THE INCIDENCE OF OBESITY AND EVOLUTION OF WEIGHT STATUS IN PATIENTS WITH TYPE 2 DIABETES, DIABETIC CARDIOMIOPATHY AND/OR DIABETIC KIDNEY DISEASE

Moca Mădălina*

*University of Oradea, Faculty of Medicine and Farmacy, 37 Republicii Street, Oradea, Postal Code 410167, România, e-mail: missy_madalina@yahoo.com

Abstract

Obesity is an independent predictor of risk factors and morbidity of obesity related diseases such as type 2 diabetes, hypertension, dyslipidaemia and cardiovascular diseases. Waist circumference is a valuable additional alternative method in identifying individuals at increased risk and it is an approximate index of intra-abdominal fat mass. In this study we followed the evolution of weight status of diabetics with or without chronic complications associated, to see if there is any link between obesity and chronic complications.

The present study is realized between 2010 - 2011, on a number of 255 diabetics with and without diabetic cardiomyopathy or diabetic kidney disease.We followed index body mass and waist circumference and we note that there were significant differences between the 4 groups in terms of the evolution of weight status, most changes were observed at patients with diabetic cardiomiopathy and diabetic kidney disease.

Keywords: type 2 diabetes, diabetic cardiomiopathy, diabetic kidney disease, obesity.

INTRODUCTION

Obesity represents a real danger, by decreasing life expectancy and by the diseases that she cause and the most important diseases through their vital consequences are cardiovascular disease, artherial hypertension and type 2 diabetes (Serban V. et al, 2011).

Cardiovascular diseases recognize obesity as a major risk factor, the risk of these diseases is being increased by the presence of high blood cholesterol and association with type 2 diabetes and artherial hypertension (Bala C. et al, 2009, Serban V. et al, 2011).

The prevalence of type 2 diabetes has increased over the past decade in most countries in the world, reaching a true scale epidemics (Alberti K.G.M.M., Zimmet P.Z., 1998), a real reason being the association with obesity, and the most affected countries are those in developing countries (Wild S. et al, 2004, Zimmet P. et al, 2000). For this reason, investigations to detect type 2 diabetes in asymptomatic people should consider overweight or obese adults (body mass index - BMI greater than/or equal to 25 kg/m2), regardless of age, who have one or more additional risk factors for diabetes (Serban V. et al, 2010, ADA, 2010).

The interrelation between diabetes and obesity appears to be due to a genetic susceptibility. There is a multiorgan determination due to a insulin

resistance in peripheral tissues and alteration of pancreatic cell function. Insulin resistance and growth hormone plasma levels are closely correlated with increased adipocytes dimensions, not with total weight adipose tissue (Bjorklund A., G. Yaney, G.D. McGarrz, 1997, Hâncu N., I.A. Vereşiu, 1999). Therefore, with weight loss and return to normal size of adipocytes, changes are reversibile. Diabetogenic effect of obesity depends of fat distribution backup. Central obesity, with excessive accumulation of abdominal fat is more closely correlated with diabetes and other metabolic disorders than peripheral obesity. Factors which increase peripheral insulin resistance are increased plasma levels of free fatty acids, increased hepatic glucose production, increased secretion of TNF-a, hepatic gluconeogenesis, glucose intolerance, hypertriglyceridemia, increased LDL associated with decreased HDL, atherosclerosis, hypertension and diabetes (Powers A.C., 2008, Cheța D.M., 1999).

In conclusion, there is a strong relationship between obesity and type 2 diabetes meaning that obesity is a major risk factor for type 2 diabetes, and on the other hand, over 70% of patients with type 2 diabetes are obese (DeFronzo R.A., L. Mandarino, E. Ferrannini, 2009, Ionescu-Tîrgovişte C., R. Lichiardopol, C. Guja, 2007).

MATERIAL AND METHODS

The present study is realized between 2010 - 2011, on a number of 255 patients with known type 2 diabetes, with and without diabetic cardiomyopathy or diabetic kidney disease. Patients were divided into 4 groups according to the chronic complications added as follows:

- 78 patients without diabetic cardiomyopathy and without diabetic kidney disease (group 1);
- 64 patients with diabetic cardiomyopathy and without diabetic kidney disease (group 2);
- 74 patients without diabetic cardiomyopathy and with diabetic kidney disease (group 3);
- 39 patients with diabetic cardiomyopathy and diabetic kidney disease (group 4);

In all study groups was determined body mass index (BMI) and waist circumference starting from the premise that obesity is a metabolic disorder commonly associated with type 2 diabetes.

Obesity is fairly easy highlighted by simple measurements, unlike other metabolic disorders requiring diagnostic laboratory determinations, sometimes quite laborious. Typically adipose tissue represents 10-15% reported to the ideal weight for men and 20-25% in women. Increasing the

amount of body fat by over 25% in women and 15% men, defines obesity (Şerban V., 2011).

There are numerous methods for determining body fat, but one of the most commonly used indices of relative weight is the Body Mass Index (BMI). In the present study, the level of obesity was determined using BMI, witch is defined as body weight in kilogram divided by height, in meters squared (Şerban V., 2011).

Height was done using anthropometry. During the measurements the patients were barefoot, taking a perfect postural position, so that the body reach anthropometric ruler in at least three points: the shoulder blades, buttocks and heels. Head has adopted such a position that the top of the ear canal and external angle of the eye to be on a horizontal line. Measurement unit used was the meter.

Weight was determined by weighing patients in the morning, on an empty stomach, after urination and defecation, wearing only underwear. Unit of measure used was the kilogram.

BMI is the most widely used indicator of overweight and obesity at the population level, as interpreted in the same manner to all adults, regardless of age and sex (Şerban V., 2011).

The classification of overweight and obesity in adults as proposed by WHO (1998) is shown in the next table.

Table 1

Classification of weight status (after Serban V. - WHO, IOTF, 1998)

Classification	BMI (kg/m2)	Risk of co-morbidities
Normal range	18,5 – 24,9	Average
Overweight	25,0 – 29, 9	Increased
Obese class I	30,0 – 34, 9	Moderate
Obese class II	35,0 – 39,9	Severe
Obese class III	> 40,0	Very severe

Waist circumference determination was made using metric band, divided into centimeters and millimeters. Place of measuring the waist was placed halfway between the umbilicus and xiphoid appendix. Unit used was centimeter. Normal value is below 80 cm for women and under 94 cm for men. Will consider a small waist below these values and increased waist above these values (37).

RESULTS AND DISCUSSIONS

At initial evaluation, 24.3% of patients were normal weight, 15.3% overweight and 60.4% obese, and at the final evaluation, normal range represented 27.8%, overweight - 19.2% and obese - 52.4 % ($p = 0.293$)

(table 2), results not very satisfactory, given the effects of obesity on insulin resistance by altering exacerbation of insulin secretion, insulin signal transmission disturbance, lipotoxocity, and so on, with a direct impact on the evolution and prognosis in type 2 diabetes.

Table 2

The evolution of weight status

Weight status	Initially		After 12 months	
	No.	%	No.	%
Normal range	62	24,3	71	27,8
Overweight	39	15,3	49	19,2
Obese	154	60,4	135	52,4
Obese class I	55	21,6	48	18,8
Obese class II	57	22,4	50	19,6
Obese class III	42	16,5	37	14,5

At initial assessment, normal range represented 28.2% of group 1, 21.9% of group 2, 27.0% on group 3 and 15.4% of group 4, and obese represented 4% of group 1, 65.6% of group 2, 55.4% of group 3 and 69.2% of group 4 (table 3).

After 12 months, the prevalence of obesity was reduced by 6.4% in group 1 ($p = 0.201$), by 6.2% in group 2 ($p = 0.216$), by 7.1% in group 3 ($p = 0.104$) and by 10.2% in group 4 ($p = 0.038$), good results considering the short follow-up of patients included in the study.

Table 3

The evolution of weight status compared between groups

Weight status	Group 1		Group 2		Group 3		Group 4	
	No.	%	No.	%	No.	%	No.	%
Initially								
Normal range	22	28,2	14	21,9	20	27,0	6	15,4
Overweight	12	15,4	8	12,5	13	17,6	6	15,4
Obese	44	56,4	42	65,6	41	55,4	27	69,2
Obese class I	17	21,8	12	18,8	18	24,3	8	20,5
Obese class II	15	19,2	18	28,1	12	16,2	12	30,8
Obese class III	12	15,4	12	18,8	11	14,9	7	17,9
After 12 months								
Normal range	25	32,1	15	23,4	23	31,1	8	20,5
Overweight	14	17,9	11	17,2	16	21,6	8	20,5
Obese	39	50,0	38	59,4	35	47,3	23	59,0
Obese class I	15	19,2	10	15,6	16	21,6	7	17,9
Obese class II	13	16,7	17	26,6	10	13,5	10	25,6
Obese class III	11	14,1	11	17,2	9	12,2	6	15,4

Regarding BMI, at the final evaluation, increasing BMI was recorded in 14 patients (5.5%) and its decrease to 20.0%. Thus, of the 62

patients initially normal weight, at one year, we recorded 5 cases were as overweight. Of the 39 patients initially overweight, 13 cases have lost weight being classified as normal range, and 3 cases have become obese class I (table 4).

Table 4

The evolution of weight status according to initial BMI

Initially		After 12 months				
		Normal range	**Overweight**	**Obese class I**	**Obese class II**	**Obese class III**
Normal range	**62**	57	5			
Overweight	**39**	13	23	3		
Obese class I	**55**	1	18	33	3	
Obese class II	**57**		3	12	39	3
Obese class III	**42**				8	34
Total	**255**	**71**	**49**	**48**	**50**	**37**

Among patients who initially were obese class I, 19 cases were lost weight (1 case was classified as normal weight and 18 cases as overweight), and 3 cases were increased BMI in the obesity level. Among patients who were initially obese class II, 15 patients lost weight (3 cases were classified as overweight and 12 cases as obese class I), and 3 cases was increased BMI in the obesity class III. Of the 42 cases obese class III, 8 patients reduced their BMI during the study (obese class II).

At final evaluation, group 1 showed increased BMI in 5 patients (6.4%) and its decreased to 17 patients (21.8%). Thus, of 22 patients initially normal weight, at one year, we registered two cases as overweight, of 12 patients initially overweight, 5 cases lost weight and were classified as normal weight and 1 case has reached obese class I. Among patients who were initially obese class I, 6 cases had lost weight (overweight) and 1 case became obese class II. Among patients who were initially obese class II, 4 cases were lost weight (obese class I), and 1 case became obese class III. Of the 12 cases with obesity class III, 2 patients reduced their BMI during the study (obese class II) (table 5).

Table 5

The evolution of weight status according to initial BMI compared between groups

Initially		After 12 months				
		Normal range	**Overweight**	**Obese class I**	**Obese class II**	**Obese class III**
Group 1						
Normal range	**22**	20	2			
Overweight	**12**	5	6	1		
Obese class I	**17**		6	10	1	
Obese class II	**15**			4	10	1
Obese class III	**12**				2	10
Total	**78**	**25**	**14**	**15**	**13**	**11**
Group 2						
Normal range	**14**	13	1			
Overweight	**8**	2	6			

Obese class I	**12**		4	7	1	
Obese class II	**18**			3	15	
Obese class III	**12**				1	11
Total	**64**	**15**	**11**	**10**	**17**	**11**
Group 3						
Normal range	**20**	19	1			
Overweight	**13**	4	8	1		
Obese class I	**18**		5	13		
Obese class II	**12**		2	2	7	1
Obese class III	**11**				3	8
Total	**74**	**23**	**16**	**16**	**10**	**9**
Group 4						
Normal range	**6**	5	1			
Overweight	**6**	2	3	1		
Obese class I	**8**	1	3	3	1	
Obese class II	**12**		1	3	7	1
Obese class III	**7**				2	5
Total	**39**	**8**	**8**	**7**	**10**	**6**

At the final evaluation of group 2, increasing BMI was recorded in 2 patients (3.1%) and its decrease to 10 patients (15.6%). Thus, of the 14 patients initially normal weight, after one year we recorded 1 case as overweight and of the 8 patients initially overweight, 2 cases lose weight and were classified as normal range. Among patients who were initially obese class I, 4 cases lost weight, being classified as overweight and 1 case has been increased BMI being classified as obese class II. Among patients who were initially obese class II, 3 cases lost weight and were classified as obese class I and of the 12 cases with obesity class III, 1 patient lost weight, being included in obesity class II.

In group 3, at the final evaluation, increasing BMI was recorded in 3 patients (4.1%) and its decrease to 14 patients (18.9%). Thus, of the 20 patients initially normal weight, after one year we recorded 1 case was as overweight. Of the 13 patients initially overweight, 4 cases lost weight and were classified as normal weight and one case has reached obese class I. Among patients who initially experienced obesity class I, 5 cases lost weight and became overweight and among patients who initially experienced obesity class II, 4 cases lost weight and were classified as overweight (2 cases) and obese class I (2 cases), and 1 case was recorded increased BMI and became obese class III. Of the 11 cases with obesity class III, 3 patients reduced their BMI during the study and became obese class II.

In group 4, at the final evaluation, increasing BMI was recorded in 4 patients (10.3%) and its decrease to 10 patients (25.6%). Thus, of the 6 patients initially normal weight, after one year we recorded 1 case as overweight. Of the 6 patients initially overweight, 2 cases lost weight 2 and were classified as normal weight and one case has reached obese class I. Among patients who initially experienced obesity, 4 cases lost weight and

was classified as normal weight (1 case) and overweight (3 cases). Among patients who initially experienced obesity class II, 4 cases lost weight and were classified as overweight (1 case) and Obese class 1 (3 cases) and 1 case was recorded increase BMI and became obese class III. Of the 7 patients with obesity class III, 2 patients reduced their BMI during the study, and became, in the final evaluation, obese class II.

Table 6

The evolution of the prevalence of abdominal obesity compared between groups

	Initially		**After 12 months**	
	No.	**%**	**No.**	**%**
Group 1	55	70,5	52	66,7
Group 2	52	81,3	48	75,0
Group 3	55	74,3	51	68,9
Group 4	35	89,7	32	82,1
Total	**197**	**77,3**	**183**	**71,8**

The prevalence of abdominal obesity was 77.3% initial and 71.8% after one year (p = 0.221). In corellation with the evolution of weight status, abdominal obesity prevalence decreased significantly in group 4 (from 89.7% to 82.1%) (p = 0.047), and insignificant in the other groups, given unsatisfactory (table 6).

.

CONCLUSIONS

Excess abdominal fat is an independent predictor of risk factors and morbidity of obesity related diseases such as type 2 diabetes, hypertension, dyslipidaemia and cardiovascular diseases. Waist circumference is a valuable additional alternative method in identifying individuals at increased risk and it is an approximate index of intra-abdominal fat mass.

In the present study, we note that there were significant differences between the 4 groups in terms of the evolution of weight status, most changes were observed at patients with diabetic cardiomiopathy and chronic kidney disease. Thus, increasing BMI was recorded in group 2 (3.1%) and in group 4 (10.3%), and BMI decrease was recorded in group 2 (15.6%) and in group 4 (25.6%) (p <0.001).

Abdominal obesity is associated with insulin resistance and hyperinsulinemia, proportional to the excess weight, which causes imbalance glycemic control and thus accelerate the emergence of chronic complications. In our study, prevalence of abdominal obesity showed significant decreases in diabetics with both complications associated, demonstrating the periodic reevaluation significance and the importance of involving specialist doctor

REFERENCES

1. American Diabetes Association, 2010, Standards of medical care in diabetes. Diabetes Care; 33 (Suppl 1): S88-S90
2. Alberti K.G.M.M., P.Z. Zimmet, 1998, Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: diaognosis and classification of diabetes mellitus. Provisional Report of a WHO Consultation. Diabet Med; 15;pp: 539-553
3. Bala C., A. Fodor, N. Hâncu, 2009, Diabetul zaharat, nutriția, bolile metabolice: curs pentru studenți. Ed. Med. Univ. „Iuliu Hațieganu" Cluj-Napoca; ISBN 978-973-693-334-9, pp: 32-108
4. Bjorklund A., G. Yaney, G.D. McGarrz, 1997, Fatty acid and beta-cell function, Diabetologia*;* 40 (suppl 3): B21-B26
5. Cheța D.M., 1999, Preventing Diabetes: theory, practice and new approaches. Wiley, Chichester, pp:45-113
6. DeFronzo R.A., L. Mandarino, E. Ferrannini, 2009, Metabolic and Molecular Pathogenesis of Type 2 Diabetes Mellitus. In: DeFronzo RA, Ferrannini E, Keen H, P Zimmet, editors. International Textbook of Diabetes Mellitus. 4rd ed. pp: 121-185
7. Hâncu N., I.A. Vereşiu, 1999, Diabetul zaharat, nutriția, bolile metabolice, Ed. Național*,* Bucureşti, pp:45-136
8. Ionescu-Tîrgovişte C., R. Lichiardopol, C. Guja, 2007, Diabetul Zaharat: Manual pentru studenți, medici de familie şi rezidenți. Bucureşti: Ed. Ilex. ISBN 978-973-7928- 16-0; pp: 55-114
9. Powers A.C., 2008, Diabetes mellitus In Harrison's Principles of Internal Medicine, 17th Edition; pp: 2275-2304
10. Şerban V., 2010, Tratat român de boli metabolice 1. Timişoara; Ed. Brumar, ISBN 978-973- 602-527-3, pp: 66-67, 69, 82-85, 179-210, 219-226, 237-257, 353-381, 473-494, 550-563
11. Şerban V., 2011, Tratat român de boli metabolice 2. Timişoara. Ed. Brumar, ISBN 978-973- 602-554-9; pp: 21-36, 63-142, 201- 398, 565-614, 691-708
12. Wild S., G. Roglic, A. Green, 2004, Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care; 27; pp: 1047-1053
13. Zimmet P., K.G.M.M. Alberti, J. Shaw, 2000, Global and societal implications of the diabetes epidemic. Nature; 414; pp:782-787