

# Study of the Prevalence of Obesity and Its Association with Diabetes in Miyandoab (Iran) City

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## Abstract

The increasing prevalence of obesity & overweight and its related disorders with diabetes is the aim of present study in Miyandoab city / West Azerbaijan province / north-west of Iran which has been chosen because of lack of available documents about prevalence of obesity and overweight and diabetes in this city and its prevalence would be determined. We decided to study the prevalence of overweight and obese and diabetes in our referred patients. With emphasizing on over obesity to determine its association with diabetes. Materials and Methods were a cross-sectional study that was done in Miyandoab city. Samples included 84 patients referred to nutrition ward of Fatimah Hospital, were matched in BMI, gender, age group and educational status. Data included demographic and anthropometric parts. Its validity and reliability was confirmed. Data was analyzed by SPSS20 chi-square test and  $p < 0.05$  was considered significant level. Eighty four patients, females ( $n=58$ ; 69% of samples) and males ( $n=26$ ; 31% of samples) entered in this study. Date of study was from September 2011 up to April 2012.

**Keywords:** Diabetes, Obesity, Iran, Prevalence.

## Introduction

In recent years, there has been a marked change in life-style of Iranian population caused by urbanization, affluence, dietary westernization. Few studies on the prevalence of obesity and its association with diabetes Iranian population, particularly in small cities, have been reported.

Diabetes is on the rise. No longer a disease of predominantly rich nations, the prevalence of diabetes is steadily increasing everywhere, most markedly in the world's middle-income countries.

Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980. Unfortunately, in many settings the lack of effective policies to create supportive environments for healthy lifestyles and the lack of access to quality health care means that the prevention and treatment of diabetes, particularly for people of modest means, are not being pursued.

Diabetes caused 1.5 million deaths in 2012. Higher-than-optimal blood glucose caused an additional 2.2 million deaths, by increasing the risks of cardiovascular and other diseases. Forty-three percent of these 3.7 million deaths occur before the age of 70 years. The percentage of deaths attributable to high blood glucose or diabetes that occurs prior to age 70 is higher in low- and middle-income countries than in high-income countries. When diabetes is uncontrolled, it has dire consequences for health and well-being.<sup>1</sup>

## Expression:

The global prevalence (age-standardized) of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population. This reflects an increase in associated risk factors such as being overweight or obese. Over the past decade, diabetes prevalence has risen faster in low- and middle-income countries than in high-income countries.<sup>2</sup> Statistics released by the International Federation of Diabetes

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<sup>1</sup> GLOBAL REPORT ON DIABETES, World Health Organization 2016, ISBN 978 92 4 156525 7 (NLM classification: WK 810)

<sup>2</sup> GLOBAL REPORT ON DIABETES, World Health Organization 2016, ISBN 978 92 4 156525 7 (NLM classification: WK 810)

suggests that more than 418 million adults worldwide are affected by diabetes, and by the next 25 years, this figure will reach over 600 million! Estimates suggest a doubling in the number of people with diabetes in the Middle East and North Africa, from 35 million and 400,000, to 72 million and 100,000. In Iran, over 12% of adults have diabetes, which has become a health and social problem! Basically, the main goal in treating diabetes is to place diabetic in a condition that can have uninterrupted, active and healthy life and long life.<sup>3</sup> Being obesity raises the risk for type 2 diabetes, heart disease and stroke. It can also increase risk of high blood pressure, unhealthy cholesterol and high blood glucose (sugar). If a person is obese, losing weight may help him (her) prevent and manage these conditions. And he (she) doesn't have to lose a lot of weight to improve his (her) health—even losing 10-15 pounds can make a big difference.<sup>4</sup>

In addition, diabetes and its complications impact harshly on the finances of individuals and their families, and the economies of nations. People with diabetes who depend on life-saving insulin pay the ultimate price when access to affordable insulin is lacking. Millions of people around the world live with diabetes or know someone living with diabetes. Regardless of the type of diabetes, diabetes isn't yet a curable disease. However, it is a very treatable disease, and no matter how frightening, annoying, and frustrating it can be, people with diabetes can live long, healthy, and happy lives. Our goal is to provide you the information, tools and resources to help make that happen. This is the place to begin your education about diabetes.<sup>5</sup> A diabetic person can easily prevent complications from diabetes by participating in diabetes classes as well as controlling your blood glucose consistently and having HbA1c hemoglobin at normal or near normal levels.

## Complications of diabetes

### 1. Early complications

1-1 Ketoacidosis or diabetic coma is a metabolic disorder

1-2 hyper-osmular cancers

1-3 Blood glucose lower than 60 mg per day threatens the risk of human hypoglycemia

4.4 When blood glucose increases, there is no proper relationship between the need and the presence of insulin in the body. Cases that may lead to hyperglycemia include low physical activity, forgetfulness about insulin injections, or taking medication, illness and gastritis

### 2. Late complications

1-2 Eye disorders

2-2 Nephropathy (Kidney Disease)

2-3 Neuropathies

2.4 Cardiovascular disease.<sup>6</sup>

## *The importance of the subject*

### Overall Numbers, Diabetes and Prediabetes

Prevalence: In 2015, 30.3 million Americans, or 9.4% of the population, had diabetes.

Approximately 1.25 million American children and adults have type I diabetes.

Undiagnosed: Of the 30.3 million adults with diabetes, 23.1 million were diagnosed, and 7.2 million were undiagnosed.

Prevalence in seniors: The percentage of Americans age 65 and older remains high, at 25.2%, or 12.0 million seniors (diagnosed and undiagnosed).

New Cases: 1.5 million Americans are diagnosed with diabetes every year.

Prediabetes: In 2015, 84.1 million Americans age 18 and older had prediabetes.

Deaths: Diabetes remains the 7th leading cause of death in the United States in 2015, with 79,535 death certificates listing it as the underlying cause of death, and a total of 252,806 death certificates listing diabetes as an underlying or contributing cause of death.

### Diabetes in Youth

About 193,000 Americans under age 20 are estimated to have diagnosed diabetes, approximately 0.24% of that population.

In 2011—2012, the annual incidence of diagnosed diabetes in youth was estimated at 17,900 with type 1 diabetes, 5,300 with type 2 diabetes.

### Diabetes by Race/Ethnicity

The rates of diagnosed diabetes in adults by race/ethnic background are:

7.4% of non-Hispanic whites

8.0% of Asian Americans

12.1% of Hispanics

12.7% of non-Hispanic blacks

15.1% of American Indians/Alaskan Natives

<sup>3</sup> <http://www.ids.org.ir/>

<sup>4</sup> <http://www.diabetes.org/>

<sup>5</sup> <http://www.diabetes.org/>

<sup>6</sup> <http://www.ids.org.ir/>

The breakdown among Asian Americans:

4.3% for Chinese

8.9% for Filipinos

11.2% for Asian Indians

8.5% for other Asian Americans.

The breakdown among Hispanic adults:

8.5% for Central and South Americans

9.0% for Cubans

13.8% for Mexican Americans

12.0% for Puerto Ricans.

Deaths:

Diabetes was the seventh leading cause of death in the United States in 2015 based on the 79,535 death certificates in which diabetes was listed as the underlying cause of death. In 2015, diabetes was mentioned as a cause of death in a total of 252,806 certificates.

Diabetes may be underreported as a cause of death. Studies have found that only about 35% to 40% of people with diabetes who died had diabetes listed anywhere on the death certificate and about 10% to 15% had it listed as the underlying cause of death.

Cost of Diabetes (Updated March 22, 2018)

\$327 billion: Total costs of diagnosed diabetes in the United States in 2017

\$237 billion for direct medical costs

\$90 billion in reduced productivity

After adjusting for population age and sex differences, average medical expenditures among people with diagnosed diabetes were 2.3 times higher than what expenditures would be in the absence of diabetes.<sup>7</sup>

#### *Literature Review about obesity and Diabetes*

Damian states the prevalence of obesity and overweight among type 2 diabetic patients attending diabetic clinics was 85.0% (n = 193). Of them, 44.9% were overweight and 40.1% were obese respectively (Damian et al, 2017). Chen expresses our results indicate that weight loss but not weight gain increased all-cause mortality and CVD mortality in overweight or obese adults with diabetes (Chen et al., 2018). Salehidoost says a U-shaped association of BMI with all-cause mortality in patients with type 2 diabetes with the lowest risk observed among the obesity patients (Salehidoost et al., 2018). Maksymets remarks modification of lifestyle and individual approach to pharmacologic correction of dyslipidaemia in overweight and obese patients help to avoid the development of insulin resistance, which is a predictor of type 2 diabetes mellitus (Maksymets et al., 2018). Again Chen declares the prevalence of non-alcoholic fatty liver disease in overweight and obese patients with Type 2 diabetes in South China is high. Multiple metabolic disorders were significant (Chen et al., 2016). *Damian writes lifestyle-based weight loss intervention trials in type2 diabetes achieve-on averag-modest reductions in weight and HbA1c levels, but results were heavily influenced by one trial. Evidence-based approaches for improving the effectiveness of lifestyle-based interventions in type 2 diabetes are needed, along with future studies reporting on maintenance and cost effectiveness (Trinova et al., 2015).* Pinhas - Hamiel emphasizes overweight but not obesity was more prevalent in women with T1DM. Metabolic syndrome and its components were more prevalent among overweight and obese individuals with T1DM than among normal weight individuals (Pinhas - Hamiel et al. 2014). Zhu says type 2 diabetes among schoolaged children was still low in Tianjin, China. However, Type 2 diabetes related factors were very common, especially overweight and obesity (Zhu et al. 2013). All of these researchers confirm there is correlation between obesity and type 2 diabetes. The high rate of overweight and obesity (31.8%) emphasize the need for developing further strategies to prevent and treat excess fat accumulation in T1D (Maffeis et al., 2018).

Type 2 diabetes among school-aged children was still low in Tianjin, China. However, Type 2 diabetes-related factors were very common, especially obesity and obesity (Zhu et al., 2013).

T1DM. Metabolic syndrome and its components were more prevalent among overweight and obese individuals with T1DM than among normal weight individuals (Orit Pinhas et al., 2014).

As Saunders et al. (2000) contends that a research is valid If only it actually studies what is set out to study if only the findings are verifiable. Saunders et al. (2000) explains, construct validity entails the establishing accurate operational measurements for the research's core concept. This is done by establishing a chain of evidence throughout the data collection process; by verifying key information through the use of multiple sources of information; and presented information's with a draft of the study for review. Fortunately, the data of this study collect from patients referred nutrition ward directly and recorded in paper as well as in computer and data is accessible any time, and several times the validity of the research was tested.

<sup>7</sup> <http://www.diabetes.org/>

## Analysis:

From the findings of the study it emerges that: The BMI (Body Mass Index) was calculated based on the weight and height and obesity and overweight were defined based on BMI score using CDC chart. SPSS (VER 20) was used for statistical data analysis. Chi-square test was used for analysis. Value under 5% included significant. The findings indicated that mean body index (BMI) in overweight samples were  $27.8 \pm 1.3$  in females and  $27.2 \pm 1.1$  in male samples, namely BMI in females samples is greater than males. In obese sample mean BMI  $34.1 \pm 2.5$  and  $32.9 \pm 1.8$  in females and males in order. 4 samples had BMI more than  $40 \text{ kg/m}^2$ , in this study wholly BMI greater than  $40 \text{ kg/m}^2$  were females, mean BMI of extremely obese people were  $43.0 \pm 1.3$ . Mean BMI of normal weight samples were  $21.9 \pm 1.6$  and under weight mean BMI were  $17.3 \pm 0.7$ . The details is showed in table 1. Meanwhile some idioms must explain clearly:

Underweight: is defined by BMI of less than or equal 18.5

And Normal weight: is defined by BMI of 18.5 .0 to 24.9

Overweight: namely BMI of 25.0 to 29.9

**Obese: according to WHO criteria is BMI of 30.0 to 39.9**

**Extremely obese: the BMI of greater than 40 or equal is defined as extremely obese**

The mentioned definitions are accepted by many health organizations such as: WHO, FAO, et cetera. Although may be to use other criteria for the mentioned idioms. the following tables and figures from NO: 4.1 the findings presents in the tables and figures. In the next pages risk factors associated with obesity and overweight such as age, gender, education and BMI has been discussed.

Table 1- Prevalence of obesity t and overweight by mean BMI and sex

Case	BMI	Frequency	Percent	Cumulative Percent	Mean BMI	
					F	M
Over weight	$25 \leq \text{BMI} < 29.9$	30	35.7142	35.7142	$27.8 \pm 1.3$	$27.2 \pm 1.1$
<b>Obese</b>	<b><math>30 \leq \text{BMI} &lt; 39.9</math></b>	<b>32</b>	<b>38.0952</b>	<b>73.8094</b>	<b><math>34.1 \pm 2.5</math></b>	<b><math>32.9 \pm 1.8</math></b>
<b>Extremely Obese</b>	<b><math>\text{BMI} \geq 40</math></b>	<b>4</b>	<b>4.7619</b>	<b>78.5713</b>	<b><math>43.0 \pm 1.3</math></b>	<b>0</b>
Normal weight	$18.5 \text{ BMI} \leq 24.9$	8	9.5238	88.0951	$21.9 \pm 1.6$	$22.3 \pm 1.8$
Under weight	$\text{BMI} < 18.5$	2	2.3809	90.476	$17.3 \pm 0.7$	0
Other	This group is not included the BMI definition	8	9.5238	100	$15.2 \pm 2$	$15.0 \pm 0.8$
Total	-	84	100	-	-	-

Data are mean  $\pm$  SE and  $P < 0.05$

\* Data was analyzed by SPSS20 by chi-square test and  $p < 0.05$  was considered significant level.

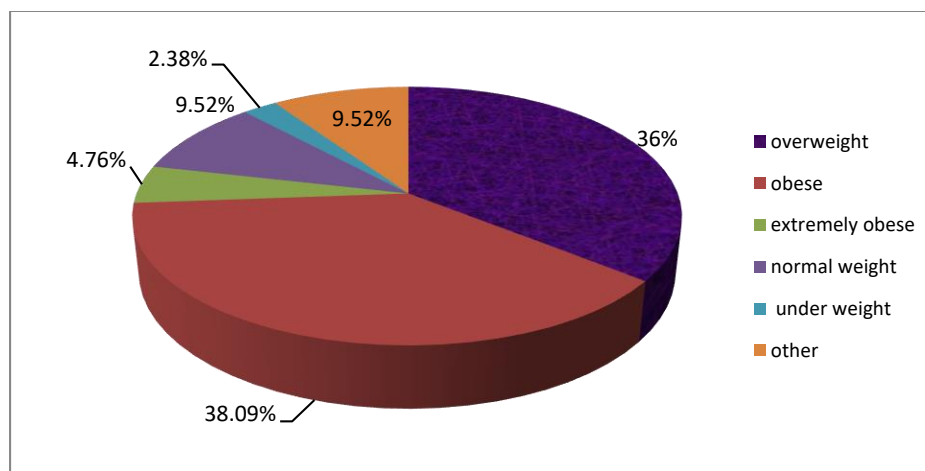


Figure 1- Percentage distribution of Samples referred nutrition ward by BMI Status

As you see in figure 1 according to the finding about 38.09% of subjects were obese, and 4.76% of subjects were extremely obese and 36% of subjects were overweight. Meanwhile only 9.52% samples had normal weight and 2.38% of persons had underweight and 9.52% of samples included other group. The number of obese people was 36 people, 42.857% of the samples included. As that showed in table 2 under 18 years old age included 2 people namely 2.38% of samples. Aged between 18–30 years, 7 males people were obese, namely 8.232% of samples. Aged between 30–60 were 24 people, namely 28.571% of sample, therefore most of obese were at this group.

Aged greater than 60 years old age included 3 females namely 3.592% of samples. In my opinion about obesity is worse than overweight because whatever was said about overweight is verity about obese. In this study we detect more details about obesity. Under 18 years old persons were 2 (2.360%) of sample and frequency female and male were equal. This study was not about adolescents. Age between 18–30 years old people were 7 (8.332%) sample, so that percent of female were 5.952 and male were 2.38. Age between 30–60 years old persons

were 24(28.751%) of samples that 22.619% of samples were female and 5.952% of samples were male. The highest prevalence of obesity was seen in this age group. The detail of the mentioned matters is presented at the table 2 and figure 2.

Table 2- Age-Adjusted prevalence of obesity by sex

Obese Age	Sex			
	F		M	
	Frequency	Percent	Frequency	Percent
<18years old	1	1.190	1	1.190
18-30years old	5	5.952	2	2.380
30-60years old	19	22.619	5	5.952
>60years old	3	3.571	0	0
Total	28	33.33	8	9.523

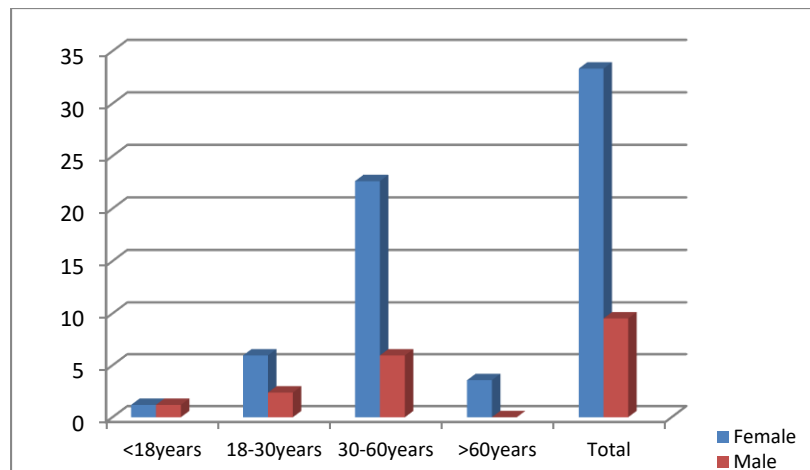


Figure 2: Chart of obesity among samples by age and sex

Table 3- percentage distribution among obese subjects by sex and education status

obese	Case	sex			
		F		M	
		Frequency	Percent	Frequency	Percent
	Did not complete high school	12	14.28	4	4.76
	High school degree	7	8.33	2	2.380
	A.A degree	1	1.190	1	1.190
	B.S degree	8	9.52	1	1.190
	M.S& Dr. degree	0	0	0	0
Total		28	33.32	8	9.52

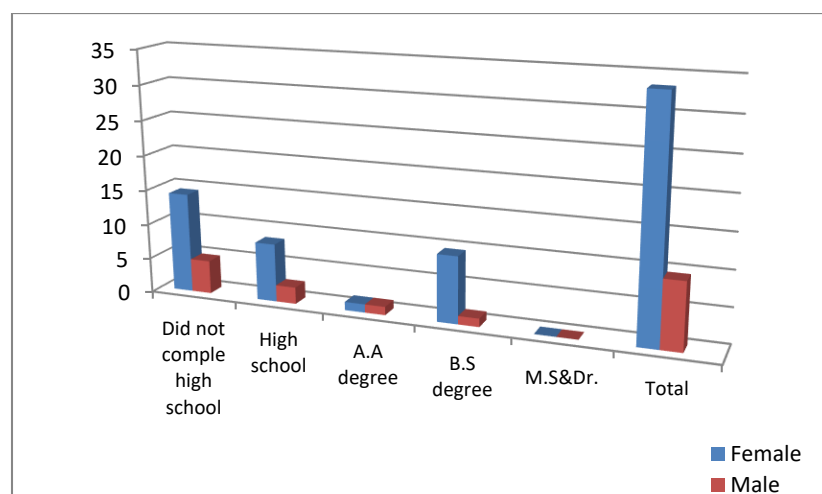


Figure 3: chart of obesity subjects by sex and education status

The number of diabetic people was 14 people, 16.6% of the samples included:

As shows the tables and figures from NO: 4to 6 the following:

Totally 16.66% of samples were diabetic only 2

people (2.38%) of diabetic person had normal weight.

6people (7.14%) of diabetic person were overweight.

6people (7.14%) of diabetic person were obese.

Totally, 85.71 percent of diabetic persons were obese or overweight.

5 people (5.95%) of diabetic persons were aged between 30 - 60 years.

9 people (10.71%) of diabetic persons had age over 60 years.

Only 2 people (2.38%) of diabetic person had high education.

12 diabetic people (14.28%) of diabetic persons did not complete high school degree and considering the 16.66% from the wholly that is means that 87.5% of diabetic persons had low education.

So, Aging, obesity, low education, female sex, low income, are factors for suffering diabetes in worldwide. Our findings are agreed with international reports, namely; aging, obesity or overweight, female sex, and low education were factors for suffering diabetes in this study.

The prevalence of obesity was higher among older women compared with younger women.

Table 4- percentage distribution among diabetic subjects by sex and BMI status

Diabetic samples case	F		M	
	Frequency	Percent	Frequency	Percent
Underweight	0	0%	0	0%
Normal weight	1	1.19	1	1.19
Overweight	5	5.95	1	1.19
obese	5	5.95	1	1.19
Total	11	13.09	3	3.57

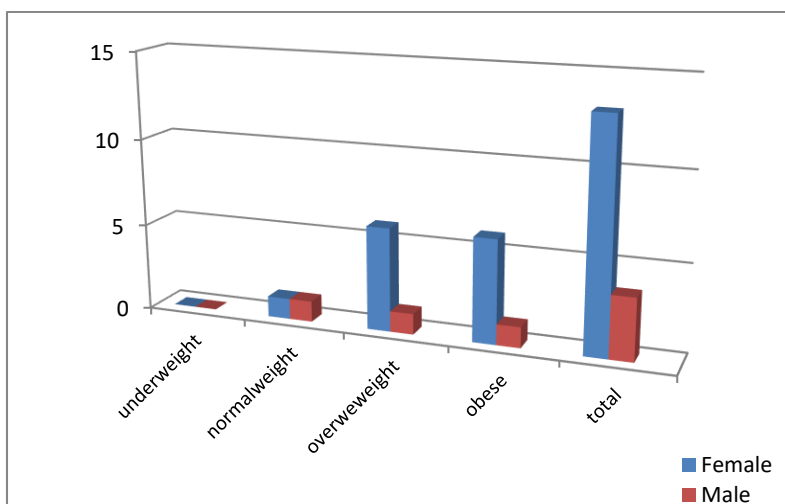
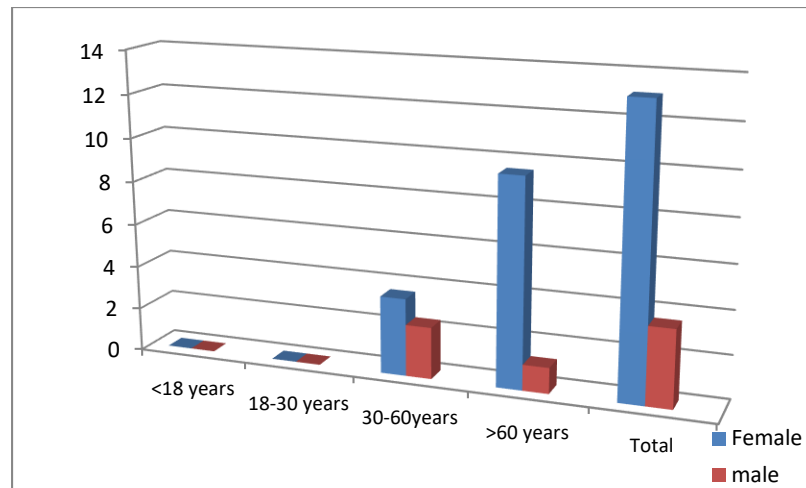


Figure 4: chart of diabetic subjects by sex and BMI status

Table 5: Age-Adjusted prevalence of diabetic samples by sex

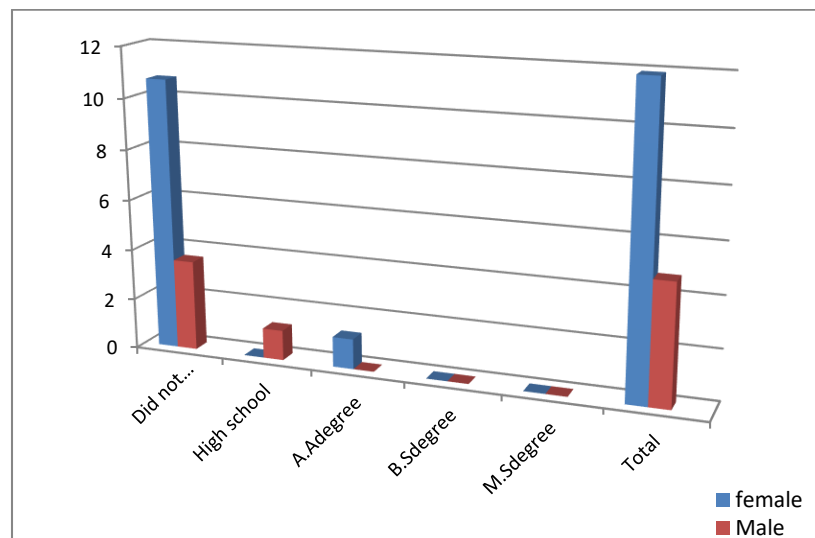
Diabetic samples Age	Sex			
	F		M	
	Frequency	percent	Frequency	percent
<18year old	0	0%	0	0%
18-30years old	0	0%	0	0%
30-60years old	3	3.57	2	2.38
+60years old	8	9.52	1	1.190
Total	11	13.09	3	3.57



**Figure 5:** chart of diabetic samples by age and sex

Table 6- Percentage distribution among diabetic subjects by sex and education status

Case	Education	Sex			
		Female		Male	
		Frequency	Percent	Frequency	Percent
	Did not complete high school	9	10.71	3	3.57
	High school degree	0	0	1	1.190
	A.A degree	1	1.190	0	0
	B.S degree	0	0	0	0
	M.S &Dr.	0	0	0	0
Total	-	10	11.9	4	4.76



**Figure 6:** chart of diabetic samples by educational status and sex

## Results

The data analysis determined statistically significant associations for obesity & overweight with the prevalence of type II diabetes and relatively high prevalence of overweight, obesity and diabetes in this city so that; 38.09 percent samples were obese. 4.76% of the samples was extremely obese; altogether 42.85% of samples were obese and 35.70% of our samples had overweight and. 9.5% of subjects had normal weight and 2.38% of subjects were underweight. 16.66% of samples were diabetic. The main point was that 71.42 percent of diabetic people were obese or overweight. Meanwhile 78.57% of diabetic persons were female and 85.71% of diabetic people

did not complete high school. The BMI of female obese cases was  $34.1 \pm 2.5$  and the mean BMI of male obese was  $32.9 \pm 1.8$ . The mean BMI of extremely obese subjects was  $43.0 \pm 1.3$  and mean BMI of female overweight subjects was  $27.8 \pm 1.3$  and the mean BMI of male overweight samples was  $27.2 \pm 1.1$ .

## Conclusion:

Both, obesity and overweight are associated with the incidence of multiple comorbidities including type II diabetes. Low education, female sex, increasing age, and increasing BMI are risk factors for suffering to obesity, overweight and diabetes. Maintenance of a healthy weight and healthy diet could be important in the prevention of the large disease burden in the future.

The prevalence of obesity in subjects was some higher than other studies that were done before in this like community. Hypo activity and intake of high calorie foods are main risk factor for obesity.

Totally, the rate of obesity growth is increasing in Iran, while the obesity rate is higher in females than in males. The rate of obesity prevalence is directly related to increasing age. To identify risk factors related to obesity in different parts of Iran, a comprehensive screening study with a unique instruction and diagnostic method, considering different races is necessary.

As other studies such as north of Iran suggested that Alarming rate of obesity investigated in the north of Iran. As wholly obesity rate has a decreasing and increasing trend in urban and rural area, respectively. Associated factors resulted to this change need to be considering in future studies and national action are needed to reduce the obesity.

This study also showed significant positive correlation between body mass indexes with prevalence of diabetes so that 71.42 percent of diabetic patients were obese or overweight. Meanwhile increasing age, females married, less educated people are more like to suffer from obesity and overweight and diabetes.

This study showed that the prevalence of diabetes, obesity and overweight is relatively high in this city and remains a major health problem at the national level should be considered especially in women. Alarming rate of obesity and diabetes in this city agree with Iranian's prevalence of obesity and diabetes however the prevalence is somehow high. Any case that national action is needed to reduce the obesity and diabetes.

The prevalence of obesity is not restricted to development countries but also underdevelopment and developing countries have the problem of increasing obesity. Based on who report, in 2005, 1.6 billion of adults over 15 years were overweight least 400 million were obese. W.H. O's report emerge that one of the ten were afflicted with obesity.

Although the prevalence of diabetes is relatively high in this city, fortunately at compared with countries like Kuwait. (34.1%) is low

The prevalence of overweight was reported in Iranian men and women 54% and 70% respectively in the year of 2005 by W.H.O.

The prevalence of obesity increases to 2.3 billion by 2015, namely equivalent the population of china, U.S.A, EU.

NHANESIII reported the followings in U.S.A:

Overweight over than 58 million.

Obesity over than 40 million

Over than 3 million extremely obese, based on the mentioned report the prevalence of obesity in adults from %15 in 1980 increased to 23% in 1994 and increased to 27% 1999.

Both overweight and obesity is associated with type II diabetes, cancer, and cardiovascular disease and some chronic disease. Maintenance of a healthy weight could be important in the prevention of the large disease burden in the future

Statistically significant association with obesity were found with the incidence of type II diabetes, all cancers except esophageal and prostate cancer, all cardiovascular disease, asthma, gallbladder disease, osteoarthritis and chronic back pain.

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