

Body mass index and its relationship with body composition in a population of university students in the state of Mexico

Índice de masa corporal y su relación con la composición corporal en una población de estudiantes universitarios en el estado de México

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Abstract

This research was carried out with the objective of determining the association between excess weight and body composition in university students. It is an observational cross-sectional study in a public university of the State of Mexico; 64 students between 19 and 25 years old were included through a simple random sampling. Body composition was assessed based on Anthropometry with written acceptance. The results when analyzing the central obesity in the population showed that 57.81% are normal weight, 29.69% are overweight and 7.81% are obese. Also 50% of men between 20-25 years, have values ≥ 90 cm waist. In the case of women, the prevalence of a value above that recommended ≥ 80 cm was greater than 55% since the age of 19. This result indicates that most women are at greater risk from an early age. These preliminary results show how the university population reflects the high rates of overweight and obesity in Mexico. It is necessary to establish plans to prevent and reduce the prevalence of obesity and avoid its impact on chronic diseases in the future.

Anthropometry, BMI, Obesity

Resumen

La presente investigación se realizó con el objetivo de determinar la asociación entre el exceso de peso y la Composición Corporal en estudiantes universitarios. Es un estudio de corte transversal observacional en una universidad pública del Estado de México; se incluyeron 64 estudiantes entre 19 y 25 años a través de un muestreo aleatorio simple. Se realizó la valoración de la composición corporal con base en la Antropometría. Los resultados al analizar la obesidad central en la población mostraron que el 57.81% tiene peso normal, 29.69% tiene sobrepeso y el 7.81% tiene obesidad. También el 50% de los hombres entre 20-25 años, presentan valores ≥ 90 cm de cintura. En el caso de mujeres, la prevalencia fue un valor arriba del recomendado de ≥ 80 cm fue mayor al 55% desde los 19 años. Este resultado nos indica que la mayoría de las mujeres presentan un mayor riesgo desde una edad temprana. Estos resultados preliminares, muestran como la población universitaria es un reflejo de los altos índices de sobrepeso y obesidad en México; es necesario establecer planes para prevenir y disminuir la prevalencia de obesidad y evitar su repercusión en enfermedades crónicas en un futuro.

Antropometría, IMC, Obesidad

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Introduction

The Food and Agriculture Organization (FAO) of the United Nations, in its report *The State of Food Security and Nutrition in the World 2018*, warned that global obesity in adults is increasing, given that one in eight is obese, which is equivalent to 672 million people. In the case of Mexico, obesity in the population over 18 years of age increased to 3.8 million from 2012 to 2018 (Labatut, 2018).

In Mexico, the 2018 National Health and Nutrition Survey indicated that the combined percentage of overweight and obesity, considering the population over the age of 20, was 75.6% in women and 69.4% in men. According to it, overweight and obesity are defined as an excessive accumulation of fatty tissue that produces several health effects. Alarmingly, obesity has almost tripled worldwide from 1975 to 2018 (Rodríguez, López & Ortega, 2018).

For a long time, obesity was considered as a sign of good health and even as an index of economic and social well-being, but it is currently known to be a risk factor for the development of chronic diseases, such as cardiovascular diseases, hypertension and diabetes mellitus, among others. Addressing obesity in the educational and work environment could contribute to improving living conditions, because it is a public health problem that requires timely attention and multisectoral actions to improve prevention and control in the population.

However, this problem has been underestimated, not only in Mexico, due to its indirect effects. It is important to keep in mind that the highest proportion of weight gain occurs between the ages of 20 and 30, this is a particular risk period in which a timely diagnosis could help prevent the development of obesity. The prevalence of overweight and obesity among young people of both sexes should be considered as a multifactorial phenomenon associated with significant lifestyle changes. Inadequate food selection and less physical activity predispose the child and adolescent to suffer from diseases such as obesity, hypercholesterolemia and arterial hypertension which will directly affect their health, reducing the quantity and quality of years to live.

In a study on eating habits conducted by Juárez, Salazar & Soriano (2010), they found that healthy eating during youth will help reduce the risk of cardiovascular disease at any stage of life. The results obtained show that young people have information on how to make a healthy diet but do not specify it in their daily practices. Young people cover the need to feed for three reasons: according to their nutritional requirements, their economic budget, and the effect of advertising in different media, so it is important to take into account the influence that these factors exert.

Problem statement

Obesity and overweight are defined as an abnormal or excessive accumulation of fat that can be harmful to health. A simple way to measure obesity is the body mass index (BMI), this is the weight of a person in kilograms divided by the square of the height in meters. A person with a BMI equal to or greater than 30 is considered obese and with a BMI equal to or greater than 25 is considered overweight. Overweight and obesity are risk factors for numerous chronic diseases, including diabetes, cardiovascular diseases and cancer.

Central obesity is one of the types of obesity in which the greatest amount of fatty tissue is found in the abdominal or visceral part. The International Diabetes Federation (IDF) has established values for maximum waistline. The International Diabetes Federation (IDF) has established values for the maximum waist circumference recommended for different populations. (Kain, Olivares & Castillo, 2016). In Asian populations, a waist circumference greater than or equal to 90 cm in men, or greater than or equal to 80 cm in women, increases the risk of developing cardiovascular disease and type II diabetes, even when the BMI is not very high. Due to the lack of studies dedicated exclusively to the Mexican population, the IDF recommends using these same thresholds for the Mesoamerican population.

Objective:

1. Performing an anthropometric analysis for the association between excess weight and physical activity in university students.

2. Identifying if there is a risk that students acquire chronic degenerative diseases in the medium and long term.

Work hypothesis

Based on the above, we have the hypothesis that the student population, knowing its anthropometric dimensions and body mass indices, will have a greater disposition to change eating habits (López, Marín, & Alcalá, 2009). For the study, the following variables were considered:

- *Anthropometry*: Body measurements of weight, height and waist circumference
- *Physical activity*: In reference to the hours of the day they remain seated and the minutes per day they walk or run.
- *Body mass index*: It is the result of the weight ratio in kilograms between the square of height.
- *Overweight and obesity*: they are defined as an abnormal or excessive accumulation of fat that poses a health risk.

Justification of the Study

This paper focuses mainly on identifying the incidence of risk factors. The body mass index and waist circumference are two measurements that can be used as screening tools to estimate weight status in relation to the potential risk of disease. Waist circumference is considered another indicator to detect possible health risks related to fat accumulation. When a person has abdominal obesity, most of their body fat is in the waist, therefore, they are at greater risk of suffering chronic noncommunicable diseases, such as Type 2 Diabetes Mellitus, Hypertension, heart attacks, among others. The risk increases if the waist circumference measures more than 80 centimeters in women and more than 90 centimeters in the case of men; the form and level of impact and the obtention of a functional relationship to give alternative solutions in the situation posed, in addition to disease prevention, to establish a preventive culture.

The investigation allows to acquire knowledge in the study of dysergonomic risks, such as the possibility that a worker suffers damage derived from the execution of his work. It is recommended to measure waist circumference in adult patients who are overweight and obese to implement actions that can prevent the development of chronic degenerative diseases such as hypertension and diabetes (Cerhan et al, 2014).

The Waist-Hip Index (WHI), which in addition to indicating the tendency or personal predisposition to accumulate fat, affects the probability of suffering from heart diseases, diabetes or blood pressure problems, among others (Perreault, Sunyer, Seres & Kunins, 2018).

WHO defines overweight as a BMI equal to or greater than 25, and obesity as a BMI equal to or greater than 30. It is an index of adiposity and obesity, as it is directly related to the percentage of body fat (except in people with a lot of lean mass, such as athletes or bodybuilders).

The university population, from the nutritional point of view, are considered a particularly vulnerable group, susceptible to frequent omission of meals, the intake of food high in fat, carbohydrates and high alcohol consumption (Cruz et al., 2019). The OMS classification establishes ranges and levels of damage to the body, as can be seen in Table 1.

Classification of the body mass index according to OMS (2018)	
Risk	IMC
Low	<18.5
Normal	18.5-24.9
Overweight	25.0-29.9
Obesity	30
Obesity grade 1	≥30-34.9
Obesity grade 1	≥35-39.9
Obesity grade 1	≥40

Table 1 Body mass index
Own elaboration based on ONU, 2018

Methodology to develop

Descriptive cross-sectional research was conducted at a public University in the northern part of the State of Mexico, (UPEM), in the Industrial Engineering Degree with 6th and 8th Semester students.

Exclusion criteria

- Pregnancy
- Postpartum recovery and rest status
- Minor injuries to the lower limbs, due to an accident.
- Respiratory diseases (asthma)
- Problems in the spine

Sample size

The sample consisted of undergraduate university students between the ages of 19 and 25 from a public university in the State of Mexico. The sample was comprised of 64 students. This sample size calculation was performed taking into account a total population of 1500 students, with a significance level of 0.05 and a confidence level of 80%. For the selection of the sample, a simple random sampling was used.

Method of measurement

Initially, anthropometric variables were investigated and body composition assessment was performed. These measurements were carried out with light clothes and without shoes, all of them carried out in the laboratory of study of work of the university. A properly trained medical professional was responsible for collecting the information and making the measurements, (Labatut, 2018). The anthropometric measurements were taken with clothes adjusted to the body, but comfortable to avoid bias in the information., considering seven points of IZAK. Each one was measured by people of the same gender to protect their integrity.

Equipment used

- Precision was used with a pedestal stadiometer with an accuracy of one millimeter.
- Stopwatch
- IBM SPSS statistics 20
- Measuring tape
- Flexometer.
- BAME scale with a capacity of 140 kg.

Results

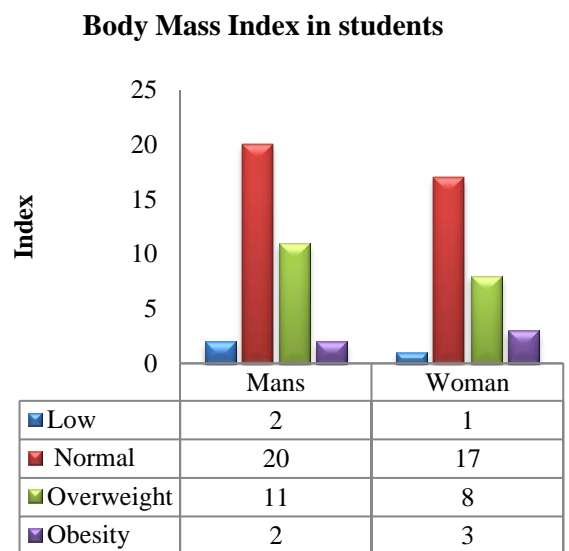
The data obtained in the study showed that 4.69% of students have low weight, 57.81% have normal weight, 29.69% are overweight and 7.81% are obese.

In the case of men between 20-26 years old, 50% have values greater than or equal to 90 cm at the waist. In the case of women, the prevalence of a value above that recommended (≥ 80 cm) was greater than 55% since the age of 19. In addition, the second highest data is overweight, which men have more incidence, while in obesity the incidence is higher in women, as shown in Table 2.

Classification Of The Body Mass Index By Classification OMSS (20018)						
Risk	Mens	%	Women	%	Total	%
Low	2	3.13	1	1.56	3	4.59
Normal	20	31.25	17	25.56	37	57.81
Overweight	11	17.19	8	12.5	19	29.69
Obesity	2	3.13	3	4.69	5	7.81
Obesity grade 1	2	3.13	3	4.69	5	7.81
Obesity grade 2						
Obesity grade 3						
Total	35	54.69	29	45.31	64	100

Table 2 Results of the Body Mass Index in students of UPEM
Own Elaboration

Graph 1 shows the way in which the BMI frequencies are distributed.



Graph1 Results of the Body Mass Index in students of UP
Own Elaboration

These preliminary results, carried out with the participation of students from the Public University of the State of Mexico, (UP), show how the university population is a reflection of the high rates of overweight and obesity in our country. Unfortunately, the average age of diagnosis for obesity is delayed, if we consider that the majority developed overweight much earlier. It would be important to continue working with the group of young adults to find preventive measures that reduce the high prevalence of overweight and obesity in Mexico (Arrivas, 2007).

Conclusions

The data obtained show that most of the students of the industrial engineering major possess an adequate weight; however, when verifying the anthropometric measurements at the waist, they exceed the acceptable ranges to be considered healthy. In the context of university students, there is a high availability of processed foods and beverages, with a high content of salt, sugars and refined fats, and a low availability of vitamins, minerals and fiber, along with a decrease in physical activity and low consumption of water due to the lack of availability or the preference for other drinks, favoring obesity.

Another relevant observation is that only 26% of overweight and obese people reported that they had already been diagnosed by medical personnel. Obesity is a disease that may not cause symptoms or discomfort in the person who suffers from it, but it considerably increases the likelihood of developing other diseases, so early diagnosis is vital.

An advantage of BMI and CC is that people themselves can track their weight and identify risks to their health. In addition to the above, the evidence also shows that coronary risk factors (hyperlipidemia, sedentary lifestyle, obesity and smoking) that promote atherosclerosis and coronary heart disease are increasing in adult life, which favors the chances of developing cardio-degenerative diseases (OPS, 2017).

Recommendations

In Mexico, it has been documented that in recent decades overweight and obesity in men is more frequent than in women and government policies and programs have been established to reduce and prevent overweight and obesity according to the different realities of the country, under a common and concerted vision, which generate changes in patterns of consumption regarding food, beverages and physical activity. As prevention measures, it is suggested to raise awareness among students and teachers through informative talks about the correct diet, specifically on the outstanding critical points in the analysis performed, and encourage physical activity with the support and supervision of doctors and nutritionists.

Among the limitations are the cross-sectional nature of the surveys, which although they do not allow establishing causality, they allow visualizing the magnitude and its behavior for the planning of adequate nutrition policies and programs in the immediate future. Although several efforts have been made to reverse the increase in overweight and obesity in Mexico, high rates are still observed (WHO, 2003).

Success depends on integrated actions between government and society, with the aim of guaranteeing spaces and laws which protect health and promote healthy lifestyles throughout the life cycle, in order to protect the future of generations against the onset of obesity and its consequences.

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