

Prevalence of Obesity and its Relationship with the Presence of Type 2 Diabetes

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Abstract

Aim: The aim of the present article was to identify the prevalence of obesity and to evaluate the relationship between body mass index, waist circumference and fasting plasma glucose in a sample of Romanian patients from general population. *Material and method:* The study sample consisted in 2200 patients care aged 25 years or older who gave their participation consent. The study was carried out on patients in primary care in Gorj County. *Results:* According to BMI, 19.5% of study participants had obesity (BMI ≥ 30 kg/m²) and 28.2% were overweight (BMI = 25-29.99 kg/m²). Prevalence of both condition was lower in patients < 40 years of age (18% of patients had overweight and 8.1% had obesity) and increased with age. Prevalence of type 2 diabetes was 6% (132 persons), and 4% (88 persons) of the study group presented impaired fasting glucose or impaired glucose tolerance. When the prevalence was analyzed according to the BMI, obese patients had significantly higher prevalence of type 2 diabetes compared with overweight patients and normal weight patients ($p < 0.001$). The same tendency was observed for impaired fasting glucose and impaired glucose tolerance ($p < 0.001$). There was a positive correlation between BMI and fasting plasma glucose and between waist circumference and fasting plasma glucose. *Conclusion:* A high prevalence of overweight and obesity in the Romanian population from Gorj County was identified.

Keywords: Obesity; Prevalence; Type 2 diabetes.

Introduction

The prevalence of type 2 diabetes is rapidly increasing worldwide. This phenomenon is resulting from the epidemic proportions reached by obesity, and especially abdominal obesity, in various populations of the world [1]. According to numerous studies, obesity is an important risk factor for insulin resistance, diabetes and cardiovascular diseases in both men and women, across different ethnic groups [2-5].

The aim of the present article was to identify the prevalence of obesity and to evaluate the relationship between body mass index, waist circumference and fasting plasma glucose in a sample of Romanian patients from general population.

Material and Methods

Study Population and Data Collection

Persons randomly selected from primary care, aged 25 years or older, were included in this study. The study protocol was previously described [6]. Between November 2007 and December 2008, every day the first 2 adult patients presenting for a consultation at their family physicians were invited to participate in the study. In the research were included only patients that agreed to participate. Were involved in the study 20 family physicians from Gorj County. Clinical, anthropometric characteristics and laboratory investigation results were assessed, as well as smoking status.

The following data were collected:

- Age (years)
- Sex
- Laboratory investigation: fasting plasma glucose (normal values: < 110 mg/dl)
- Weight (kg), height (m), waist (cm)
- Personal history of dysglycemia (type 2 diabetes mellitus, impaired fasting glucose or impaired glucose tolerance).

Type 2 diabetes was defined according to World Health Organization criteria [7]. Body mass index (BMI) was calculated using the formula: weight (kg)/ height (m)². According to BMI patients were categorized as normal weight (BMI < 25 kg/m²), overweight (BMI = 25-29.99 kg/m²) and with obesity (BMI ≥ 30 kg/m²).

The research was conducted in accordance with the guidelines in The Declaration of Helsinki and the local medical ethical committee approved the study protocol.

Statistical Analysis

SPSS-PC 13.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Skewness and kurtosis were used to test the normal distribution of the variables. Waist, BMI and glucose plasma values displayed a normal distribution.

Results were reported as means and standard deviation for continuous variables and % for dichotomous data. *T-test* and χ^2 test were used to compare data. Bivariate correlations were used in order to evaluate the relationship between plasma glucose, BMI and waist. Because all variables showed a normal distribution, Pearson correlation coefficients were calculated. A p-value of less than 0.05 was considered statistically significant.

Results

In the research were included 2200 persons (1232 women and 968 men). According to BMI, 19.5% had obesity (BMI ≥ 30 kg/m²) and 28.2% had overweight (BMI = 25-29.99 kg/m²) (Figure 1).

Prevalence was analyzed according to the sex of the study participants. Prevalence of both overweight and obesity was significantly higher in men compared with women (χ^2 test, $p < 0.001$).

Also, prevalence of overweight and obesity was analyzed according to participant's age. Prevalence of both conditions was lower in patients < 40 years of age (18% of patients had overweight and 8.1% had obesity) and increased with age: prevalence of overweight was 29.3% in age group 40-59 years and 35.6% in participants aged ≥ 60 years. Prevalence of obesity was 25.2% in age group 40-59 years and 21.8% in participants aged ≥ 60 years.

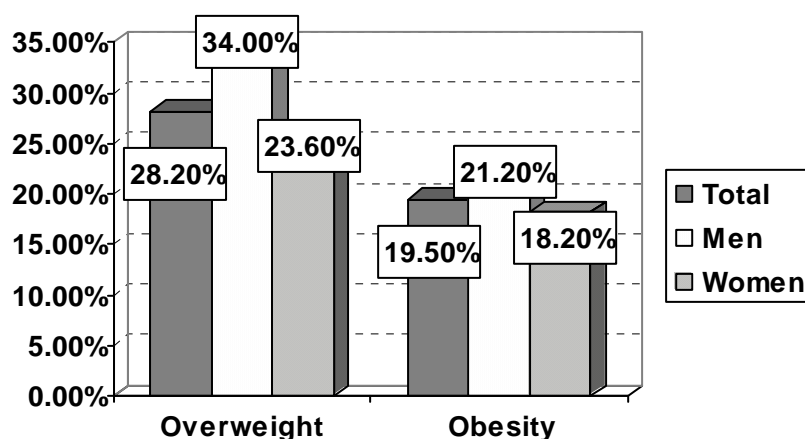


Figure 1. Prevalence of overweight and obesity in the study sample

Clinical characteristics of participants according to their BMI were summarized in Table 1.

Table 1. Characteristics of study participants according to their BMI

	Normal weight (n=1151)	Overweight (n=620)	Obesity (n=429)	P
Women - No(%)	718 (62.4%)	291 (46.9%)	224 (52.2%)	<0.001
Age (years)	46.4±14.5	52.7±13.8	52.7±11.6	0.06
Personal history of diabetes - No (%)	19 (1.7%)	41 (6.6%)	73 (20.2%)	<0.001
Personal history of IGT or IFG - No (%)	31 (2.7%)	24 (3.9%)	34 (7.9%)	<0.001
Waist circumference (cm)	82.6±10.1	94.9±8.1	103.1±10.4	<0.001
Fasting plasma glucose (mg/dl)	95.7±10.2	108.3±30.5	111.1±27.5	<0.001

IGT – impaired glucose tolerance, IFG - impaired fasting glucose; No – number.

Data is shown as mean ± SD for continuous variables and % for dichotomous variables.

Prevalence of type 2 diabetes was 6% (132 persons), and 4% (88 persons) of the study group presented impaired fasting glucose or impaired glucose tolerance. When the prevalence was analyzed according to their BMI, patients with obesity had significantly higher prevalence of type 2 diabetes compared with patients with overweight and normal weight ($p < 0.001$). The same tendency was observed for impaired fasting glucose and impaired glucose tolerance ($p < 0.001$).

In order to evaluate the relationship between the fasting plasma glucose, BMI and waist circumference, Pearson correlation coefficients were calculated (Table 2). As it can be seen there is a positive correlation between BMI and fasting plasma glucose and between waist circumference and fasting plasma glucose.

Table 2. Correlation coefficients of plasma glucose, with BMI and waist

Parameter	Pearson correlation coefficients	p
BMI (body mass index) (kg/m^2)	0.28	<0.001
Waist circumference (cm)	0.26	<0.001

Discussion

Obesity prevalence is increasing all across the world and has become a general public health issue. The main finding of the present article is the increased prevalence of overweight and obesity in this sample from the general population. Also, we demonstrated that the prevalence of type 2 diabetes impaired fasting glucose and impaired glucose tolerance increased in parallel with BMI value. Another finding is the positive correlation between BMI, waist circumference and fasting plasma glucose.

These results are in concordance with previous epidemiological data available from Romania. In an article published in 2007 by Cinteza and collaborators [8], were analyzed 3124 individuals aged between 18-85 years. They found a prevalence of obesity of 26.3%. This slightly higher prevalence could be explained by the study sample that was older than in the present study (51 ± 15 years) and had a higher proportion of women participants (61% compared with 56% in our study). Similar results were reported also for the SEPHAR population (24 %) [9].

Regarding the prevalence of type 2 diabetes we found a prevalence of 6%. This is similar to the prevalence reported by authors of the SEPHAR study that also included Romanian patients from general population [9]. Cinteza et al reported a prevalence of 11% that is higher than what we found in this report [8]. This could be again explained by the differences in populations included in the studies.

In the present article was also demonstrated that the increase in BMI is associated with an increase in the prevalence of type 2 diabetes. These results are in accordance with two surveys (SHIELD and NHANES) that showed that the prevalence of diabetes mellitus increased in an observable, linear fashion as BMI levels increased [10].

Conclusion

There is a high prevalence of overweight and obesity in the Romanian population from Gorj County. There could be important from the point of view of future preventions strategies both of obesity, but also in prevention of type 2 diabetes and cardiovascular diseases.

Ethical Issues

The research was conducted in accordance with the guidelines in The Declaration of Helsinki and the Local Medical Ethical Committee approved the study protocol.

Conflict of Interest

The author declares that there is no conflict of interest.

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