Paradox of Obesity in University Young People. True or False?

Abstract

Introduction: Obesity is a chronic disease of high prevalence in Mexico and in most countries of the world. It does not discriminate between ages and sex and its repercussions at the cardiovascular level are lethal.

Materials and Methods: Observational and correlational study in which 155 university students participated, with ages between 18 and 25 years of age. Sociodemographic, anthropometric and physiological data were collected. The participants were also given a Ruffier Dickson test for cardiovascular resistance.

Results: The 155 university students had an average age of 20 ± 2.93. The size was 1.61 ± 0.15 and the weight was 74.5 ± 11.94. Regarding body composition, participants had an abdominal perimeter of 90.77 ± 13.03 and a BMI of 28.59 ± 4.03; being overweight 70.9% (n=110) and obesity 29.1% (n=45). In contrast to the performance of the participants in the Ruffier Dickson test, 3.2% (n=5) had "very good" cardiovascular resistance, 29.6% (n=46) "good", 44.5% (n=69) "enough" and 22.5% (n=35) "bad".

Conclusion: The cardiovascular response in the study population was in great "good" average. However, no relationship was found between the body mass index, abdominal perimeter, waist/hip ratio versus cardiorespiratory capacity obtained by individuals with excess weight to corroborate the theory of the obesity paradox.

Keywords

Obesity; Body mass index; Risk factor; Cardiovascular

Introduction

Obesity is a chronic disease of high prevalence in Mexico and in most countries of the world, given its magnitude and the negative effect on the health of people who suffer from it [1]. Few chronic diseases have progressed so alarmingly in most countries during the last decades as it has happened with Obesity, a concern for health authorities due to the disastrous physical, mental and social consequences [2,3].

Data from the World Health Organization (WHO) indicate that obesity has more than doubled since 1980 in the world. In 2008, 1.5 billion adults were overweight. Within this group, more than 200 million men and nearly 300 million women were obese, for which WHO has declared obesity and overweight as a global epidemic [4]. Then, for 2016, more than 1,900 million adults over 18 years of age were overweight, of which more than 650 million were obese; More than 340 million children and adolescents from 5 to 19 years of age were overweight or obese [5]. On the other hand, cardiovascular diseases (CVD) are the leading cause of death worldwide, it is estimated that in 2015, 17.7 million people died from this cause, 31% of all deaths recorded in the world [6].

Obesity is associated with cardiovascular diseases due to the coexistence of risk factors such as dyslipidemia, hypertension, insulin resistance and diabetes mellitus; These factors are linked to an excess of adipose tissue. These metabolic characteristics are normally observed in patients with obesity, which can present as metabolic syndrome and this is related to the development of cardiovascular disease [7].

Once patients gain weight, it has been observed that there is a tendency to maintain and defend this new weight, through various biological and psychological mechanisms. It is postulated that in the initial stages, a series of factors (both behavioral and environmental) would be responsible for the development of obesity in those subjects with genetic predisposition, in whom changes are developed in the metabolism of adipose tissue, which tend to perpetuate the obesity condition and favor the development of many of the comorbidities associated with obesity such as cardiovascular disease (CVD) [2]. Other
Factors linked to the development of CVD in subjects with obesity are changes on neurohormonal activation, subclinical inflammation, insulin and leptin concentration, obstructive sleep apnea, among others [6,8].

In 2001, the theory of the “obesity paradox” was raised for the first time [9]. This term indicates that there is a probability that high values of body mass index (BMI) are associated proportionally with a better prognosis of clinical evolution in CVD. In other words, the paradox refers to the fact that people with excess weight who suffer from cardiovascular disease, such as heart failure (HF), would have a lower risk of death from cardiovascular diseases in the short and long term, than those with normal weight or overweight [10-12]. To justify this epidemiological paradox, different explanations have been pointed out, among others, that the greater weight is accompanied by greater metabolic reserve, which allows these patients to face with greater possibilities of survival acute decompensation of a chronic disease [13].

Otherwise, when talking about cardiorespiratory fitness, it refers to the capacity of the organism to resist fatigue through some physical activity that requires adenosine triphosphate (ATP), which is synthesized by aerobic metabolism; it also represents the level of physical condition that somebody can have [14,15].

Currently there are many tests that can determine the aerobic and cardiovascular capacity of an individual. Some more known than others, but with great use in the clinical part. Among the best known are the 6-minute walk test, Cooper; Course Navette, Harvard, Queens College, Ruffier Dickson, among others.

The Ruffier Dickson test [16], it is one of the most used tests to determine the capacity of cardiovascular resistance and recovery after an effort. This test consists of performing 30 free squats in a maximum time of 45 seconds and the cardiac pulse is determined before the test, at rest, just at the end of the test and one minute after performing the squats.

Having said all of the above, this research proposes as a research question: Is the paradox of obesity in young university students in Mexico from the point of view of cardiovascular resistance true? In addition, the main objective is to determine the relationship between overweight and obesity versus cardiorespiratory status in university students in Mexico.

Materials and Methods

An observational and correlational study was carried out in which 155 university students participated (Men: 40% and women 60%), with ages between 18 and 25 years of age. The sample was selected for convenience, where the population of students of the Physical Therapy Degree of the City of Puebla, Mexico.

In addition, all participants were invited to the different areas of the educational institution to which the Physiotherapy Degree belongs, where they were explained the purpose of the research and of which they accepted to be an object. The methods for the preparation of the assessment tests and the use of the information were detailed to each of the students and applicators. The participants had to sign an informed consent, previously approved by the ethics and research committee of the institution, for the use and extension of the data.

We included apparently healthy subjects, of legal age, being active Physiotherapy students and having signed informed consent. Participants with heart rate >120 bpm at rest, systolic blood pressure (BP) >190 mmHg and diastolic blood pressure <89 mmHg, surgical history of cardiovascular type or acute myocardial infarction, and minors were excluded.

For the gathering of sociodemographic, anthropometric and physiological information, the application of a questionnaire was carried out. The sociodemographic variables were related to sex, age and semester. On the other hand, the physiological variables (heart rate, dyspnea and fatigue pre and post test) and anthropometric variables (weight, height, abdominal and hip circumference) were obtained by a previously calibrated Tezio TB-30037 digital scale. In the method, the weight and height of the students evaluated were calculated, placing the patient standing, with the head in Frankfort plane and with the shoulders relaxed to avoid lordosis. The abdominal perimeter was achieved by using a tape measure, with the patient standing and the figure was obtained at the point at the end of the exhalation.

The protocol of Ruffier Dickson [16], it consisted in doing 30 squats with a maximum time of 45 seconds at a speed of 1 squat per second or according to the participant’s capacity. The heart rate was taken manually before and after the test, as well as 1 minute after completion. The perceived dyspnea and fatigue were assessed using the modified Borg scale [17].

Results

This study counted with the participation of 155 students of Licentiate in Physiotherapy; 40% (62) men and 60% (93) women. The age range was 17 to 25 years old with an average of 20 ± 2.93. The average size was 1.61 ± 0.15 and the weight was 74.5 ± 11.94. Regarding body composition, participants had an abdominal perimeter of 90.77 ± 13.03 and a BMI of 28.59 ± 4.03; being overweight 70.9% (n=110) and obesity 29.1% (n=45) (Table 1).

Regarding the hemodynamic behavior of the participants compared to the Ruffier Dickson test, the subjects presented a pre-test heart rate of 82.0 ± 10.72 bpm (beats per minute), 134.5 ± 18.38 bpm post-test and 102.2 ± 18.66 bpm one minute after the end of the test. According to the subjective scale of effort, The Modified Borg scale, the participants showed pre-test values of 0.10 ± 0.63 (total rest) of fatigue and 0.1 ± 0.35 of dyspnea and post-test of 2.7 ± 2.23 and 2.4 ± 2.21 (mild effort) respectively; In contrast, women presented higher hemodynamic values compared to men, also for perceived effort versus exercise (Table 2).

According to the cuts proposed by Zhu et al., for the values of abdominal perimeter, men are at a higher risk of developing some disease of cardiovascular origin; 41.93% of men have a high probability of developing cardiovascular disorders, while in women 11.82% are likely to manifest some type of cardiogenic disorder.

In contrast to the performance of the participants in the Ruffier Dickson test, 3.2% (n=5) had “very good” cardiovascular resistance, 29.6% (n=46) “good”, 44.5% (n=69) “enough” and 22.5% (n=35) “bad”. Now, if we discriminate by greater abdominal perimeter and therefore, higher cardiovascular risk, the results in the Ruffier Dickson test was 0% (n=0) for a “very good” cardiovascular resistance, 12.9% (n=20) “good”, 16.1% (n=25) “enough” and 5.1% (n=8) “bad”.

In addition, the Pearson correlation coefficient was determined with p=0.05, which showed that for the purpose of our study there is no significant relationship between cardiovascular resistance and body mass index, abdominal perimeter and waist/hip ratio p= 0.000, 0.001, 0.004 respectively (Table 3).

On the other hand, in subjects with overweight and obesity there was a low significant moderate relation with a level of significance of 0.05 for the values of cardiac frequency pre, post and after 1 minute after the Ruffier Dickson test (Table 3).

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<thead>
<tr>
<th>Characteristics</th>
<th>M</th>
<th>W</th>
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<tbody>
<tr>
<td>Age (years)</td>
<td>20.02 ± 2.93</td>
<td>19.88 ± 1.48</td>
</tr>
<tr>
<td>Size (cm)</td>
<td>1.61 ± 0.15</td>
<td>1.67 ± 0.07</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>74.5 ± 11.94</td>
<td>79.85 ± 11.96</td>
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<tr>
<td>IMC</td>
<td>28.59 ± 4.03</td>
<td>28.25 ± 2.96</td>
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<tr>
<td>Abdomen (cm)</td>
<td>90.77 ± 13.03</td>
<td>94.12 ± 9.84</td>
</tr>
<tr>
<td>Hip (cm)</td>
<td>104.09 ± 9.37</td>
<td>103.76 ± 8.03</td>
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Table 1: Anthropometric characteristics (n=155)
which when compared to our study population, we found that the result for “poor” in the female sex was 30% and if compared with the male sex was 9.6%.

Conclusions
The cardiorespiratory response in the study population was in great “good” average. However, no relationship was found between the body mass index, abdominal perimeter, waist/hip ratio versus cardiorespiratory capacity obtained by individuals with excess weight to corroborate the theory of the obesity paradox. However, the present investigation was carried out 100% with population with excess weight, therefore, we suggest carrying out future studies comparing individuals with infra and normal weight versus excess weight.

References


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