers protection against diseases and provides nutrients for proper growth and development.[32–34] However, many women deprive their children of breastfeeding and offer artificial formulas or begin abrupt supplementation without considering the child's degree of gastrointestinal maturity; which produces intolerance, losses due to diarrhea and emaciation.[10] Currently, experts recommend starting supplementation after the sixth month of life because breastfeeding has demonstrated sufficiency to meet the energy and nutrient demands required by the first semester of extrauterine life; and above all, because it protects against infections.[18,35]

In our study, supplementation was incorrect in 83.81% of the children, a result that coincides with other investigations that describe iron deficiency anemia and malnutrition in children due to inadequate breastfeeding and feeding practices.[9,10]

The high number of children with chronic malnutrition and laboratory alterations described in the study reflects deficiencies in the quality of nutritional advice and care processes offered to the family; problem that must be faced with health promotion and prevention at the community level, and by analyzing as a whole the social condition, access to high-calorie foods and nutritional education regarding the preparation of healthy meals and the use of dietary supplements.

It is documented that the mother's preparation before childbirth determines successful performance in child care (continuation of exclusive breastfeeding, adequate supplementation, use of trace elements) and lower frequency of diseases in children.[4,5,10]

Roy et al.[36] in India and Luzingu et al.[27] in the Democratic Republic of the Congo described that the mother's low level of education is a risk factor for malnutrition in children. Information that reinforces the importance of working on nutritional education of the mother in the pre-conception period and pregnancy, as a vehicle to achieve positive expectations in relation to breastfeeding and general care of the child.

In the research presented, mild chronic malnutrition predominated in children who abandoned breastfeeding before the third month, a result that coincides with a study carried out in Ecuador in 2022, in a sample of 157 infants between zero and six months in the that this type of malnutrition predominated, related to abandonment of breastfeeding, working mothers and rural origin.[18]

Currently, numerous authors describe the reversible nature of malnutrition depending on the measures adopted and their quality. Hence the importance of research in vulnerable groups, knowledge of its causes, and the imposition of preventive-curative treatment at all levels of health care.[6,10,19]

In the study we present, the main causes of admission were: acute febrile syndrome and acute respiratory infections; mainly in children under two years of age with problems with breastfeeding and dietary supplementation; which coincides with the report of other authors.[11,15,37]

The high number of acute febrile syndrome as a cause of hospital admission is due to the fact that the hospital during the study period worked in the active investigation of febrile cases suspected of dengue and covid-19; and the majority of these turned out to be uncomplicated acute upper respiratory infections, and to a lesser extent bronchiolitis and pneumonia. All cases had a favorable clinical evolution, and there was no mortality.

In the series of 5366 malnourished children published by Hodgson et al.[17] In 2021 in nine Latin American hospitals, infections accounted for 11.6% of admissions (n=623) and generated 10.4% of malnutrition. Marrugo-Fernández et al.[15] in Colombia documented a relationship between infectious disease and childhood malnutrition, mainly respiratory and acute diarrheal malnutrition. Shahid et al.[29] in a study published in 2022 found a significant association between diarrhea and malnutrition, and documented that this infection in malnourished children from low-income families is a risk of mortality.

Guerra-Domínguez et al.[21] In a study carried out in Bayamo (Cuba) in 2018 with 76 malnourished children under 9 years of age, repeated acute infectious diseases were documented in 75.0%. Luna et al.[19] in Colombia described an association of malnutrition in children with recurrent diseases, mothers with deprivation of education, low economic income and nutritional alterations. Likewise, a systematic review that included nine studies from different countries documented the relationship between malnutrition and repeated infections (respiratory and diarrheal), and concluded that infection is a factor of great significance for mortality in malnourished children under one year of age, especially all, those with delays in the care process.[37]

The increased predisposition to infections during malnutrition is related to thymic atrophy, reduction of lymphoid tissue, and paracortical depletion of lymph nodes. This explains the susceptibility to sepsis due to Gram-negative germs, the afebrile response to infections, the predominance of gangrenous lesions over lesions with suppuration, and the tendency to spread infections and the high morbidity and mortality of malnourished children.[38]

Immunological studies in malnourished children report that this condition produces loss of the integrity of anatomical barriers (skin and mucous membranes) and alterations in cell-mediated defense functions, leukocyte activity and phagocytosis. This is due to compromises in the proportion of cytotoxic and suppressive T8 cells, the absolute number of peripheral rosette-forming lymphocytes, and skin hypersensitivity; fundamentally, in patients with severe forms of malnutrition.[38]

Similarly, a slowing of the chemotactic migration of neutrophils, intracellular alterations for the destruction of bacteria and fungi, a reduction in the activity of serum complement at the expense of C3 and a decrease in the concentration of nasal IgA in saliva and tears are described, which produces changes in mucosal immunity and explains the greater predisposition to infections in malnourished children.[38]

The high vulnerability to infections and the danger to life that malnutrition entails in young children in the current epidemiological context, makes it necessary to promptly address this problem. Its reversal is an ethical obligation for healthcare workers at all levels of care that cannot wait. For this reason, it must be included in the priorities of the health sector, and in the work guidelines of territorial governments.

Conclusion

The majority of malnourished children presented nutritional limitation due to situations linked to family dysfunction, low income, and deprivation of exclusive breastfeeding and supplementation errors, conditions that can be preventable or modifiable with health education programs.

Limitations of the study

The type of research (retrospective descriptive observational) and the sample size, limitations that can be resolved with prospective research with greater representativeness, and in which relationships between the variables associated with malnutrition are evaluated.

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Authors' contribution

José Antonio Díaz Colina: conceptualization, project administration, data curation, formal analysis, methodology, research, drafting and final version of the manuscript.

Mirelis Díaz Colina: conceptualization, data curation, formal analysis, research, statistical analysis, validation, visualization, writing - original draft.

All authors reviewed the manuscript, agree to be fully accountable for ensuring the integrity and accuracy of the work, and read and approved the final manuscript.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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