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Malnutrition and its association with intellectual coefficient in children from a school in Seville de oro. Province of Azuay, Ecuador, 2023

Desnutrición y su asociación con coeficiente intelectual en escolares del cantón Sevilla de oro. Provincia del Azuay, Ecuador, 2023

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ABSTRACT

Introduction: in Ecuador, malnutrition is considered a public health problem because it affects approximately one out of every four children. This figure increases in the Inter-Andean region since it is influenced by the socioeconomic situation or the diet, causing problems in cognitive development as it compromises one´s intelligence quotient.
Objective: determine malnutrition and its association with intelligence quotient in 6-to-10-year-old schoolchildren from two rural schools in Sevilla de Oro Canton in Azuay Province, Ecuador.
Methodology: this was an observational, analytic, cross-sectional study. One hundred and nineteen 6-to-10-year-old children were used as a sample, the children being selected via stratified random sampling. The parameters of the World Health Organization for weight and size were used, which determined the body mass index for its location in the respective percentile. To assess the intelligence quotient, Kaufman Brief Intelligence Test (K-BIT) was applied.
Results: 7,6 % of the population under study had malnutrition, 63,9 % of which were below average as regards the intelligence quotient. The statistical association test was square chi, with a P value of 0,856.
Conclusions: No statistically significant association existed between malnutrition and an intelligence quotient below average.

Keywords: Child Development; Malnutrition; Intelligence Quotient.

RESUMEN

Introducción: en Ecuador la desnutrición se considera como un problema de salud pública ya que afecta aproximadamente a uno de cada cuatro niños. Esta cifra aumenta en la región Interandina, ya que está influenciada por la situación socioeconómica o la alimentación, provocando problemas en el desarrollo cognitivo por compromiso de su coeficiente intelectual.
Objetivo: determinar la desnutrición y su asociación con el coeficiente intelectual en escolares de 6 a 10 años de dos escuelas rurales del cantón Sevilla de Oro en la provincia del Azuay, Ecuador.
Metodología: estudio observacional, analítico de corte transversal. Como muestra se utilizaron 119 niños de 6 a 10 años, seleccionados mediante muestreo aleatorio estratificado. Se usaron los parámetros de la organización mundial de la salud para peso y talla que determinaron el índice de masa corporal para la ubicación en el percentil correspondiente. Para evaluar el coeficiente intelectual se aplicó el test Breve de Inteligencia de Kaufman (K-BIT).
Resultados: el 7,6 % de la población en estudio presentó desnutrición, de los cuales el 63,9 % se ubicaban

por debajo del promedio en el coeficiente intelectual. La prueba de asociación estadística que se usó fue chi cuadrado, con un valor P de 0,856.
Conclusiones: no hubo una asociación estadísticamente significativa entre la desnutrición y el coeficiente intelectual por debajo del promedio.

Palabras clave: Desarrollo Infantil; Desnutrición; Coeficiente Intelectual.

INTRODUCTION

One of the essential stages in the process of development of individuals is childhood since the physical and mental growth of children distinguishes it. Keeping their nutritional condition is part of good health; however, some factors can condition its adequate management. It is for that reason that the term malnutrition is used when there are disorders related to lack or deficit of nutrients, understood as malnutrition or excessive calories, understood as overweight.[1]

Deficiencies in development, growth retardation conditions, malnutrition and short height for the age of the child, including essential impacts on health, productivity and good development of the child, inadequate dietetic intake, lack of education of parents and the socioeconomic situation can be predominant factors for an increase in the risk of malnutrition in schoolchildren.[2]

The United Nations International Children´s Emergency Fund (UNICEF) assesses the nutritional condition of children at the world level, and it indicates that one out of every four children suffers from malnutrition.[3] On the other hand, in Latin America, child malnutrition exceeds 10 % of prevalence, so it poses a public health problem, particularly in indigenous populations that do not have the same equality conditions as the other population.[4]

According to the 2012 National Health and Nutrition Survey (ENSANUT), there is 15 % of malnutrition in Ecuador, discriminating between height retardation, other types of malnutrition, preschool, school age and teenagers, as well as between provinces, where there is 35,1 % in Chimborazo Province, followed by Bolivar with 31,5 %, Cañar 23,8 % and Azuay 22,4 %.[5] Conversely, in 2018, ENSANUT data are not altogether specific, and they show figures for chronic malnutrition ranging from 14,6 % to 15,8 %.[6]

Child growth is genetically established, from their conception in their mother´s belly and throughout their lives, by environmental factors they interact with. This is why optimal nutrition during the first 1,000 days is vital to achieving excellent development and health in the long term; some of the consequences of inadequate diet are deficient neural development and the risk of suffering from non-transmissible diseases in adult life.[7]

One of the adverse effects of malnutrition is at the cognitive level, which can be known by measuring the intelligence quotient (IQ). Said figure expresses the relative intelligence of a person as compared with similar values in other individuals of the same mental age, using standardized tests according to their sociocultural level. The American Academy of Pediatrics (AAP) explains that the normal IQ levels for a child range from 90 to 110 points; however, in underdeveloped countries, it is considered to be up to 80 points when the points of these values fall below the standard, their possible causes should be investigated.[8]

Researchers from several countries have been laying out projects to know about the consequences of malnutrition for school children, so in a study carried out in Jambi City – Indonesia –, it was found that having low points in their intelligence quotient (IQ) is one of the effects of malnutrition in children.[9]

In Mocha Canton, Tungurahua Province – Ecuador, the nutritional condition of schoolchildren was assessed to determine their intelligence quotient (IQ), and a relation was found where underweight and undersized rates with low IQ predominate in the rural area.[10] However, in Azuay Province, no studies assessing malnutrition together with the IQ of students have been conducted, so it is deemed important to analyze these variables in a specific canton in Azuay.

This study aims to determine malnutrition and its association with intelligence quotient in 6-to-10-year-old schoolchildren from two rural schools in Sevilla de Oro Canton in Ecuador.

METHODOLOGY

An observational, analytical, cross-sectional study was conducted at Sevilla de Oro Educational Units and Las Palmas Educational Unit, belonging to Sevilla de Oro Canton in Azuay Province. The total universe of this research was 161 children being 6 to 10 years old, and the sample was made up of 152 children chosen via stratified random sampling.

The intelligence quotient was considered a dependent variable affected by the nutritional condition, which is our independent variable, and we have included intervening variables such as age and sex.

The results were obtained via the online form Kobotoolbox, where the sociodemographic data card was placed with the weight-size measurements. Afterwards, the physical form containing graphical questions from

Kaufman Brief Intelligence Test (K-BIT) was filled out.

The BMI was calculated based on the anthropometric measurements (weight and size), and the nutritional condition was dichotomized as malnourished and non-malnourished. This value was related to the ranges (very low, low, low medium, medium) of intelligence quotient (IQ), which in like manner were dichotomized as: below average and on average.

During this piece of research, population selection biases may have occurred since the urban areas were not taken into account as the chosen schools are predominantly rural, the schools were chosen at random but not randomly, taking into account the size of the larger schools; besides, at the time of selecting the individuals, we had negations by 33 children, having the informed consent of the parents and/or tutors of those who participated in the study.

The principles of medical ethics and those aspects established in the Declaration of Helsinki were complied with.

RESULTS

It was observed that 49,6 % were of the female sex and 50,4 % of the male sex, with the predominance of the latter (table 1).

Table 1. Description of the population by sex. Sevilla de Oro Canton, Azuay Province, Ecuador, 2023

SEX	N	N
Female	59	49,6
Male	60	50,4
Total	119	100

There was the predominance of children being 6 and 8 years old, accounting for 26,1 %, followed by 9-year-old children (25,2 %) (table 2).

Table 2. Description of the population by age

AGE	N	%
6 years old	31	26,1
7 years old	22	18,5
8 years old	31	26,1
9 years old	30	25,2
10 years old	5	4,2
Total	119	100

Non-malnourished children predominated and accounted for 92,4 % (table 3).

Table 3. Description of the population by malnutrition condition. Cuenca 2023

Nutritional Status	N	%
Malnourished	9	7,6
Not malnourished	110	92,4
Total	119	100

There was the predominance of children whose intelligence quotient was below average, accounting for 63,9 % of the sample (table 4).

Out of the children below the IQ average, 7,9 % were also malnourished; out of those falling into the acceptable IQ average, only 7 % were underweight (table 5).

Table 4. Description of the population by average Intelligence Quotient (IQ), Cuenca 2023

IQ	N	%
Below average	76	63,9
Above Average	43	36,1
Total	119	100

Table 5. Relation between intelligence quotient and nutritional condition

Variable	IQ		OR	CI95%	p value
	Below average N (%)	On average N (%)			
Nutritional Status					
Malnourished	6 (7,9 %)	3 (7 %)	1,143	0,271 – 4,820	0,856
Not malnourished	70 (92,1 %)	40 (93 %)			

DISCUSSION

The anthropometric weight and size indicators to assess the nutritional condition of this population are not significantly related to the intelligence quotient (IQ), a fact that is similar to a study conducted by Akubuilo et al.[11] where they worked with a sample composed of 1,122 schoolchildren being 6 to 12 years old, with a prevalence of malnutrition accounting for 7,7 % and the assessment of their IQ via the Raven Test in which only 7,5 % had a suboptimal IQ, which translates into a p value of 0,4, indicating that there is no statistical significance.

However, contrary to the results presented above, in 2013, a study was carried out in four countries in Southeast Asian, where the association between anthropometric indicators and IQ was analyzed. The sample was made up of 6,746 children being 6 to 12 years old, where 21 % of the schoolchildren were underweight and growth retarded, which translated into low scores on the intelligence test, pointing to a relative risk (OR) of 3.53.[12]

On the other hand, a piece of research conducted in Giza City, Egypt, with 51 students as old as those in this study concluded that a low nutritional condition and low intellectual development are attributed not only to nutritional factors but also to sociodemographic circumstances, so no significant association was found.[13]

Likewise, in Nigeria City, 384 5-to-12-year-old students from public schools in that place were analyzed. 5,7 % out of them were seriously malnourished, and 19,4 % out of them had low IQ scores; however, more variables such as diet were analyzed, and they showed a weak correlation, concluding that the anthropometric data including BMI (weight/size) had no significant effect on the IQ of the malnourished infants.[14]

Finally, a piece of research carried out in Ecuador in 2014 assessed the same variables as this study, where it was verified that 6.4% of the total sample was below the percentile; likewise, about the IQ, most schoolchildren had a medium range (51,1 %) followed by a low medium IQ (19,1 %) and low (14,6 %). This research showed that underweight and growth retardation predominated in the rural area, where the IQ was estimated to be significantly lower compared to the urban population, which differs from this study, where there was no correlation between the two variables.[15]

CONCLUSIONS

Ecuador is considered a country with a population with different malnutrition degrees, mainly in rural areas. The consequences of this public health problem are not habitually recognized, so malnutrition was anticipated to be related to low intelligence quotient in schoolchildren; however, in this population, there was no statistically significant association between malnutrition and an intelligence quotient below average. Despite the above, this piece of research helped us know the reality of rural communities, so it is necessary to suggest to the academic authorities of the educational units that they should devise feeding strategies and cognitive assessments in conjunction with the parents of the students.

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CONSENT

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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