



**Anthropometric measurements for the pediatric nutritional study in the volleyball team of the Panther Club of Guatemala**

**Mediciones antropométricas para el estudio nutricional pediátrico, en el equipo de voleibol del Club Panther de Guatemala**

**Mesures anthropométriques pour l'étude nutritionnelle pédiatrique, dans l'équipe de volleyball du Panther Club du Guatemala**

**Medidas antropométricas para o estudo nutricional pediátrico, na equipe de voleibol do Clube Panther da Guatemala**

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**ABSTRACT**

**Introduction:** Evaluating young athletes in stages of growth, development, and maturation is essential to understand and enhance children's physical capabilities in recreational and high-performance sports. **Objective:** to evaluate the nutritional status of the children's volleyball team

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members according to sex in the Panther Club of Guatemala. **Methods:** a descriptive cross-sectional investigation was carried out, and weight, height, and body mass index were evaluated to know the current nutritional status using the Z-score growth curves of the World Health Organization for children according to age. **Results:** 57.1% of the female sex had a normal nutritional status according to their body mass index for age and height for age. Among the males, those at risk of growth retardation according to their height for age predominated with 25% compared to 10.7% for females. 12.7% of males are underweight, while no cases occurred in females; 25% of males were obese compared to 10.7% of females; 12.5% of males are at risk of being underweight compared to 7.1% of females; 21.4% of females are overweight, unlike males, in which no case was reported. **Conclusions:** anthropometric indicators revealed a better nutritional status in women than men.

**Keywords:** Volleyball; Body mass index; Sport; Child nutritional status; Growth; Athletes.

## RESUMEN

**Introducción:** la evaluación de los atletas jóvenes que se encuentran en etapas de crecimiento, desarrollo y maduración es fundamental para entender y exponer las capacidades físicas de los niños en el deporte recreativo y de alto rendimiento. **Objetivo:** evaluar el estado nutricional de los integrantes del equipo de voleibol infantil según sexo, del Club Panther de Guatemala. **Métodos:** se realizó una investigación descriptiva de corte transversal y se evaluó el peso, talla e índice de masa corporal para saber el estado nutricional actual, por medio de las curvas de crecimiento de puntuación Z de la Organización Mundial de la Salud para niños según edad. **Resultados:** el 57.1% del sexo femenino tuvo un estado nutricional normal según su índice de masa corporal para la edad y talla para la edad. Dentro de los masculinos predominaron los que tienen riesgo de retardo de crecimiento según su talla para la edad con un 25% comparado con un 10.7% para las de sexo femenino. El 12.7% del sexo masculino presenta bajo peso mientras que no se presentó ningún caso en el sexo femenino; el 25% del sexo masculino presentó obesidad en comparación de un 10.7% dentro del sexo femenino; un 12.5% del sexo masculino presenta riesgo de bajo peso en comparación al 7.1% del sexo femenino; el 21.4% del sexo femenino se encuentra en sobrepeso, a diferencia del sexo masculino, en el que no se reportó ningún caso. **Conclusiones:** los indicadores antropométricos revelaron un mejor estado nutricional en el sexo femenino en comparación a los hombres.

**Palabras clave:** Voleibol; índice de masa corporal; Deporte; Estado nutricional infantil; Crecimiento; Atletas.

## RÉSUMÉ

**Introduction:** l'évaluation des jeunes athlètes en phase de croissance, de développement et de maturation est essentielle pour comprendre et améliorer les capacités physiques des enfants dans les sports récréatifs et de haut niveau. **Objectif:** évaluer l'état nutritionnel des membres de l'équipe de volley-ball des enfants selon le sexe, du Panther Club du Guatemala. **Méthodes:** une enquête descriptive transversale a été réalisée et le poids, la taille et l'indice de masse corporelle ont été

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évalués pour connaître l'état nutritionnel actuel, en utilisant les courbes de croissance du score Z de l'Organisation mondiale de la santé pour les enfants en fonction de l'âge. **Résultats:** 57,1% du sexe féminin avaient un état nutritionnel normal selon leur indice de masse corporelle pour l'âge et leur taille pour l'âge. Parmi les hommes, ceux à risque de retard de croissance selon leur taille pour l'âge prédominaient avec 25% contre 10,7% pour les femmes. 12,7 % des hommes souffrent d'insuffisance pondérale alors qu'aucun cas n'est survenu chez les femmes; 25 % des hommes étaient obèses, contre 10,7 % des femmes; 12,5 % des hommes risquent d'avoir un poids insuffisant contre 7,1 % des femmes; 21,4% des femmes sont en surpoids, contrairement aux hommes pour lesquels aucun cas n'a été signalé. **Conclusions:** les indicateurs anthropométriques ont révélé un meilleur état nutritionnel chez les femmes par rapport aux hommes.

**Mots clés:** Volley-ball; Índice de masse corporelle; Sport; État nutritionnel de l'enfant; Croissance; Athlètes.

## RESUMO

**Introdução:** A avaliação de atletas jovens em fases de crescimento, desenvolvimento e maturação é fundamental para entender e potencializar as capacidades físicas das crianças no esporte recreativo e de alto rendimento. **Objetivo:** Avaliar o estado nutricional dos membros da equipe de voleibol infantil por sexo, do Clube Panther da Guatemala. **Métodos:** Foi realizada uma pesquisa descritiva de coorte transversal e foram avaliados peso, altura e índice de massa corporal para determinar o estado nutricional atual, por meio das curvas de crescimento Escore Z da Organização Mundial da Saúde para crianças de acordo com a idade. **Resultados:** 57,1% do sexo feminino apresentou estado nutricional normal de acordo com seu índice de massa corporal para idade e, altura para idade. Entre o sexo masculino, predominaram aqueles com risco de atraso no crescimento de acordo com a altura para idade, com 25%, em comparação com 10,7% com o sexo feminino. 12,7% do sexo masculino apresentou baixo peso, enquanto nenhum caso foi relatado no sexo feminino; 25% do sexo masculino com obesidade, em comparação com 10,7% no sexo feminino; 12,5% do sexo masculino estava em risco de baixo peso, em comparação com 7,1% no sexo feminino; 21,4% do sexo feminino estava com sobrepeso, enquanto nenhum caso foi relatado no sexo masculino. **Conclusões:** Os indicadores antropométricos revelaram um melhor estado nutricional no sexo feminino em comparação com o masculino.

**Palavras-chave:** Voleibol; Índice de massa corporal; Esporte; Estado nutricional infantil; Crescimento; Atletas.

## INTRODUCTION

The students of the children's volleyball team of the Panther Club of Guatemala are in a primary stage of development during childhood. Added to this are the circumstances that each person faces in their sports training and they need a good diet for optimal development and growth and to have good sports performance. Derived from the above, there is a risk of poor sports performance due to

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a lack of calories, nutrients, and/or risk of dehydration. It is important to clarify that, in general, anywhere, children of this age in sports activities are exposed to similar circumstances.

The World Health Organization (WHO) recognizes malnutrition due to deficiencies and excesses in any person's caloric and nutrient intake.<sup>1</sup> A study prepared by the United Nations Children's Fund (UNICEF) in 2017 on boys and girls under five years of age concluded that in Latin America and the Caribbean, there was a prevalence of chronic malnutrition of 9.6% and 1.3% in acute malnutrition.<sup>2</sup>

Due to the multiple consequences of excess malnutrition on health, experts agree on the importance of studying the dietary intake of children and adolescents, as well as the amount of daily physical activity they practice, to be able to work on the planning and intervention of activities aimed at the prevention and treatment of this malnutrition that exists.<sup>3</sup>

Sports nutrition is the branch of nutrition that specializes in people who do sports. Athletes are guided, educated, and advised in a specific way by age, sport, energy, and fluid expenditure to know what, when, and why they should eat and drink certain foods and/or supplements.<sup>4</sup>

Sports nutrition is based on the principles of balanced nutrition during the day to overcome training difficulties and promote recovery.<sup>5</sup> According to the Los Condes Clinical Medical Journal, nutrition is relevant to sports performance.<sup>6</sup>

Sports nutrition aims to provide the appropriate amount of energy, provide nutrients to maintain and repair tissues and maintain and regulate the body's metabolism. The mainstay of macronutrients for athletes is carbohydrates; in most sports, the caloric expenditure is very high, so the contribution must be adjusted according to the training a week before the competition and the day of the competition. competition and recovery.<sup>7</sup>

It is well known that during training, there is a large expenditure of muscle glycogen and a significant loss of fluids; this depends on the conditioning and the physical training place (ventilation, air conditioning). Therefore, special attention should be paid to weight and height measurements along with the children's birth dates, as well as the hydration plan and the total calories to eat daily, particularly if they are athletes in their growth stage.<sup>8</sup>

One of the main causes of poor performance in athletes is dehydration, which occurs due to insufficient fluid intake during physical activity.<sup>9</sup> The importance of drinking water or liquids while doing a sport is because the body needs to maintain constant body temperature regulation to perform well. For this reason, any excess heat must be eliminated, so it is essential to maintain adequate hydration so that sweat evaporation is favored and heat dissipates during exercise.<sup>10</sup>

Anthropometric measurements are a technique that allows for analyzing body composition, offering an excellent indication of the nutritional status of the athlete. Weight and height measurements are important to verify the nutritional status of the athlete to evaluate the existence of an adequate

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state, a possible deficit, or overweight for better performance and recovery in sport and an optimal state of health.<sup>11,12</sup>

The fundamental purpose of this research is to evaluate the students' nutritional status, analyze their weight and height with respect to their sexes and ages, and determine whether their diet and lifestyle are appropriate for continuing with their training and promoting their recovery.

## METHOD

A cross-sectional descriptive observational research was carried out. The universe for this investigation was the children's volleyball team members of the Panther Club of Guatemala.

We had the Panther Club authorities' approval to conduct the study, and the children's parents were evaluated. Parents were informed about the objectives and importance of the research. The confidentiality of the results obtained was complied with, which were used by the researchers and for research purposes. The results are presented collectively and not individually.

To respond to the research's objective, the following variables were operationalized: age, sex, weight, height, and body mass index (BMI) to determine each team member's nutritional status.

To define the problem, a search was carried out in the existing literature related to the topic to be developed. To obtain the results, anthropometric measurements were carried out, evaluating weight and height to identify the body mass index and obtain the nutritional status of each team member using the growth curves of the World Health Organization (WHO).

Once the data were placed in the database, they were processed in the SPSS21 statistical program in Spanish. The results were presented in statistical tables with absolute and relative frequency distributions, all to facilitate communication and understanding of the results.

## RESULTS

It can be seen in Table 1 that, of the 36 members evaluated, the majority are female. Regarding the diagnosis of height for age, 86.1% of both sexes predominate with a normal nutritional diagnosis, that is, without growth retardation. Within the male sex, 25% were observed with a risk of growth retardation.

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Table. No 1 Diagnosis according to size for age and sex.

Size for age		Sex		Total
		Female	Male	
Normal	Count	25	6	31
	% within sex	89.3%	75.0%	86.1%
Risk of growth retardation	Count	3	2	5
	% within sex	10.7%	25.0%	13.9%
Total	Count	28	8	36
	% within sex	100%	100%	100%

It can be seen in Table 2 that ages 10-14 years predominate in just over half of the group studied. Regarding sex, the female predominates with 77.8% while the male represents 22.2%.

Table. No 2 Diagnosis according to height for age.

Age groups		Sex		Total
		Female	Male	
10-14	Count	16	5	21
	% of the total	44.4%	13.9%	58.3%
5-9	Count	eleven	3	14
	% of the total	30.6%	8.3%	38.9%
Under 5	Count	1	0	1
	% of the total	2.8%	0.0%	2.8%
Total	Count	28	8	36
	% of the total	77.8%	22.2%	100.0%

Note that in Table 3, 55.6% predominate with a normal nutritional status, followed by 16.7% for overweight, 13.9% for obesity, 8.3% for risk of underweight, and 2.8% for low weight and risk of overweight. Normal nutritional status predominated in both sexes, with 57.1% in females and 50% in males.

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Table No. 3. Diagnosis according to body mass index for age

BMI for age		Sex		Total
		Female	Male	
Underweight	Count	0	1	1
	% within Sex	0.0%	12.5%	2.8%
Normal	Count	16	4	20
	% within Sex	57.1%	50.0%	55.6%
Obesity	Count	3	2	5
	% within Sex	10.7%	25.0%	13.9%
Risk of underweight	Count	2	1	3
	% within Sex	7.1%	12.5%	8.3%
Risk of overweight	Count	1	0	1
	% within Sex	3.6%	0.0%	2.8%
Overweight	Count	6	0	6
	% within Sex	21.4%	0.0%	16.7%
Total	Count	28	8	36
	% within Sex	100.0%	100.0%	100.0%

## DISCUSSION

In child athletes, it is important to prioritize health to be able to project the abilities developed from an early age, creating good health over time and sporting longevity. The authors of this research propose measuring nutritional status to timely improve possible nutritional problems, whether due to deficiency or excess, which can help improve sports performance and athletes' general health. The indicators used are weight/age, height/age, weight/height, and BMI/age. These allow for the evaluation of malnutrition due to excess and deficiency. The World Health Organization recommends using the Z score in developing countries like Guatemala to obtain a more accurate value and be more precise when obtaining a nutritional diagnosis.<sup>1</sup> This is important to correct possible disorders in the infant belonging to the evaluated sports team.

According to the reference values in the Z score tables proposed by the World Health Organization,<sup>1</sup> just over half of the children in this research have a normal nutritional status. Furthermore, it can be observed that the biggest problem in the evaluated child population is malnutrition due to excess. This is data that agrees with the health and overweight situation in the country, which shows that the Guatemala area has a higher prevalence of overweight and obesity, with an increase of 11.7% from 2014 to 2019.<sup>13</sup> As part of the efforts to improve the nutritional status of children, health policies

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must be implemented that help educate both parents and children about nutritional and lifestyle issues.

It is worth mentioning that a more in-depth evaluation must be carried out on the students since more than half of the children have a normal nutritional status and are therefore suitable for a structured physical activity program without any impact on their nutritional status. However, low weight for height affects 2.8% of children, while overweight affects 16.7%, and obesity affects 13.9%. These are factors that must be considered when considering proposals for improvement since these nutritional problems affect students' performance.

When compared with a study carried out in Peru, children and adolescents are not exempt from this trend. According to the international definition of obesity in pediatric ages, it is estimated that at least 10% of school-age children in the world are overweight or obese. The highest prevalence is in America (32%), Europe (20%) and the Middle East (16%). Latin America has a rapid demographic transition. Its obesity rates have increased in the last 10-15 years, especially at school age. The main consequence of childhood obesity is its persistence into adulthood and the development of comorbidities. 60% of children who are overweight in the prepubertal period and 80% of those who are overweight in adolescence will be overweight in early adulthood.<sup>14</sup>

Anthropometric procedures have been sought to estimate the amount of adipose tissue indirectly. For the diagnosis of childhood obesity, age and sex must be considered since there are at least three critical periods for developing childhood obesity, such as fetal life, the period of rebound adiposity between the ages of 4 and 6 years (in which the body mass index, then the increase in childhood, followed by the reduction in values, which begins to increase again gradually) and the period of adolescence.<sup>14</sup>

Childhood malnutrition is understood as the imbalance between food intake and energy expenditure or basal nutrient requirements in children under 5 years of age. This imbalance may be due to a lack or excess in food consumption or, failing that, a low energy expenditure that reduces the basal requirement of calories and micronutrients.<sup>15</sup>

Currently, only malnutrition or a lack of micronutrients is emphasized in children under 5 years of age, leaving aside the problem of overweight and obesity in early childhood, which can, in some cases, occur together.<sup>16</sup> This topic is not widely studied from an epidemiological point of view, so it is necessary to analyze this double burden of child malnutrition to better focus on promotion and prevention policies in the country.

## CONCLUSION

Just over half of children have normal nutritional status as a result of an assessment of normal body mass index and height for age. The cases that were found with ranges outside the normal range were mostly overweight and obese, despite being part of the volleyball team and having weekly

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physical activity, which suggests the need to increase the frequency of physical activity within that period of time.

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## CONFLICTS OF INTEREST

No conflicts of interest are declared.

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Supervision: All authors  
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