



(RESEARCH ARTICLE)



## Physical and nutritional activity as an intervention against obesity

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### Abstract

**Introduction:** Obesity and overweight are the most dominant chronic non-communicable pathologies of the century, causing metabolic diseases, such as Diabetes Mellitus and Arterial Hypertension. With WHO data indicating that since 1980 it has more than doubled worldwide, in 2008 1.5 billion adults were overweight, of this number 200 million men were obese and 300 million were obese women. Such is the impact that the WHO declared obesity and overweight as a worldwide epidemic. **Objective:** To identify the integral health status of university students by means of a clinical history, healthy and unhealthy lifestyles related to nutrition and physical activity. **Method:** We studied a population of 50 students, 19 males and 31 females, of different degrees of the Facultad de Estudios Superiores Iztacala, with overweight and obesity, and interested in improving their eating habits and lifestyles and are attended in the clinics of the disease prevention program (PROSALUD). **Results:** There was a statistical reduction in the average BMI and abdominal circumference, but no decrease in the percentage of body fat. **Conclusions:** Constancy in physical activity is a vital constant in weight reduction, along with diet, however described this in the literature that more time is required with this discipline to obtain statistical significance in the reduction of body fat, it is highly recommended the intervention plan used in the PROSALUD program to attend students with overweight and metabolic problems

**Keywords:** Obesity; Overweight; Stress; Feeding Habits; Exercise

### 1. Introduction

Overweight and obesity are the most dominant chronic non-communicable pathologies of the century, causing multiple metabolic diseases, the most predominant being Diabetes Mellitus and Arterial Hypertension. WHO measures overweight and obesity by calculating the Body Mass Index (BMI) and waist circumference [1]. The BMI is the one that is best associated with the percentage of fat. This in turn is associated with the risk of obesity, cardiovascular disorders, insulin resistance and arterial hypertension. This index is calculated by dividing the kilograms of weight by the square of the height in meters ( $BMI = \text{weight [kg]} / \text{height [m}^2\text{]}$ ) [2,3].

Information from the WHO tells us that since 1980 it has more than doubled worldwide, in 2008 1.5 billion adults were overweight, of these number 200 million men were obese and 300 million were obese women. Such is the impact that the WHO declared obesity and overweight as a worldwide epidemic [4].

In 2016, more than 1.9 billion adults aged 18 and over were overweight, of which more than 650 million were obese. With data from the Food and Agriculture Organization of the United Nations (FAO), in the Americas region, 58% of people live with overweight and obesity (360 million people), with Chile (63%), Mexico (64%) and Bahamas (69%) having the highest rates [5].

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It is estimated that the number of people suffering from diabetes in Latin America will increase by more than 50%, from 13.3 million in 2000 to 32.9 million by 2030. (5) In relation to childhood obesity, between 7% and 12% of children under 5 years of age and one fifth of adolescents are obese, while in adults the rates of overweight and obesity are close to 60% [4,5].

In Mexico, in 2018, the percentage of adults aged 20 years and older with overweight and obesity is 75.2% (39.1% overweight and 36.1% obese). (6-8) Three out of four people over 20 years of age suffer from obesity or overweight; Veracruz, Quintana Roo, Sonora, Tabasco and the State of Mexico have the highest rate of Overweight and Obesity. More than 10% of people over 20 years of age have a diagnosis of diabetes, while in 2012 it represented 9% [8-12].

In economic terms, obesity and overweight are a major burden on health budgets; it is estimated that obesity and overweight are responsible for 44% of the burden of diabetes, 23% of ischemic heart disease and between 7 and 41% of the burden of some cancers [12].

They are a major risk of death, with a mortality of about 3 million adults per year [10,12].

Obesity is considered a disease of multifactorial cause, where we can find genetic, environmental, metabolic and endocrinological factors, the excessive accumulation of fat can secondarily produce alterations in the regulation, metabolization and secretion of different hormones.[13] The cause of obesity is an energy imbalance between calories consumed and calories expended, an intake rich in fat, salt and sugars, poor in vitamins, minerals and other micronutrients, together with a decrease in physical activity as a consequence of a sedentary lifestyle [14].

Obesity is defined using a person's body mass index (BMI), the ratio between weight and height, with a BMI of 25 to 29.9 considered overweight and over 30, obesity [13]. Hip circumference (HC) is an indicator of adiposity useful for assessing cardiovascular risk, indispensable for the diagnosis and classification of obesity; abdominal circumference is located at the upper point of the iliac crest, the tape is placed around the abdomen at this level, and the measurement is made at the end of normal expiration.

In the middle of the 20th century fatness was considered good health, a fat child was a healthy and happy child, nice and good-natured. Nowadays there are no healthy fat children, and even less happy ones: overweight people are the object of ridicule and discrimination, and are exposed to serious diseases [14,15]. From the public health point of view, the most serious consequences of obesity are its cardiovascular and metabolic complications, in the short and long term; but there are also psychological consequences that can worsen the situation [16]. 48% of obese adolescent's present symptoms of moderate to severe depression and 35% report high levels of anxiety. Obese girls make more suicide attempts than non-obese girls and are more isolated from their social networks [15]. If eating as an anti-anxiety resource becomes habitual, with the passage of time one will gain weight, forming a "vicious circle" in some people, where anxiety is reduced by eating and, therefore, by gaining weight. And since this weight gain constitutes a "cause for alarm" and concern, anxiety appears again and, once again, people eat as a compensatory mechanism [16]. Young university students are characterized by an unhealthy or unhealthy lifestyle, in a study conducted in Malaysia, with a sample of 290 university students in which 14.8% were overweight and 5.2% obese, showing that, due to poor nutrition based on excessive consumption of processed foods, omission of certain foods, predominantly breakfast, and low or no physical activity, men were more likely to be overweight or obese [17]. The poor eating habits that are generated throughout the development of the students' academic life, this same poor lifestyle makes them more prone to suffer alterations in their state of health in adulthood [17,18]. Eating behaviors are a series of behaviors that may be regulated by the education that the person has had since childhood, beliefs and customs, social position, purchasing power, personal tastes, social and demographic environment, among others; which will play an indispensable role in the eating lifestyles that each person develops in all stages of life. Adolescents tend to skip meals and develop irregular eating habits, thus there is a risk of suffering deficiencies of some essential nutrients, developing eating behavior disorders or becoming overweight and obese [19]. Eating habits obtained from adolescence onwards persist into adulthood being a predisposing factor in acquiring metabolic diseases that increase morbidity and mortality in the population. the academic environment is linked to the adoption of negative practices since there is greater access to fast food with high caloric content, saturated fats, artificial and sugary drinks than healthy food; as well as the lack of physical activity and exercise represents a latent risk in the increase of weight and body composition [20]. Previous studies have shown the existence of incorrect eating habits, characterized by skipping meals, snacking between meals, abusing fast food, eating highly processed foods with a high content of saturated fat, sugars and/or sodium outside the home, and following a diet that is not very diversified [21,22]. During the university period, young people's lifestyles change, since there is less time available, obligations and daily duties increase, and academic stress, poor diet, lack of physical activity and exercise, and high alcohol consumption increase the risk of overweight and obesity [20]. The promotion of physical activity and

healthy habits in university students is very important not only in the prevention of chronic degenerative diseases, but also in increasing academic performance and learning throughout their professional and adult life [22].

Another unhealthy lifestyle in adolescents is stress, a multifactorial condition resulting from the individual's relationship with his or her environment and his or her ability to adapt to physical and emotional burdens that may be generated in daily and academic life [23]. This relationship can cause psychosomatic imbalances manifested by: asthenia, loss or increase of appetite, alopecia, irritability, insomnia, this can be caused by unhealthy lifestyles such as poor diet, drug addiction, violence, poor study habits, among others. Academic stress describes those cognitive and affective processes that the student perceives the impact of academic stressors. The student evaluates the environment as threatening and may respond with emotions such as: worry, distrust, sadness, anxiety [24].

The academic environment at the higher level represents an environment of high pressure and professional overload and academic activities. Students are exposed to school demands that could be defined as stressors, causing psychosomatic imbalance. Internal stressors are all the personal physical and emotional burdens, the demands that each person is predisposed to fulfill without anyone imposing them, external stressors are all the academic and professional activities that the student must fulfill throughout his school period [23].

Stress is necessary to act and respond to the demands of the environment; it is what moves the individual to act. It is necessary to be able to actively adapt to the requirements that the school and teachers demand, but at high levels can cause disorders to the person. School stress has a physical and psychological character that students face because there is an individual pressure to meet the obligations of the same environment wanting to improve their academic performance, seeking solutions to the problems that arise, it is also of great importance the social relations in which it develops as the student not only seeks the acceptance of their peers and teachers but their own identity. Rossi's theory shows that the stressful situation manifests itself in the students in psychological, physical and behavioral ways. Among the physical ones are: digestion problems, insomnia, fatigue; among the psychological ones: anxiety, nervousness, mental block, concentration problems. Among behavioral: arguments, isolation, absenteeism from classes, reluctance to do school work. Students observe and experience a series of events typical of the university environment in which they are subjected to a set of burdens and school tasks that when having to meet the demands there will be a psychosomatic imbalance that appears as a symptomatology such as: anxiety, depression, overweight and obesity, fatigue, diarrhea or constipation, alopecia, headache, migraine [23,24].

The learning process is affected by various factors that cause emotional and psychological imbalance within the family, teaching and work environments. Academic demands function as curricular stressors or persistent stimuli for responses to stressful situations. Academic stress is a threat to students as it jeopardizes their physical, biological, psychological and social balance that can significantly affect the health and integrity of each of them, so it is of utmost importance the prevention and treatment of this condition to improve both the quality of life of students and their academic performance [24].

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## 2. Material and methods

This is an applied, descriptive, cross-sectional research with a quantitative approach. A study was carried out on a population of students from different degrees of the who Iztacala Faculty of Higher Studies present health problems such as overweight and obesity, and who are interested in improving their eating habits and lifestyles. Students of both sexes (male and female) from different FESI careers, who suffer from overweight and obesity and are attended at the clinics of the disease prevention program (PROSALUD) were included. Students of both sexes who do not suffer from overweight and obesity and do not show interest in changing their lifestyles and eating habits to improve their state of health were excluded. The sample population of the study was selected by convenience of 50 students, 19 males and 31 females of the Iztacala Faculty of Higher Studies who are overweight and obese. Their medical history, nutritional history and application of the SISCO academic stress questionnaire were taken.

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## 3. Results

The objective of this study was to improve the nutritional status of the students by means of hygienic-dietary therapeutic management. For the inferential analysis, the distribution of the variables was obtained with the K-S test, resulting in a nonparametric distribution, so the differential analysis was performed with the Kruskal Wallis test, for the descriptive analysis the arithmetic mean was used and the standard deviation was used as a variability test. It should be noted that 10 measurements were evaluated during the research process because they included the total of the initial

population; for reasons of each participant, at the end of the study the total population was no longer available, so it was decided to work with the first measurements taken.

In table one we find the analysis of the weight variable, with a P value of 0.000, there is statistical significance, so it is evident the reduction of body weight, a decrease in the arymetrical mean is observed, however the variability prevails practically the same in the ten measurements.

**Table 1** Average weight comparison

Measurement	Min	Max	Media	Standard deviation
1	46	100	72.70	12.940
2	55.00	97.20	73.9594	12.34381
3	54.10	97.00	73.1269	12.54977
4	53.50	96.20	72.7700	12.89745
5	53.00	95.30	72.1172	12.84701
6	52.20	95.00	71.4607	13.05462
7	51.30	95.00	70.3571	13.21972
8	51.00	94.10	69.6036	12.79119
8	50.50	93.00	68.7714	12.85676
10	50.10	92.10	68.6036	12.87917

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**Table 2** Comparison of average waist

Measurement	Min	Max	Media	Standard deviation
1	69.00	119.00	89.9268	9.36053
2	78.20	119.00	91.5219	8.69815
3	76.00	116.00	90.5156	8.84698
4	74.00	114.00	89.9633	9.02443
4	74.00	112.50	89.5621	8.71519
6	73.00	112.00	88.2321	8.54687
7	73.00	112.00	87.4107	8.31965
8	72.50	110.00	86.9107	8.21477
9	72.50	106.50	86.4071	7.92969
10	71.00	104.00	85.2857	7.83103

Table 3 shows the comparison of means of the body mass index, as well as the weight, it presents statistical significance in each of its measures, however, it also presents a great variability in its average and standard deviation, so it was not constant throughout the study, as shown by the mean value, the greatest stability was found towards the final phase of the research.

**Table 3** Mean IMC comparison

Measurement	Mín	Max	Media	Standard deviation
1	14.68	43.07	28.0778	4.91981
2	14.68	43.07	28.0778	4.91981
3	23.81	42.07	29.0794	4.04461
4	23.42	40.37	28.6975	3.98500
5	23.16	41.64	28.5030	4.29757
6	22.94	41.25	28.2752	4.29617
7	22.59	41.12	27.9400	4.35122
8	22.21	41.12	27.5050	4.43620
9	22.38	40.73	27.2743	4.26385
10	22.07	40.25	26.9514	4.35264

Finally, Table 4 shows the comparison of means for the percentage of fat, with a P value of 0.338 there is no statistical significance, so it always remained in equal values with respect to the beginning of the study, this analysis is corroborated in the population because the variability always remained homogeneous, this is probably due to the fact that more time is required to reduce the percentage of body fat.

**Table 4** Average fat percentage comparison

Measurement	Mín	Max	Media	Standard deviation
1	0.82	1.07	0.9315	0.05420
2	0.82	1.07	0.9293	0.05188
3	0.86	1.09	0.9375	0.05035
4	0.84	1.08	0.9334	0.05178
5	0.82	1.09	0.9273	0.05729
6	0.83	1.06	0.9262	0.05003
7	0.82	1.05	0.9218	0.04922
8	0.82	1.04	0.9218	0.04839
9	0.81	1.04	0.9200	0.05312
10	0.83	1.03	0.9225	0.05154

#### 4. Discussion

In Mexico, among the top three causes of death in the Mexican population, are cardiovascular and metabolic diseases, both highly related to obesity, which in turn is highly related to poor eating habits and lack of physical activity, ENSANUT 2020 reports that increasingly younger populations have problems with being overweight or obese or even already suffer from metabolic syndrome, which increases the risk that at an earlier age they acquire diseases such as DM2 or SAH [25]. The university population has not been exempt, on the contrary, it is a population that increases the risk of association, due to the fact that student life demands a considerable investment time in study and academic preparation, reducing the time to practice exercise and in the preparation of food, since most tend to eat in food stores that generally sell food that does not cover the nutritional quality and is high in carbohydrates and lipids [26,27].

In the Iztacala Faculty of Higher Studies, descriptive analyzes have been carried out on the state of health, as well as treatments on the management of hygienic-dietetic habits have also been put into practice in addition to the consumption of oatmeal smoothie with apple, in this study we reduced the prevalence of metabolic syndrome, but not body weight or BMI, this because one of the components that are evaluated are plasma glycemia levels and LDH and HDL lipoproteins, which decrease their plasma levels more quickly in compared to fat that is brown or stored in the visceral area [28].

In the current study we demonstrated the reduction in weight and BMI throughout an intervention lasting 10 weeks, however, we did not find a statistical reduction in the percentage of fat. These results are opposite to those described by Bonfanti N. et al., Where they applied low-calorie diets combined with physical activity, where said intervention was applied for three months, to assess ensuring good physical activity, the elimination of CO<sub>2</sub> was evaluated, after The implementation of the health program observed a reduction in body weight and BMI, as well as in the level of plasma triglycerides, it should be noted that various authors affirm that to achieve a significant effect on weight loss and improvement of metabolic condition, It requires that in physical activity the patient uses a minimum of 60% of his maximum heart rate for at least 30-45 minutes, where the first physiological changes will begin to be detected 15 days after the activity begins [29,30].

In our study, only a plan that involved isometric effort was developed, however, the maximum heart rate was not considered as a method to guarantee the effectiveness of exercise, so future interventions will consider not only the use of the FCM but also other indicators such as SaO<sub>2</sub> and CO<sub>2</sub>. Regarding food, we designed a hypocaloric model, however, the absence of statistical significance in the decrease in the percentage of fat is due to a lack in the assessment of an effective caloric deficit in the relation of consumption and loss in physical activity and basal metabolism [31,32].

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## 5. Conclusion

Based on the latest results published by INEGI, the leading causes of death in Mexico are cardiovascular diseases and metabolic diseases, both of which are closely related to the nutritional status of the population and, at the same time, are related to the lack of physical activity and poor diet. This phenomenon is present from childhood to adulthood as Mexico has the first places in childhood and adult obesity. The university and the PROSALUD service have a high commitment to the health status of the university students of the FES-Iztacala, previously we had reported the health status of new students from the generation of 2016 to 2020, in the analysis of all generations an increase in body weight and alterations in metabolic status were observed, data that agree with ENSANUT from 2016 until the last published in 2020, where the increase in body weight is reported in populations aged 20 years or older, we also identified which were the main factors that put the health of students at risk, among which activity stands out. Physical and poor nutrition, so our health program to reduce weight is the first intervention carried out to the students, the results show favorable effects in the improvement of weight, however, it takes more time with adherence to the treatment to obtain more and better results, collaboration with other disciplines such as psychology is not ruled out.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

The authors declare that we have no conflict of interest.

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