DIABETES TYPE 2 AND OBESITY
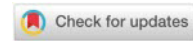
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Abstract: Diabetes mellitus type 2 is a socially significant disease, which etiologically and pathogenetically is to the greatest extent influenced by body weight. Obesity has become a pandemic of our time. It is most often caused by the imbalance between energy intake and energy expenditure. Excess calories accumulate as fat. In patients with DM type 2, obesity further increases the risk of atherosclerosis, ischemic heart disease, cerebrovascular disease, arterial hypertension, hepatic steatosis, chronic kidney disease, increased mortality. The aim of the present analysis is to determine the frequency of patients with type 2 DM 170 patients with DM type-2 were studied. Of them, 77 with a relative share of 45.% are men, 93 are women, who make up 54.7%. The method of calculating the body mass index, which serves to assess the physical condition of the patients, was applied. After processing the data, it was found that 4.4% of the patients had a normal body weight, 26.5% were overweight, 1st degree obesity - 34.7%, 2nd degree obesity - 20.3% and with obesity of the 3rd degree are 14.1% of the studied patients. Obesity is a serious metabolic disorder that harbors multiple health risk factors that may reduce quality and life expectancy among patients with type-2 DM.
Keywords: diabetes mellitus type 2, obesity, frequency
Field: Medical Sciences and Health

1. INTRODUCTION

Obesity is an epidemic metabolic disease and a leading cause of death and disability in Europe and worldwide. It is a leading cause of the appearance of a number of risk factors and chronic diseases such as hypertension, dyslipidemia, type 2 diabetes, which cause cardiovascular complications, increased risk of a number of carcinomas and high opacity. According to the WHO definition, obesity is a heterogeneous multifactorial syndrome of excessive deposition of adipose tissue in the body, which adversely affects health. (Borisova, A.M. ,2019)

The diagnosis of obesity is easy - easy weight measurement. However, judging the degree of obesity by comparing it to the ideal weight for sex, age and height is not a good indicator, as it cannot distinguish the amount of fat tissue from muscle mass. To assess obesity today, the body mass index - BMI is most often used, which is equal to weight in kilograms divided by height in meters squared BMI = kg/m2. Based on the BMI value, the degrees of obesity are determined:

-underweight- BMI - below 18.5 kg/m2
- desired weight - BMI - from 18.5 kg/m2 to 24.9 kg/m2
- overweight - BMI - from 25 kg/m2 to 29.9 kg/m2
-obesity 1st degree- BMI - from 30.0 kg/m2 to 34.9 kg/m2, obesity 2nd degree- BMI - from 35.0 kg/m2 to 39.9 kg/m2, obesity 3- th degree - BMI - over 40.0 kg/m2 (Dimitrakov,D. ,2006)

Anthropometric estimation of body fat percentage is a more accurate measure of obesity than BMI. (De Lorenzo,A. ,2016)

Obesity is a chronic medical condition and a known risk factor for developing type-2 diabetes. In patients diagnosed with overweight or obesity and type-2 DM, treatment begins with changing lifestyle risk factors. (Powers, MA. ,2020)

The main manifestation of diabetes mellitus is elevated blood sugar. It is the result of insufficient production of insulin or inefficient use of insulin by peripheral tissues due to insulin resistance, which leads to increased levels of fatty acids. Hyperglycemia results from decreased glucose transport in muscle cells, increased fat breakdown, and increased glucose production in the liver. At the root of the increased prevalence of type 2 diabetes is obesity. (Røder, M.E et all.,1998)

Most patients with type 2 diabetes are obese, with abnormal distribution of body fat and a high percentage of body fat. This is related to the pathophysiology of diabetes. Insulin resistance is exacerbated by the release of free adipose xelins from adipose tissue.(Goyal, R.et all.,2023)

A BMI over 29.9 kg/m 2 appears to be a factor increasing the relative risk of developing type 2 DM. This risk is 4.6 times higher in women and 3.5 times higher in men, compared to their peers of the same sex with a BMI below 24.9 kg/m 2. (Field, A.E.et all.,2001)

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A decisive factor in triggering type 2 diabetes is the type of body fat distribution, which is independent of the degree of obesity. (D'Adamo, E.,2011)

A study has also established the relationship between the incidence of obesity and type 2 diabetes. It turns out that obese men have a seven times higher risk of developing type 2 diabetes compared to those without obesity. In women, this risk increases by twelve times..(Boden, G.et all.,1999)   Patients with diabetes mellitus type 2 and obesity in which a weight loss regimen is included appear to have better glycemic control. This emphasizes the close relationship between obesity and diabetes mellitus type 2.(Wilding, J.P.,2014)

Reducing body weight at the expense of adipose tissue appears to be an effective strategy for reducing complications and comorbidities among patients with type 2 diabetes. A moderate weight reduction of 5 to 10% appears to be sufficient to normalize blood pressure, improve glycemic control and increase in non-atherogenic HDL cholesterol levels. Gradual weight reduction leads to a decrease in adipocyte size, which regulates mechanisms and pathways involved in lipogenesis and oxidative stress. (Wing, R.R.and all.,2011)

Given the association between obesity and type 2 DM, appropriate antidiabetic treatment for obese and diabetic patients should focus on preventing further weight gain while using glucose-lowering agents that maintain weight loss.(Leitner, D.R.and all.,2017)

Among patients with type 2 diabetes mellitus, those with comorbid obesity were significantly more likely to have nephropathy, neuropathy, cardiovascular disease, peripheral vascular disease, and metabolic disease.(Boye KS and all.,2020)

Both obesity and type 2 diabetes are major risk factors for cardiovascular disease.

(Atlanta,2022)   Weight loss can have profound therapeutic effects on metabolic function, type 2 diabetes, and diabetes comorbidities.(Cohen et all.,2020)

2. MATERIAL AND METHODS

The purpose of the present analysis is to determine the prevalence of overweight and obesity as an independent cardiovascular risk factor among patients with type 2 diabetes mellitus. To achieve the set goal, the following task was decided: to examine the socio-demographic profile of the patients and their health status.

One hundred and seventy patients with type 2 diabetes mellitus were studied. All available medical records of the patients were used. The results were processed using the statistical package SPSS22. An Independent Samples T-test was applied for the analysis of hypotheses comparing two means of independent samples. With this test, the statistically significant differences between the mean values of the indicators with a high degree of statistical significance (Sig. (2-tailed) < α = 0.05) are established. This analysis was applied to compare anthropometric indicators (height, weight, waist size and BMI)

The method of calculating the body mass index (BMI - Body Mass Index) was also applied, which serves to assess the physical development of the patients. The comparative analysis and assessment of the physical development of patients according to the indicators of height, weight, waist size and BMI, according to this method.

3. RESULTS

170 patients were studied. Of them, 77 with a relative share of 45.3% are men, and 93, making up 54.7%, are women.

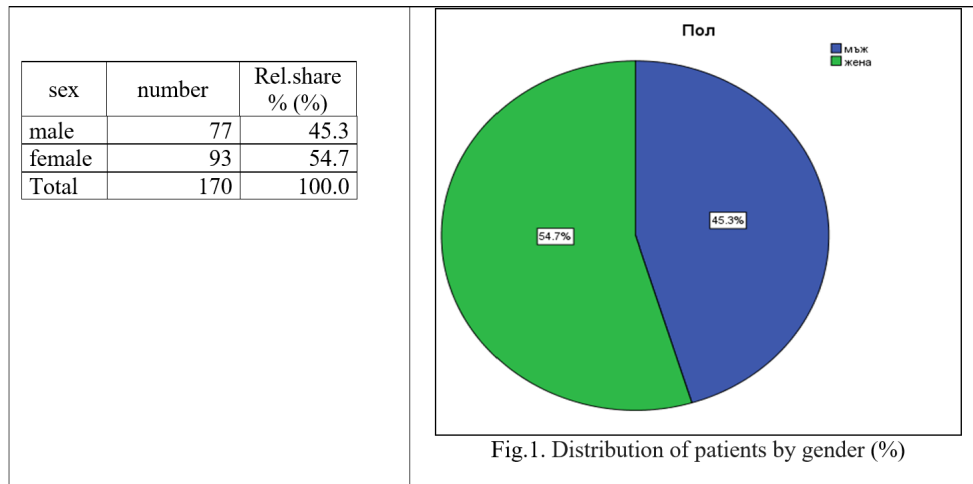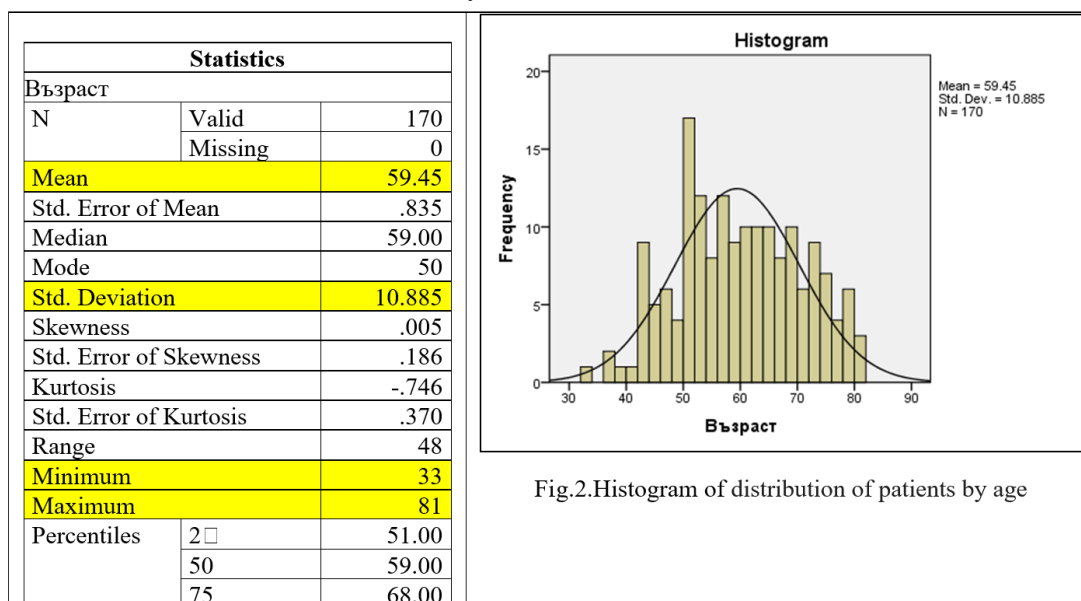| sex	number	Rel.share % (%)
male	77	45.3
female	93	54.7
Total	170	100.0

Fig.1. Distribution of patients by gender (%)

Table1. Distribution of patients by gender

The patients were aged from 33 to 81 years, with the average age being 59.45±10.89 years. The most common age is Mode = 50 years, and the median, which characterizes the average age for 50% of the ordered statistical series, is Median = 59 years.

Statistics		
Възраст		
N	Valid	170
	Missing	0
Mean		59.45
Std. Error of Mean		.835
Median		59.00
Mode		50
Std. Deviation		10.885
Skewness		.005
Std. Error of Skewness		.186
Kurtosis		-.746
Std. Error of Kurtosis		.370
Range		48
Minimum		33
Maximum		81
Percentiles	2□	51.00
	50	59.00
	75	68.00

Fig.2.Histogram of distribution of patients by age

Source: Author

The distribution of patients by age shows that it is similar to a normal Gaussian distribution, as the coefficient of skewness is Skewmess = 0.005. This distribution has a blunt kurtosis (peak skewness) whose peak is below the peak of the normal distribution defined by the Kurtosis coefficient = - 0.746. The quartile values show that for 25% of the patients the average age is 51 years, for 50% and 75% of them – 59 and 68 years, respectively.

The analysis of the anthropometric indicators shows that the height of the patients varies from 150 to 193 cm, and the average height is 168.55±8.767 cm. The weight varies widely from 52 kg to 185 kg, with the average weight being 96.44±21.612 kg. The size of the waist is from 60 to 144 cm with an average value of 106.84 ± 14.457 cm. BMI varies widely - from 20.31 to 58.54, and its average value is above the norm - 34.101 ± 6.425.

BMI assessment shows that only 15 patients (4.4%) are in the normal range [18.5 – 24.99]. The rest were overweight and various degrees of obesity.

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Table 3. BMI assessment

Indicators:	Total (170 patients)
18.5 – 24.99 normal	15 (4.4%)
25.0 – 29.99 overweight	90 (26.5%)
30.0 - 34.99 obesity I-degree	118 (34.7%)
35.0 – 39.99 obesityII- degree	69 (20.3%)
>= 40 obesity III-degree	48 (14.1%)
Total:	170 (100.0%)

Source: Author

There are 90 patients (26.5%) who are overweight [25.0-29.99], and a little more than a third - 118 (34.7%) - with congestion of the first degree [30.0-34.99]. Obesity of the II degree [35.0 – 39.99] was observed in 69 patients (20.3%), and obesity of the III degree (BMI over 40) had 48 patients (14.1%).

Fig.3 BMI assessment
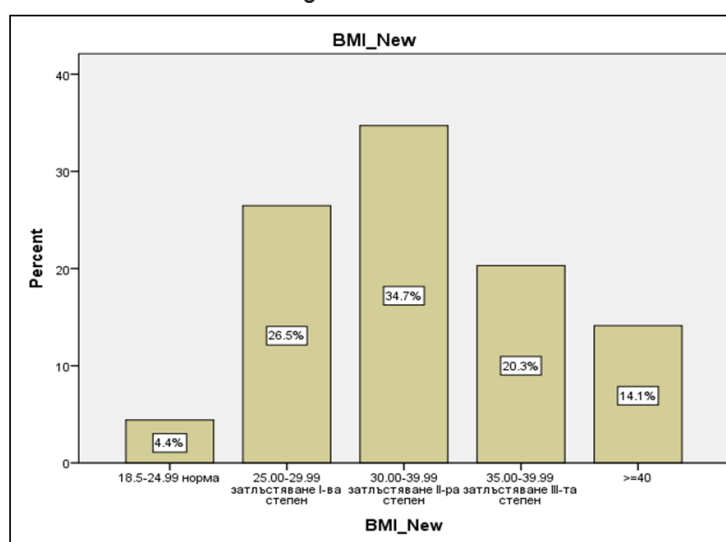
Source: Author

4. DISCUSSION

Overweight and obesity as an independent cardiovascular risk factor appear to be common among patients with type 2 diabetes and can lead to a number of clinical consequences by increasing the oxidative stress of the body. Screening for type-2 diabetes mellitus is indicated in all obese patients.

Considering the above data, we are obliged to focus on the necessity of early screening, identification and timely treatment of overweight and obese patients with appropriate classes of antidiabetic drugs.

Obesity is a common risk factor for type 2 DM. Treatment of obesity is central to the successful management and control of type-2 DM, to treat both conditions. Studying in detail the multiple relationships between obesity and type 2 diabetes would be central to the clinician's therapeutic success.

The current analysis also has some serious limitations such as the small number of patients studied.

5. CONCLUSION

Although further research is needed to confirm the results, the findings of this study suggest that treatments that help reduce weight in adults with T2D, particularly those who are obese, may have significant health benefits.

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