

Original Articles

Nutritional State of Mexican Children Younger Than Five Years from Mennonite Community, Mestiza Population of Urban and the Rural Areas from Durango, Mexico

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Abstract

Introduction: Malnutrition is a public health problem in children younger than five years in developing countries. The diagnosis and monitoring of the nutritional conditions of children constitute a practical form of evaluating health conditions. **Objectives:** To determine the nutritional state of children younger than five years in three communities and to know if there are ethnic differences among these children. **Methods:** The indicators weight/age; height/age; and weight/height were determined. An analysis of Kruskal-Wallis variance was carried out. **Results:** The Mennonites had the highest percentage of overweight/obesity. The rural children were eutrophic and with lower percentage of malnutrition. The urban children showed a higher percentage of malnutrition based on the indicators of weight/age. **Conclusion:** Differences with respect to access to food and ignorance on correct diet, are factors that have led to insufficient, incorrect, and disordered food nutrients that entail excess and disequilibrium in the diet reflected in the nutritional alterations found in this study.

Key words

Children under five; Mennonites; Nutritional state; Rural and urban children

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Introduction

The nutritional state of a population is one of the most sensible variables of social and economic development. Food and nutrition are essential for complete human growth and development potential and so, indispensable instrument for engendering good quality of life. The diagnosis and monitoring of the nutritional conditions of children constitute practical and sensible forms of evaluating health conditions and tendencies.^{1,2}

Malnutrition generally implies poor nutrition and refers to all deviations from an adequate and optimum nutritional state in babies, children, and adults. In children, malnutrition is manifested by inadequate weight, and growth delay (low size) while in severely malnourished children, symptoms and signs characterising the conditions known as kwashiorkor, marasmus or marasmic kwashiorkor are seen.^{3,4}

Approximately, 39% of pre-school children in the world suffer from some grade of malnutrition.^{5,6}

In Mexico, acute malnutrition in less than five-year old children, defined as the ratio of weight/height below -2 standard deviation in accordance with international norm, ceased to be a national public health problem; chronic malnutrition in the same age group continued to be a very important problem.⁷⁻⁹ In the rural population, the prevalence (27.5%) is the double of the urban zones.¹⁰

In accordance with the indicator height for the age, malnutrition affects 50.9% of the children from non-indigenous communities, 50.5% in communities with the presence of indigenous people, and 73.6% in communities totally indigenous. Deficient height for the age is consistently correlated to the accumulative effect of chronic malnutrition.¹¹

Reyes et al carried out a transversal study of height and weight of 11454 children from 6-14 years old in Oaxaca rural indigenes and found that 23% of the boys and 21% of the girls have variation in height and weight.¹² In rural area, the highest risk for growth delay is associated to the paternal occupation, such as agriculture, and the presence of family chains for the care of the child. The most protective effect against this is exclusive care of the child by the mother. In urban area, growth delay risk factors are linked to a father with unstable work, the presence of small social chains, the low rate of assistance to programs of healthy child, and breast feeding for more than six months. In both groups, there are two variables within the family characteristic dimensions such as duration of parents' togetherness and rural-urban migration.¹³

Nutritional deficiency occurs significantly at school age and by their characteristics, chronic malnutrition could be considered as the most frequent, and this problem has brought about alterations in the height of the children. Half of the school children are affected and this is notably higher in girls, perhaps, due to cultural conditions where boys are privileged for more food than girls.¹⁴

The prevalence of delay in height by chronic malnourished in Latin America fluctuated between 16.5% and 56.7%. According to national nutrition survey in our country, the prevalence of delay in height by chronic malnourished is 23% in less than five-year old children, whereby in Mexico it is considered a severe nutritional impairment and is the principal growth and development delay problem.^{15,16}

In developed societies, many studies have shown an increasing number of children with overweight while in developing countries the magnitude of the problem has remained unknown.¹⁷

The Durango Mexico state, consists of three ethnic groups: the indigenous group (Tepehuanos), the mestizo group (mixed Spanish and indigenous) and the Caucasian group (Mennonites, which are families who arrived in Nuevo Ideal Durango, Mexico in 1924 coming from Saskatchewan Canada, and originating in the Netherlands and Switzerland dedicated to agriculture and livestock).¹⁸

In Mexico, malnutrition, overweight and obesity have continued to be a public health problem. For these, it is of paramount importance to know the nutritional state of children less than five years of age from ethnic groups such as Mennonites communities of Nuevo Ideal municipal government area of Durango and its rural zones (indigenous) as well as the mixed populations (mestizo) of Durango Mexico. These populations share the same geographical characteristics of northern Mexico however, without the same cultural characteristics, nutritional habits and customs, or political rules. Presently, Mennonites community has gradually been incorporating to the society and semi-urban area although they still conserve their cultural identity and customs of the caucasian population. The objectives of the present research were to determine the nutritional state of less than five-year old children in the aforementioned three communities and to know if there are differences among them.

Materials and Methods

Observational, transversal, prospective, and comparative

study. The study was approved by the ethic and research committee of Durango General Hospital (SSA). A sample size of 219 children was calculated in accordance with the prevalence of malnutrition in Durango state.

A total of 590 children (306 males and 284 females) of less than five years old were recruited for the study.

The sample and recruiting of children who participated in the study, was conducted with children recruited from households selected randomly of three Populations of Durango states, Mexico, with the following inclusion criteria: rural population (lower class, dominated related economic activities the transformation of natural resources in unprocessed primary products (agriculture, livestock, beekeeping, hunting and fishing), urban population (people living in urban areas and have economic industrial activities and services). Mennonite population (people from Canada Saskatchewan originating in the Netherlands and Switzerland dedicated to agriculture and livestock). The list of addresses of households in the study populations were obtained from the list of the 2014 census conducted by the National Institute of Statistics and Geography (INEGI) in the state of Durango.¹⁹

230 children of them belong to low socio-economic class and were mainly from rural part of Nuevo Ideal municipal government area, 241 were from the urban zone of the north-east of Durango City, and 119 were caucasian Mennonites from Nuevo Ideal municipal government area participated in the study.

Compilation of the clinic record of each child based on clinic history and anthropometric measurement of weight and height was carried out. A technical card was designed with specification of the following data: progressive number, date, complete name, gender, age, body weight, and height. The collaboration of chronological age was done by checking the registry of date of birth of each child. The age was recorded in years and months.

The anthropometric measurements of weight and height were obtained in the following form: the measurements were done with the least possible clothes on and without foot wears. The body weight was obtained using a portable scale, Master Craft® brand and the result was registered in grams (gr). For the height, a wooden infantometer with metric tape, First Infinity, and with a length of 150 centimeters was used. The measurement was taken in firm position without objects on the head. The results were expressed in centimeters (cm).

The nutritional indicators used were as follows: a) weight for the age, b) height for the age and c) weight for the height. Mexican Official Norm, Nom 008-SSA2-1993 score was

employed for this purpose.²⁰

a) Weight for the age. The patients were classified in the following categories:

Weight/age indicator	Standard deviation in relation median
Obesity:	+ 2 to + 3
Overweight:	+ 1 to + 1.99
Normal weight:	more or less than 1
Mild malnutrition:	- 1 to - 1.99
Moderate malnutrition:	- 2 to - 2.99
Severe malnutrition:	- 3 and less

b) Height in relation with age. The children were classified in 5 categories In accordance with these criteria:

Height/age indicator	Standard deviation in relation median
Tall:	+2 to +3
Slightly tall:	+1 to -1.99
Normal height:	more or less than 1
Slightly short:	-1 to -1.99
Short:	-2 and more

c) Weight in relation with height. The children were classified in the following categories in accordance with these criteria:

Weight/height indicator	Standard deviation in relation median
Obesity:	+2 to +3
Overweight:	+1 to +1.99
Normal weight:	more or less than 1
Mild malnutrition:	-1 to -1.99
Moderate malnutrition:	-2 to -2.99
Severe malnutrition:	-3 and less

With the results obtained, a data base was elaborated for statistical analysis.

Statistical Analysis

Measurements of central tendency and dispersion were used. The proportions of nutritional indicators for each population were calculated. Finally, the proportions among the groups were compared using Kruskal-Wallis variance analysis.²¹

Results

The selected samples were 590 of less than five-year old children, 48.14% (284) of them were females and 51.86% (306) were males. The nutritional states of the

children from the three communities studied were distributed in the following way: malnutrition 193 (32.71%), eutrophic 215 (36.44%), and overweight and/or obesity 182 (30.85%). Comparisons of the nutritional states of the children of both sexes are presented in Figure 1 (indicator weight/age). The children from rural community had the highest percentage of eutrophic members (69.57%), and the least number of malnourished children (7.83%). Those from Mennonites community presented the highest number of overweight/obese children (38.66%) and the least number of eutrophic children (42.02%). The urban community children had the highest percentage of malnourished individuals (21.58%) but with the least number of children with overweight/obesity (20.33%). Significant statistical differences were found among the three communities with H of Kruskal-Wallis of 69.50, $P < 0.001$.

The rural community girls presented higher grade of malnutrition than the boys (4.78% vs 3.04%) and higher overweight/obesity (12.17% vs 10.44%). With regard to Mennonite girls, there was also a higher grade of malnutrition than the boys (11.76% vs 7.56%) however; the boys presented a higher percentage of overweight/obesity than the girls (21.01% vs 17.65%). The behaviour of this indicator was completely different in urban community with the boys registering a higher percentage of malnutrition than the girls (11.63% vs 9.95%) while a higher percentage of overweight/obesity was seen in girls (11.2% vs 9.13%) (Figure 2).

In Figure 3, the comparisons of the groups based on the indicator height/age are presented. It could be observed that Mennonite community presented a higher percentage in the relation height/age with slightly high and high that

correspond to 51.26% and only 6.72% of the boys had low or slightly low high. The highest percentage of boys with normal size (64.35%) was seen in the children of rural community. 15.65% of the children from this group had low or slightly low high which is more than the double of

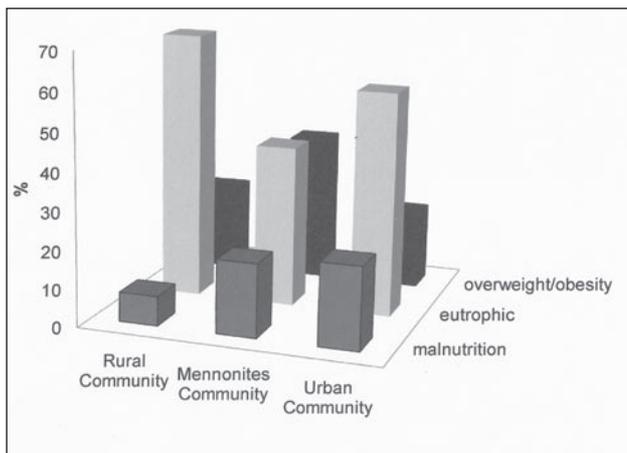


Figure 1 Nutritional states of the children from the three communities studied.

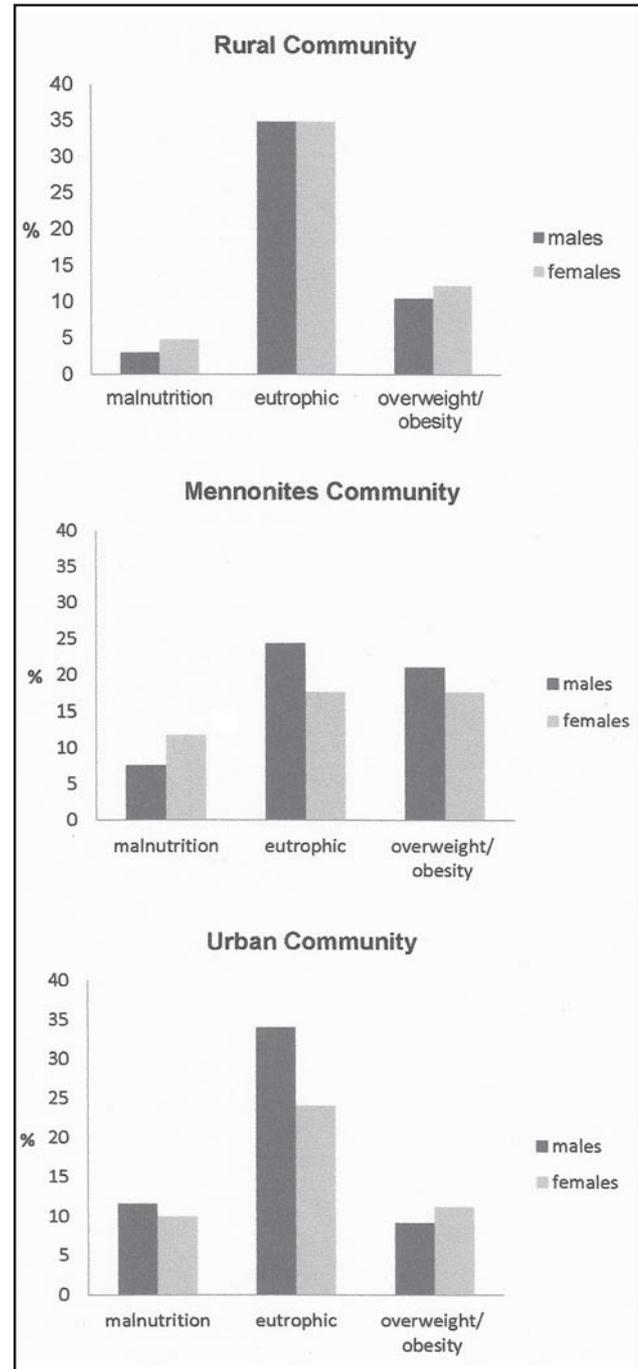


Figure 2 Distribution of nutritional status of children in the three communities based on the indicator weight / age and sex.

what were seen in Mennonite children, and only 20.00% were tall or slightly tall. With respect to children from urban community, it was observed that this group had the highest percentage of children with low or slightly low high (22.41%) and higher percentage of tall or slightly tall children when compared with rural community. On carrying out statistical analysis of the three communities with regard to the indicator height/age, a significant statistical difference ($P>0.001$) was found.

With regard to the indicator weight/height (Table 1), the children from Mennonite community had higher percentage (46.22%) of malnutrition when compared with rural community (26.95%) and urban community (31.53%). With respect to overweight/obesity, the community with the highest percentage is the rural community in spite of the fact that apparently there are differences in the distribution of nutritional state when weight/height is considered. No significant statistical difference ($P>0.05$) with this indicator.

Discussion

In accordance with the results obtained in the three communities of the state of Durango, Mexico, the difference in the nutritional state of children less than five years old is evident.

Given the diversity in the dates found in the nutritional state in this study, even when the majority of the percentages indicate a normal state (eutrophic) based on the indicator

weight/age, the children from the community of Mennonites presented a tendency of overweight/obesity while those from urban community showed a tendency of mild malnutrition.

An important percentage of the Mennonite population studied was found to be with malnutrition. Perhaps, these results only reflect, on one side, the use of the same group of food in their daily diet that consist of excess calories and low protein which is an important cultural aspect in this community; and lack of physical exercise (sedentary life) by the children of less than five years old from Nueva Ideal municipal government area, since the principal activity of this population is farming and livestock.

On the other part, the populations of the Mennonite and rural area, both of which are geographically located in the

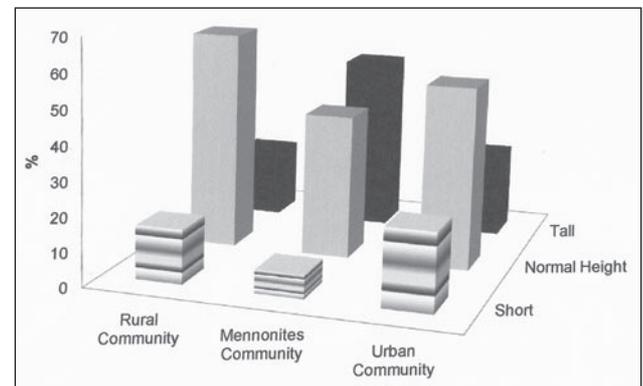


Figure 3 Comparison of the study groups according to indicator height / age.

Table 1 Nutritional status of children studied for weight / height indicator

State Nutrition	Rural Community			Mennonites Community			Urban Community		
	Fr	%	% Total	Fr	%	% Total	Fr	%	% Total
Malnutrition			26.95			46.22			31.53
Severe malnutrition	3	1.30		12	10.08		5	2.07	
Moderate malnutrition	13	5.65		16	13.44		13	5.39	
Mild malnutrition	46	20.0		27	22.68		58	24.07	
Eutrophic	83	36.09		35	29.41		97	40.25	
Overweight/Obesity			36.96			24.37			28.22
Overweight	57	24.79		10	8.40		46	19.09	
Obesity	28	12.17		19	15.97		22	9.13	
Total	230			119			241		

Fr= frequency; %=percentage; $P>0.05$

same municipal government but with different ideologies, habits, customs, and activities; the nutritional behaviour could be said to have certain similarities, because the tendency in both is towards overweight and obesity when the three indicators are considered. Contrary to expectation, urban community had a higher grade of malnutrition with respect to the other two communities.

This phenomenon is perhaps due to the population growth of cities is a global and progressive phenomenon. Over the past century, population growth has become an urban phenomenon linked to the less developed regions.²²

The areas of extreme poverty in urban areas, have emerged as a phenomenon resulting from social inequality; in these areas both marginalised populations of the cities themselves are concentrated as migrating from rural areas.²³

These people live with economic problems, overcrowding, family instability, unhealthy housing, children living in these areas are often in precarious situations, violence and insecurity. Because of the enormous poverty they cannot meet basic needs for nutrition, school services, and have access to medical services, which is reflected in their health.²⁴⁻²⁷

As has been documented in other countries of America, the nutritional status of children is an important indicator that reflects the inadequate food intake when basic needs are not met.²⁸

Our results agree with those reported by Hortensia Reyes-Morales et al studied the health needs of different urban areas in Mexico and report that 15.9% of children under 9 years are malnourished and also report overweight and obesity.²⁹

As to the predominance of eutrophic children in the rural communities found in this study and that there is a tendency towards overweight and obesity are in accordance with what were reported in previous studies in the literature where rural groups were included. This and all the other studies in the literature are pointing to the fact that there is urgent need for the development of strategies for the prevention of malnutrition, be it for excess or defect.^{1,2,30-32}

It is worthy to note that nutritional deficient is present in an important form in pre-school age and based on its characteristics, chronic malnutrition could be considered to be more frequent. This problem provokes alterations in the height of the children. Moreover, there are differences in terms of gender with regard to malnutrition where we could observe higher presence of malnutrition in girls from rural and Mennonite communities and this could be attributed to the cultural conditions privileging male nutrition reported in previous studies in Mexico.^{9,14,33}

Childhood obesity is epidemic in countries like Greece, USA, Mexico, Italy and New Zealand and is increasing in others; it is estimated that globally, 22 million children under five are overweight.^{34,35}

Mexico is among of the countries with the highest prevalence of overweight and obesity in children. It is estimated that the country between 10 and 20% of these conditions occur in childhood, 30 to 40% in adolescence and up to 60-70% in adults.^{36,37}

The etiology of overweight and obesity is multifactorial, one of the acquired factors that are most important are the birthplace and residence of the population, since it is known that the prevalence of this disease is higher in Western countries and this is closely linked to own eating habits of each country.³⁸

The genetic influence to be associated with external conditions such as dietary habits (diets high in fat, carbohydrates and low in fiber) and lifestyle (children and adolescents live sedentary, because for reasons of violence and insecurity prevailing in the country, have had to replace physical activities by electronic means), and the sociological structure, and the importance of culture and beliefs on attitudes towards health as preference for heavier children in some cultures, including African-American and Mexican-American in which mothers believe that an overweight child or obesity is a happy child, while a small child is considered in poor health, are factors that predispose people to develop this disease.³⁹⁻⁴⁶

These cultural reasons can explain our results that the rural population has a higher degree of overweight and obesity and our data are consistent with the results obtained by Jimenez-Cruz that found that low-income mothers from different regions of Mexico, have a high underestimation of overweight and obesity in children 6-24 months of age.⁴⁷

With regard to the indicator height/age, the community of Mennonites was taller. This could be explained based on genetic point of view since the ancestral origin of these people points to Canada from where they migrated to Mexico. Thus, they bore genetically tall root.⁴⁸

Despite the great advances made in Mexico in recent years, both malnutrition and obesity in childhood, are still important problems and need to make major education measures to solve them.

Conclusion

Perhaps, we are living in situations where differences in food access and ignorance of correct diet that contains the

required nutrients for the age still prevail. These are principally what have led to insufficient, incorrect and disordered consumption of food nutrients the result of which is excess or disequilibrium in the diet consumed all of which are reflected in the results obtained in this study.

In spite of the persistent efforts of the health, educational, and government authorities to improve the nutritional aspects of children less than five years of age in Durango state, the impacts projected in different nutritional programs that have continuously been under way have not been achieved for the fact the nutritional problems in the three population studied are still evident and extensive. This is surely due to inadequacy of these programs for this population sector for their lack of basic considerations of individual, cultural, and population differences. We suggestion that such programs should be based on investigations that should permit the right and adequate decision taking that is in accordance with the circumstances of the communities.

Declaration of Interest

The authors have no conflict of interests to declare.

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