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Low body weight in pacients with adolescent idiopathic scoliosis

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Abstract
Objective: Scoliosis is a three-dimensional deformity of the spine that leads the frontal plane to more than 10º. In adolescent idiopathic scoliosis (AIS), the cause of the condition is not known, and the search of the pathology source settings may involve the analysis of the nutritional status of patients. This study aimed to investigate the nutritional status of patients (AIS) compared to asymptomatic population in the age-matched group. Methods: A prospective, descriptive and comparative study with a sample of 60 subjects divided equally into two groups. The AIS group (n = 30) represented by holders of AIS and control group (n = 30) comprised healthy subjects of both sexes and groups with equivalent age. We analyzed age, gender, menarche, weight, height and BMI. Results: In terms of age: AIS Group: 14.3 ± 1.97 years; Control group: 14.23 ± 1.79 years. Regarding weight: Group AIS: 47.4 ± 13.8 kg; Control group: 55.6 ± 11.63 kg As for height: AIS Group:. 1.6 ± 0.1 m; Control group: 1.64 ± 0.08 m. As for BMI: AIS Group: 18.5 ± 3.7 kg / m2; Control group: 20.79 ± 2.92 kg / m2. Age and height did not achieve statistical difference when compared to the different AIS and control groups (p> 0.05). While statistically significant difference of body weight (p = 0.01) and BMI (p = 0.01) when comparing the AIS and control groups. Conclusion: Patients with AIS have a low body weight.

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Introduction

Scoliosis is a three-dimensional deformity of the spine that runs with thoracic spine or lumbar lateral curvature in a scale greater than 10 degrees in the front axial radiography [1]. The Adolescent Idiopathic Scoliosis (AIS) is the most common form among the different types of scoliosis, and it strikes patients between 10 and 16 years old [2]. Its prevalence ranges from 1% to 3% of the population [3-4]. Girls are more affected than boys in a ratio of about 4:1. [3]

The etiology of AIS is unclear. However, several theories may be involved in its origin: the standard deviation of growth, neuromuscular disorders or connective tissue, asymmetric growth of the limbs and trunk as well as environmental factors such as diet have been postulated. Recently it has been alerted to the genetic factors related to AIS genesis with the prevalence of 5.21% in first-degree relatives, and 4.54% in second-degree relatives, affected by the disease. [5-7]

Although these factors should be taken under consideration, it is known that AIS etiology is still not fully understood, and its discovery is a challenge for Medicine. Because of the increased knowledge about the disease process, it is possible to draw new and best diagnostic and therapeutic targets.

Thus, the search for the AIE etiology definition involves several investigations and it may also involve the nutritional status of patients with the disease. Such status was obtained by analyzing the clinical signs, food history, anthropometric and biochemical data that can be adopted to adequately analyze the status of different body cell components (body fat, skin, skeleton and muscles). [8]

It is known that anthropometry consists of a nutritional status analysis method which is easy to be applied and relatively sensitive in evaluating the isolated nutritional status of each patient [8]. The anthropometry uses variables such as weight, height, waist circumference, skinfold, among others, as analysis method. It is possible to calculate the Body Mass Index (BMI) by combining these measures. [8]

The BMI or Quelelet Index holds parameters to determine weight (kilograms) and height (meters), and their calculation is expressed by the formula kg/m2. Data is easily obtained due to the availability of equipment and good acceptance of patients. Because of its simple and accurate determination, BMI has become widely used in medical practice. [9-18]

Considering some previous researches linking low weight to the presence of AIS, [19-24] due to lack of studies in the national literature on the nutritional status of these patients and knowing that the nutrition status directly interferes in the post operative results, the present study aims to investigate the nutrition status of AIS carriers treated at Santa Casa de Misericórdia in Vitória (SCMHV) and in Vila Velha Hospital (VVH).

Materials and Methods

Prospective, descriptive and comparative design study, involving 60 participants equally distributed into two groups. The AIS group (n = 30) represented by AIS outpatients from SCMHV and from VVH who have previously undergone scoliotic deviation correction as surgical indication as recommended by the literature. The control group (n = 30) included healthy individuals randomly selected by lot, according to their number in the call list. The groups presented individuals from both genders in the same age group.

Patients in the AIS group were invited by phone to attend the SCMV for reading and signing the Informed Consent and to be informed about the data collection appointment. Attendance at SCMV and IC signing was done by the parents in the case of underage individuals.

Control group data collection was done by means of Authorization Request acceptance. The authorization sheet was sent to parents or guardians to appropriate approval and signature. After the consent was given, researchers returned to the institution to

document the required parameters. Age, gender, menarche, weight, height and BMI were analyzed in both groups and the results were documented in a specific format.

A scale with stadiometer (brand Brião model 125 M) was used to measure weight and height. Weight and height data were used to calculate BMI using the following formula: weight (kg) /height $(m)^2$.

Individual data (age, gender, menarche, weight, height and BMI) were descriptively analyzed by separately observing the AIS and the control groups, to feature each one of them.

A comparative analysis was used to compare BMI between the AIS and the control groups. The univariate statistical analysis through t Student unpaired test was applied to compare the averages found in similar situations, in different patients.

In order to do so, the Microsoft Office / Excel 2007 and the GraphPad Prism (San Diego, CA, USA) software were used. P values < 0.05 were considered to be statistically significant.

Results

Isolated analysis of different groups

The mean ± SD of age, weight, height and BMI isolated from the AIS and control groups are shown below:

- The age

AIS group: 14.3 ± 1.97 years old; Control group: 14.23 ± 1.79 years old

- The weight

AIS Group: 47.4 ± 13.8 kg; Control group: 55.6 ± 11.63 kg

- The height

AIS group: 1.6 ± 0.1 m; Control group: 1.64 ± 0.08 m

- The BMI

AIS group: 18.5 ± 3.7 kg/m2; Control group: 20.79 ± 2.92 kg/m2

Comparative analysis among different groups

The variables “age” and “height” did not show statistical difference when the different AIS and control groups were compared ($p > 0.05$), whereas statistically significant difference in body weight ($p = 0.01$) and BMI ($p = 0.01$) was found when the AIS and control groups were compared.

Discussion

The etiology of idiopathic adolescent scoliosis (AIS) remains unknown. Therefore, the continuous search for its origin is essential in order to prevent and intervene in its parameters to avoid the progression and modification of the entire chest and the aesthetic discomfort, the loss of quality of life, and other pathological alterations inherent to vertebral column deviations. [1]

There are several theories that seek to determine the origin of AIS; however, its precise origin is still unclear. There are studies in the literature correlating low weight and the development of spinal scoliosis. No studies in the Brazilian literature to assess these patients’ nutrition status and it results on doubts about the nutrition status of the herein studied patients were found.

The study was conducted in only one state in the country. It is believed that since the study assessed patients from different inpatient services, the sample can gives a brief idea about the nutrition profile in the rest of the country. However, it is worth emphasizing the need of carrying out new studies, preferably multicenter ones, in order to get a better sample of AIS patients in Brazil.

The present study was focused on performing a study similar to those found in the international literature. There was reduction in body mass of patients with adolescent idiopathic scoliosis (2). The results justify the conduction of the research in order to assess the herein studied patient’s nutrition status and to find the relationship between low weight (BMI ≤ 18.5 kg/m2) and adolescent idiopathic scoliosis.

Smith et al exposed eating disorders such as anorexia to justify AIS. The present study found no patient with anorexia. Sun X et al. and Qiu et al. have published studies related to low leptin EIA development levels, since this hormone regulates food due to its anorectic potential. [23]

Chi Y et al. were the only authors who directly investigated BMI in patients with scoliosis. They performed a descriptive study relating low weight and AIS, fact that is subject of great interest among physicians. Thus, the subject must be thoroughly investigated.

Several factors are related to the development of AIS. However, the core of its pathology would be linked to nutritional deficit among these patients and it is represented by their low weight (BMI ≤ 18.5 kg/m2).

BMI is widely used in healthcare as nutritional status parameter for patients in different research fronts. Its application enabled the good evaluation of patients and of the control group as well as the practical measurement and analysis of its parameters and its good acceptance by patients [9-18]. We used BMI as anthropometric parameter to assess the nutritional status of the herein patients and the control group.

The BMI analysis in the two groups ($p < 0.05$) showed variations in the height and weight of components and it enabled classifying the AIS group as low weight (≤ BMI 18.5 kg/m^2) and the control group as eutrophic (BMI 18.5 to 24.99 kg/m^2). Thus, it is suggested that low birth weight is related to adolescent idiopathic scoliosis.

The current study showed similar results to those found in other publications in which underweight (BMI ≤ 18.5 kg/m2) represents patients who have greater predisposition to AIS development. [19-24]

On the other hand, several authors have shown that decreased lung compliance in patients with spinal scoliosis leads to increased respiratory rate and therefore to higher energy expenditure. This fact may explain these patients' low weight; so underweight would not predispose scoliosis. However, the pulmonary changes that cause scoliosis would lead to increase in energy expenditure and consequently to low weight. Still there is no way to prove the correct theory, but it is possible saying that most AIS patients are underweight. These patients should undergo preoperative nutrition status analysis to reduce serious complications such as postoperative infections.

Conclusion

Patients with adolescent idiopathic scoliosis have a low body weight.

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