

# Overweight, Obesity and Cardiovascular Risk in a Group of Women from the State of Michoacán, México

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## ABSTRACT

Overweight and obesity in Mexico has been increasing in recent decades associated with unhealthy eating habits where highly processed foods prevail as well as little physical act According to the National Health and Nutrition Survey of 2018, it indicates that it is the group of women who have a higher prevalence of obesity and with it a greater risk of presenting diseases such as type 2 diabetes mellitus, cardiovascular diseases and some types of cancer among other pathologies. Both overweight and obesity occur in both rural and urban areas of the country and are not characteristic of a defined age group. With this as background, this study was carried out in a group of 22 young women in two municipalities of the state of Michoacán in order to identify, evaluate and correlate some anthropometric and biochemical indicators that would account for the cardiovascular risk they presented.

**Keywords:** Overweight; Obesity; Health; Cardiovascular Risk

**Abbreviations:** WHO: World Health Organization; IOTF: International Obesity Task Force; CHF: Congestive Heart Failure; DM: Diabetes Mellitus; BMI: Body Mass Index; ENSANUT: Encuesta Nacional De Salud Y Nutrición

## Introduction

Overweight weight and obesity in Mexico represent a serious problem of public health, a deterioration in life quality, elevating the risk of diseases such as diabetes type 2, cardiovascular diseases, non-alcoholic fatty liver disease and some types of cancer. Within its etiology we can recognize some genetic factors and non-healthy lifestyles. Obesity has been constituted as the main problem of malnutrition in adults and is increasing significantly in children. According

to the World Health Organization (WHO) International Obesity Task Force (IOTF), this disease is defined as an abnormal and excessive accumulation of fat that puts life at risk. Due to its impact on mortality and morbidity, health, and quality of life, it is considered the twenty-first century pandemic (WHO, 2010). At least 18 deaths are associated with overweight, and relative risks are somewhat different among men and women. These vary according to gender and age and are aggravated with weight excess. More concrete, overweight and

obesity in males have greater risks of suffering rectal colon cancer, stroke, and osteoarthritis; meanwhile women with overweight have more risks of contracting diabetes, heart diseases, endometriosis, breast and ovarian cancer.

On the other hand, the risk of sudden death of the obese is three times greater than the non-obese and have twice the risk for the development of congestive heart failure (CHF), cerebrovascular disease and ischemic heart disease, meanwhile the possibility of developing diabetes mellitus (DM) is 93 times higher when having a body mass index (BMI) above 35 (Dávila, et al. [1]). In Mexico, according to the ENSANUT 2018, obesity represents a severe public health problem affecting 7 out of 10 adults, with women experiencing more obesity than in men. Specifically, in the state of Michoacán Mexico, where the study was conducted, the comparative between the “Encuesta Nacional de Salud y Nutrición (ENSANUT)” (National health and nutrition questionnaire) of 2006 and 2012, the prevalence of overweight and obesity in people greater than 20 years old had an increase of 3.8 percent points in women. In 2018 “ENSANUT” reports that 40.2% of women suffered from obesity, equaling almost half of the female population of the state. This forces a bigger commitment of the state to identify multifactorial factors of overweight and obesity in females and related pathologies to this health problem.

### Generalities of Overweight and Obesity

Obesity is one of the biggest problems that society faces during the twenty-first century. Its prevalence is such, that in 2004 it began to be considered the pandemic of the twenty-first century, embracing the word “globesity” in the year of 2010. Globesity, accepted by the World Health Organization in 2011, is facing the disturbing reality and the facts show no improvements of the situation in the short term. (WHO [2]). Constituted in the present time as one of the biggest challenges of public health at a global level due to its magnitude, the speed of its growth and the growing number of cases, this is provoking harmful effects in the health of the population who suffer from it. Epidemic statistics show that overweight and obesity is considered in the present time a serious public health problem. Both overweight and obesity significantly increase the risk of having non transmittable chronic diseases, premature mortality, and a high cost of social health issues as well as decreasing life quality (Dávila, et al. [1]). These health problems have a multifactorial origin, conjoining the individual behavior, the family environment, community and social environment.

It is noted that the fundamental cause of overweight is an energetic unbalance between expended and undigested calories relating to eating patterns where an increase of the ingestion of hypercaloric foods and other micronutrients, and the lack of physical activities.

(Shamah [3]). Specifically in the case of women in 1975, countries such as Mexico, Colombia and Brazil were registered as stage 1 transition of obesity in Latin America. Many countries of middle east women showed a larger prevalence in obesity. This stage is manifested as a larger prevalence of obesity in people of higher socioeconomic status mainly among women. Stage two, it is characterized by an increase of obesity in adults, a percentage increase in children with slight differences among women of socioeconomic differences. All of the above countries in 1975 as with the case of Mexico were in stage one, were in stage two by 2016 indicating the prevalence of obesity in women increase between 25 and 40% (Jacks, et al. [4]).

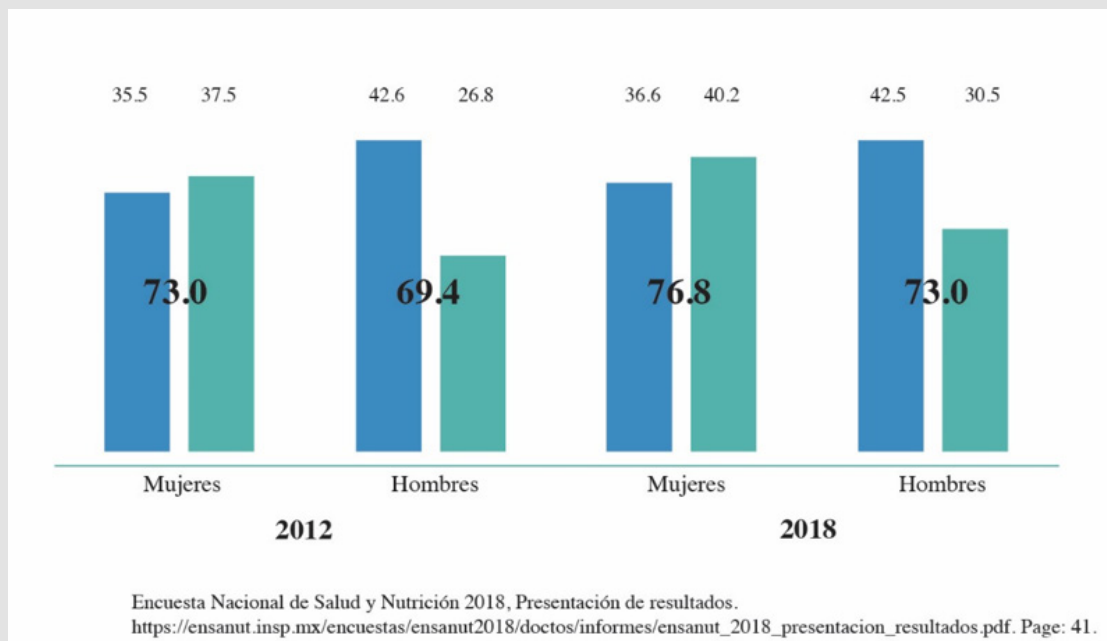
### Dimensions of Overweight and Obesity in Mexico

The report of the global number of cases showed that the global tendencies, national and regional, during the period from 1980 to 2013 manifested that obesity, especially in the younger population, continued to rise with Mexico being one of the top 10 countries with the largest number of obese people. (Shamah [5]).

In general terms, in Mexico the prevalence of obesity and overweight increased in recent years and from 1980 to date and has tripled in the present day resulting in 75% of the Mexican adult population having a weight above the recommended health standard. This is mainly due to the increase of consuming high energetic density and less physical activity. (Shamah [3]). From a gender point, the prevalence of both overweight, obesity and morbid obesity were higher in the females in general terms, 7 out of every 10 women (Shamah, et al. [5,6]). Among the pathologies associated with these health problems we can point that Mexican women show larger numbers than men regarding arterial hypertension and diabetes mellitus (ENSANUT [7]) (Graphic 1).

### Overweight and Obesity in Michoacán

At the state level according to the “Encuesta Nacional de Salud y Nutrición (ENSANUT)” (National Health and Nutrition Questionnaire) 2006-2012, in the health and nutrition of Michoacán, it has the evaluation of nutritional condition in adults among 20 years or older, registered a prevalence of overweight and obesity by gender, 74.6% in women and 70.2% in men. These numbers put the state in 5<sup>th</sup> place in the national ranking. During the last six years the tendency of the prevalence of overweight and obesity increased 2.4 percentage points in men and 3.8 percentage points in women. The health programs in place in Michoacán at present allow for larger coverage in the services and an increase in the implementation of new medical technologies that contribute to an epidemiological and health change (Reveles, et al. [8]).



**Graphic 1:** Percentage of Mexican population aged 20 years and over with overweight and obesity, by sex 2012-2018.

### Homa Index and Its Predictive Potential of Cardiovascular Risk

Insulin resistance is a complex process which is characterized by the diminished response in peripheral tissues (muscle, fat and liver) to the biological actions of insulin. This process provokes a compensatory increase of insulin by the beta cells in the pancreas with the objective of keeping within the ranks of normal blood sugar levels (Benozzi, et al. [9,10]), it is in summary a decrease of the biological function of the hormone characterized by requiring a high level of plasmatic insulin to maintain the metabolic homeostasis (Acosta, et al. [11]). An important group of diseases, such as the impaired glucose tolerance and the DM2, arterial hypertension, polycystic ovary syndrome, metabolic syndrome, ischemic cardiopathy and exogenous obesity, among others, have manifested insulin resistance with different degrees of variability (Martin, et al. [11-15]).

This indicator provides information between the level of blood sugar and the amount of produced insulin by the organism, which is associated with a sedentary lifestyle and obesity, the elevated numbers have been pointed as a previous stage of Diabetes mellitus 2 also related to cardiovascular diseases. (Aguilar Salinas, et al. [16]). The HOMA-IR index is a simple minimally invasive procedure which can allow, by a validated formula, a precise numeric value that expresses the insulin resistance; the calculation of Matthews homeostatic model known as HOMA-IR appears from the equation: fasting insulinemia (mU/mL X fasting glycemia (mmol/L)/22.5 (Hernandez Yero, et al.

[17]). At the moment the normal reference value of HOMA-IR for adults is equal to or less than 3 (Lemos [18]). Regarding the correlation between the insulin resistance and anthropometric indicators, a bicipital fold  $\geq 4,50$  mm and the arm circumference  $\geq 27,50$  cm predict a 97,4% the IR and the BMI  $\geq 25$  kg/m<sup>2</sup> in a 92,3% predicts the IR; by lineal regression these parameters turn out to be better predictors for IR (Gomez Garcia [19]) meanwhile, a HOMAR IR index was 5.9 the average for glycemia  $\geq 110$  mg/dl, an average of 2.6 was related with BMI  $\geq 25$  kg/m<sup>2</sup> and an average of 2.2 in presence of triglycerides  $\geq 150$  mg/dl (Ascaso, et al. [20-24]).

### Materials and Methods

The study was cross-sectional and correlational. The sample was convenient. There were considered 22 women with overweight and obesity diagnosis from the center and east zone of the entity (La Piedad and Sahuayo). They have received private nutrition consultation in the region of the study.

### Results

(Table 1) Regarding age, the average age was 23.5 years. Table 2 represents the patients' age ranges. Regarding the BMI, the average age for the study group was 30.32 resulting in obesity. According to the reference tables of the World Health Organization 50% of the sample was in the range of overweight, 14% obesity 2 and 9% obesity 3 (Graphic 2). According to the current parameters of blood pressure in adult population (120/80), specifically the systolic pressure (SBP)

of the study group had an average of 115.6 resulting in normal ranges (120), 30.4% resulted in numbers higher than 120 mmHg and the remaining with less than 120 (46.5%). Regarding diastolic blood pressure associated with cardiovascular risk, the average was 76.6 mmHg; seeking a relation between this and age, no synchronic behavior was found between these indicators, on the other hand, the higher num-

bers were among the ages of 27 and 40 years. It is noted that from the study group, five women had 90 mmHg or more. Regarding the waist circumference indicator, the average was 95.7cm, with a maximum of 123 and a minimum of 80, with the majority being between 90 and 110 cm.

**Table 1:** Anthropometric and biochemical indicators of a group of women with overweight or obesity in the middle east zone of the State of Michoacán, México.

Number	Age (years)	BMI	WC (cm)	BP (mmHg)	Glucose (mg/dl)	Insulin (uUI/ml)	HOMA-IR Index
1	39	26.5	80	110/70	85	12.3	2.49
2	37	37.1	125	127/85	175	10.6	4.58
3	34	26.4	94	121/73	90	21	4.66
4	21	26.8	90	115/71	95	16.9	3.96
5	27	26.4	83	117/82	91	12.5	2.8
6	18	29.3	108	125/83	100	17.4	4.29
7	40	27	102	110/70	95	15.1	3.5
8	33	42.3	123	136/80	115.04	11.33	2.3
9	34	26.2	90	121/74	97.89	13.4	3.23
10	32	34	95	110/80	91	7.7	1.73
11	33	39.1	112	120/70	89.44	19.9	4.39
13	21	40.6	95	118/75	84.13	13.5	2.8
14	30	32.7	103	110/70	85	27.25	5.7
15	33	34.2	101	150/90	94	19.4	4.5
16	40	29.8	97	130/90	90	15.4	3.4
17	23	26.1	102	110/80	75	6.66	1.23
18	34	38.7	95	120/90	77	15.3	2.9
19	36	26.8	96	129/89	88	10.4	2.25
20	27	29.1	98	120/90	85	18.9	3.96
21	36	30.9	106	120/80	88	15.8	3.43
22	21	34.2	108	120/80	89	15.2	3.34
23	40	33.2	100	130/90	100	17.6	4.34

Note:

Simbology:

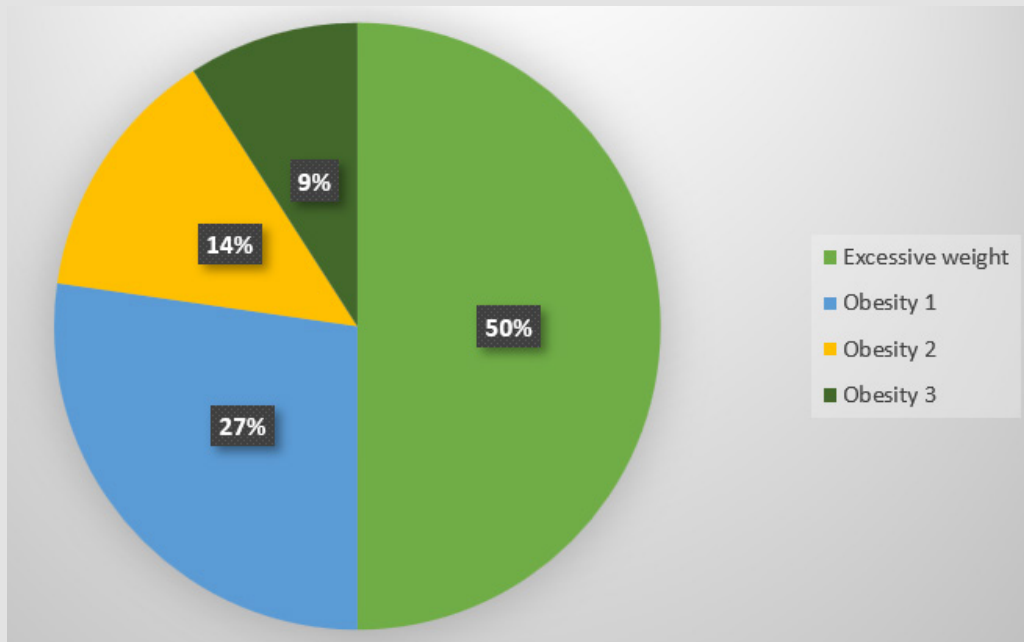
BMI Body Mass Index

BP Blood Pressure

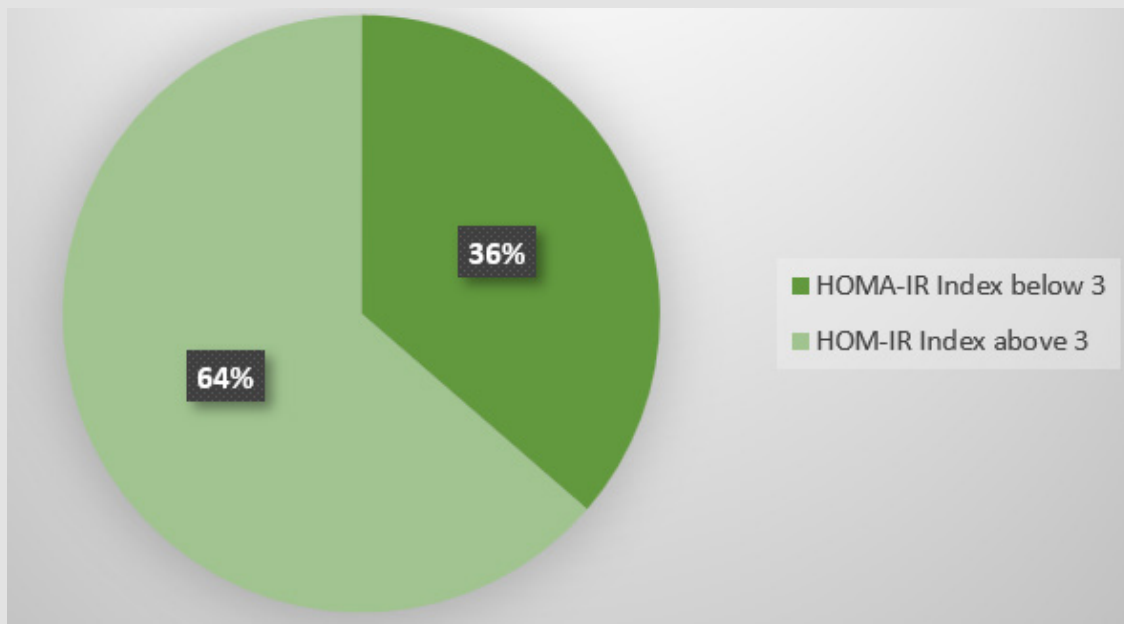
WC Waist circumference

**Table 2:** Age ranges of the studied group.

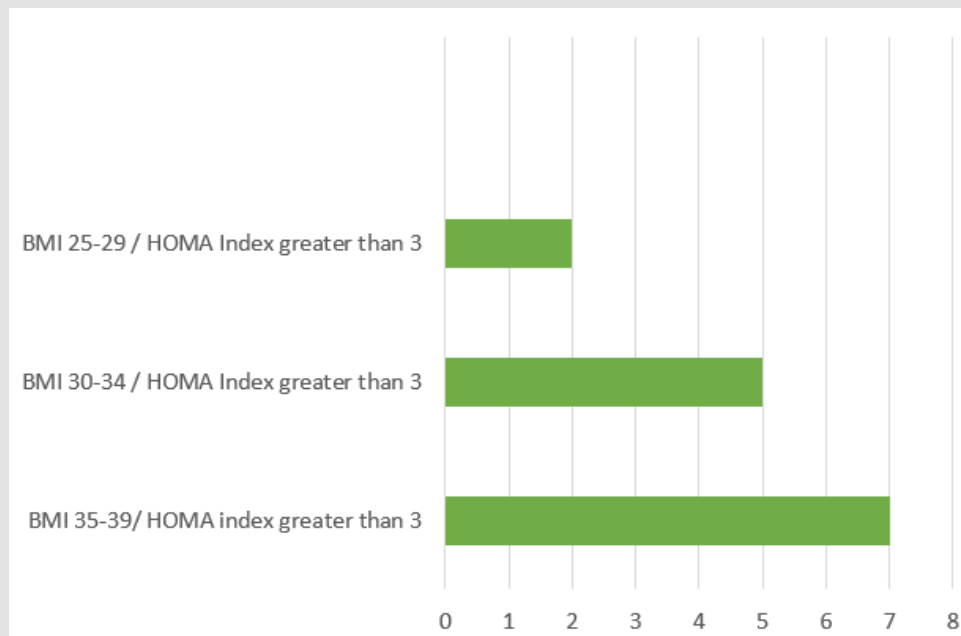
Age Range	Number of Patients
18-20 years	1
21-30 years	7
31-40 years	11



Graphic 2: Nutritional Condition of the study group of women in Michoacan, Mexico.



Graphic 3: HOMA-IR Index in the women study group with the excessive weight or obesity in Michoacan, Mexico.



**Graphic 4:** Frequency of the correlation between BMI and HOMA-IR index greater than 3 in excessive weight or obese women from Michoacan, Mexico.

In relation to the figures of pre-prandial glucose, the group in average had 90.38; 54.5% in same or inferior figures to 90 mg/dL; 36.36% in figures between 91 and 100 mg/dL and 9.09% with figures above 100 mg/dL. It is noted that according to what is present day for Mexico, the last group exceeding 100mg/dL could be in a denominated Pre-Diabetes. Regarding the HOMA-IR index, which provides information about the blood sugar levels and the amount of insulin produced by the organism, it is directly associated with a sedentary lifestyle and obesity. The graphic 3 that were less than 3 are considered above normal presented in 36% of the study group, meanwhile the figures above 3 were present in 64% of the study group (Graphic 3). By relating this index with the BMI-IR (Graphic 4) it was found that in the rank of 25 to 29 the HOMA index more than 3 had the larger number of cases and for BMI equal or above 40, no patient presented HOMA-IR index above 3.

Regarding other correlations behaviors, it was found the diastolic blood pressure -associated with a higher cardiovascular risk- had a direct relation between the BMI and figures above 80 mm Mg and in 5 of the cases with these characteristics had overweight and 4 obesities. However, the highest BMI (40.6) did not register a diastolic pressure above 80. In the case of glucose, only three women with a BMI above 30 had blood sugar levels equal or above 100mg/dL (Pre-Diabetes). In the waist circumference ratio -which refers to abdominal obesity- and HOMAR-IR index, the average of the group was 3.4, considering in general terms, the group presents insulin resistance; specifically,

women with over 88cm of waist circumference, representing 90.9% and inside this group of risk, 55% of them had a waist circumference above 100cm, signifying an even higher cardiometabolic risk, according to the WHO. Finally, as to the association between the levels of glucose and HOMA-IR index in the four patients that had over 100, three of these indexes were above 4, which evidence, as in other studies, the strong relation between these indicators.

## Conclusions

About diastolic blood pressure, linked to cardiovascular risk, it had a direct relation with BMI, this relation was present in five patients with overweight and five with obesity. It became evident the relation between the waist circumference, the abdominal fat indicator, and the HOMA-IR index, highlighting that 55% of the women with high cardiovascular risk data, it should be remembered that the study group is located within a relatively young, economically active population. There is a positive relation among overweight, obesity and HOMA-IR index. This is why it is suggested that this test be performed in patients with these two pathological entities, which can be enhanced with a lipidic profile to identify the fat levels in the blood stream, leading to an increase in the atherogenic index, increasing the risk of a heart attack and strokes. It should be noted about the topic, studies like Heuer's in 2017 a significant correlation was found between the HOMA index and the lipidic profile parameters in this population sample during the three trimesters of gestation. The use of complementary indicators allows a wider vision of the health and



nutrition conditions of the patient with obesity, which in the case of a group of young adult population allows the chance to establish new preventive strategies of chronic degenerative diseases and improve the quality of life in the face of cardiometabolic risks.

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