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CHARACTERISTICS OF PEOPLE WITH NEWLY DIAGNOSED TYPE 2 DIABETES DEPENDING ON AGE AT ONSET

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Abstract

Objectives. *The aim of this study was to compare the cardio-metabolic profile between younger (< 45 years) and older (≥ 45 years) people with newly diagnosed type 2 diabetes (T2DM).* ***Material and Methods****. A cross-sectional study including 910 persons with newly diagnosed T2DM and registered at the Clinical Center of Diabetes Cluj-Napoca was carried out between 2006 - 2008.* ***Results:*** *The mean age was 40.21±3.60 yrs. in the younger group and 60.08±8.22 yrs. in the older group. Both groups of patients were obese, but the younger-onset group was significantly more obese as measured by body mass index (BMI), than the older group (BMI 32.45 vs. 30.61 kg/m^2, p=0.001). The absolute coronary heart disease (CHD) risk level was significantly higher in older than younger individuals (p<0.001).* ***Conclusions:*** *Despite being two decades younger, it is remarkable that many young people with newly diagnosed T2DM have a clustering of cardiovascular risk factors.*

key words: *newly diagnosed T2DM, obesity, cardiovascular risk factors*

Background

The number of people with type 2 diabetes (T2DM) is increasing rapidly in both the developed and developing countries around the world [1]. Diabetes has become widespread epidemic, primarily because of the increasing prevalence and incidence of T2DM [2,3].

The emerging diabetes pandemic is driven by the combined effects of population ageing, increased prevalence of obesity and physical inactivity, and greater longevity among patients with diabetes (explained by improved medical management) [1]. The estimated number of diabetic subjects has currently increased to 366 million or 8.3% of the global adult population and new data estimated that the number of people with diabetes will rise to 552 million by 2030 [4]. Certainly, T2DM is epidemic. Its long-term consequences translate into a major problem for public health and

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consequently for healthcare systems [5]. The age at diagnosis of T2DM mellitus has decreased with time. This finding is probably due to a combination of factors such as: changing diagnostic criteria, improved physician recognition of diabetes and increased public awareness. Younger age at diagnosis may also reflect a true population trend of earlier onset of T2DM [6]. Younger age at diagnosis also means an increased duration of diabetes and an increased risk for diabetes-related complications, particularly cardiovascular disease (CVD) [7,8]. Early-onset T2DM may be a more aggressive disease phenotype with an increased risk to develop cardiovascular complications than later-onset T2DM, reflected by a more adverse CVD risk profile [9].

More research is needed to understand how the pathophysiology and clinical course of T2DM differs by age of onset [10]. The aim of this study was to compare the cardio-metabolic profile between younger (<45 yrs.) and older (≥45 yrs.) people with newly diagnosed T2DM.

Material and methods

We performed a cross-sectional study including 910 persons with newly diagnosed T2DM,–registered at the Clinical Center of Diabetes Cluj-Napoca between 2006-2008.

The following inclusion criteria were used for the study: subjects with newly diagnosed T2DM (defined according to World Health Organization criteria [11]), aged ≥ 18 yrs. and availability of subject characteristics within 3 month from diagnosis. The following data were evaluated: demographic characteristics (age, gender), anthropometric parameters (BMI, waist circumference), glycaemic control, lipid profile and blood pressure. Considering that age is a major risk factor for diabetes, newly diagnosed diabetic patients were categorized as younger T2DM if they were diagnosed before the age of 45 and older T2DM if diagnosed ≥ 45 yrs. of age. We chose the age of 45 for the definition of study groups because the American Diabetes Association currently recommends that T2DM screening in adults, without risk factors, should begin no later than 45 yrs. age and the International Diabetes Federation considers that people of European origin over 45 yrs. are at increased risk for diabetes [12,13].

BMI was calculated as weight/height^2. Overweight was defined as BMI ≥ 25 kg/m^2 and obesity as BMI ≥ 30 kg/m^2. The threshold for waist circumference used to define abdominal obesity was ≥ 94 cm for men and ≥ 80 cm for women [14]. Hypertension was defined as systolic blood pressure (SBP) ≥ 130 mmHg or diastolic blood pressure (DBP) ≥ 80 mmHg or prescription of antihypertensive therapy [12]. Low-density lipoprotein (LDL)-cholesterol was calculated using Friedewald's formula. Dyslipidaemia was defined by the presence of at least one of the following values: total cholesterol ≥ 200 mg/dl, LDL-cholesterol ≥ 100 mg/dl, triglycerides ≥ 150 mg/dl, HDL-cholesterol ≤ 40 mg/dl [15].

The IRIS II score and Reaven score assessment were used for the evaluation of insulinresistance [16,17]. The estimated absolute 10 year CHD risk was calculated using the UK Prospective Diabetes Study risk engine [18].

We conducted statistical analyses using the SPSS program version 15. Data were summarized by means (±SD) or median (1st quartile/ 3rd quartile). Groups were compared

using Student's t, chi-square and Mann-Withney U-tests as appropriate. We used chi-square tests for comparing categorical variables and t tests for continuously distributed data. P values <0.05 were considered to be statistically significant.

Results

Clinical and metabolic characteristics of people with newly diagnosed T2DM

A total of 910 patients with newly diagnosed diabetes met the inclusion criteria: 102 (11.20%) younger T2DM and 808 (88.80%) older T2DM. The demographic, anthropometric and biological characteristics of study subjects are given in Table 1. For the entire study group, the mean age at diagnosis of T2DM was of 57.85±10.04 yrs. and the median 10 year CHD risk was of 17.80% (10.07; 40). The estimated risk for CHD was higher for men: median value = 22.35% (13.95; 40) than for women: median value 13.90% (7.55; 32.65).

Table 1. Characteristics of newly diagnosed T2DM in the two groups.

	Younger onset T2DM (<45 years)	Older onset T2DM (≥45 years)	P value
Number (%)	102 (11.2%)	808(88.80%)	
Male gender	59.80 %	48.80 %	0.03
Age (yrs.)	40.21±3.60	60.08±8.22	<0.001
Current smokers (%)	39.21	19.30	<0.001
Family history of diabetes (%)	45.10	30.52	0.003
BMI (kg/m^2)	32.456±5.17	30.618±4.15	0.001
BMI ≥ 25 kg/m^2 (%)	98.04	89.72	0.007
Weight (kg)	94.25±17.93	84.04±14.16	<0.001
Abdominal obesity (%)	95.10	94.14	NS
HbA1c (%)	8.13±2.21	7.69±2.01	NS (0.08)
Plasma glucose (mg/dl)	228.82±91.54	211±93.92	0.06
Systolic BP (mmHg)	133.10±15.04	141.71±18.35	<0.001
Diastolic BP (mmHg)	83.06±10.43	84.59±10.71	NS (0.1)
Hypertension (%)	57.84	86.01	<0.001
Total cholesterol (mg/dl)	204.50(169/251)	216(185/251)	NS (0.07)
LDL cholesterol (mg/dl)	117.50±39.73	131.97±41.83	0.003
HDL cholesterol (mg/dl)	40.09±9.69	44.71±11.88	<0.001
Triglycerides (mg/dl)	207(123/353)	197(128.5/271.5)	0.01
TG/HDL-cholesterol	5.44(2.93/9.78)	4.40(2.61/6.79)	0.02
Cholesterol/HDL-cholesterol	5.01(4.11/6.47)	4.92(4/6)	NS (0.25)
Dyslipidemia (%)	74.50	82.80	0.04
IRIS II score	85.26±13.68	79.53±13.99	<0.001
CHD risk	7.00 (3.6/12.2)	20.30 (11.30/40.00)	<0.001

Data presented are mean (±SD), median (1st quartile/ 3rd quartile) or number (%)
BP, blood pressure; LDL, low density lipoprotein; HDL, high density lipoprotein; TG, triglycerides;
CHD risk, 10-year absolute risk of coronary heart disease; NS, not significant

The mean age at diagnosis was 40.21±3.60 yrs. in the younger group and 60.08±8.22 yrs. in the older group. Most of the patients were male (59.80%) in the younger group and female (51.20%) in the older group (p=0.03). Both groups of patients were obese, but the younger-onset group was significantly more obese as measured by BMI, than the older group (BMI 32.45 vs. 30.61 kg/m^2, p=0.001). The younger T2DM subjects in the current study were on average 10 kg heavier at diagnosis than the older T2DM subjects (94.25 kg vs. 84.04 kg, p<0.001). The majority of younger individuals (98.04%) were overweight or obese.

Plasma glucose values at diagnosis were higher among younger people with T2DM than among older people with T2DM (228 vs. 211 mg/dl, p=0.06). HbA1c was slightly higher in the younger group, but not statistically significant (8.13 vs. 7.69).

Although the prevalence of hypertension was higher in the older group (86.01%), 57.84% of those with early T2DM had hypertension (p<0.001).

There were no statistically significant differences in the mean total cholesterol level (204.50 vs. 216 mg/dl, p=0.07) and the mean ratio of total cholesterol/HDL-cholesterol (5.01 vs. 4.92, p=0.25) between the two groups. The average LDL and HDL cholesterol levels were however markedly different. The LDL-cholesterol was higher in the older group compared with younger group (131.97 vs. 117.50 mg/dl, p=0.003). HDL-cholesterol was significantly lower in the younger group compared to the older group (40.09 vs. 44.71 mg/dl, p<0.001) and the mean ratio of triglycerides/HDL-cholesterol (5.44 vs. 4.40, p=0.02) was higher in the group with younger onset T2DM. The mean triglyceride level was significantly higher in younger than older patients (207 vs. 197 mg/dl, p=0.01).

Forty-five percent of the younger group and 30.52% of the older type 2 diabetic group had a family history of T2DM. The absolute CHD risk level was significantly higher in older than younger individuals (p<0.001).

Prevalence of obesity depending on age groups

The highest prevalence of obesity was recorded in the 30-35 years age group, 75% of the patients with newly diagnosed diabetes being obese as shown in Figure 1. The obesity prevalence remains high among subjects aged 35-65 yrs. and decreases in the elderly (≥ 65 yrs. old). The lowest prevalence of obesity was noticed in subjects over 75 yrs. old (48.7%). Mean BMI was > 30 kg/m^2 in all age groups with the only exception for those ≥70 yrs. old who were overweight (mean BMI: 29.53±4.75).

Discussions

The present study evaluated the characteristics of 910 people with newly diagnosed T2DM depending on the age at diagnosis. We found that the proportion of T2DM subjects diagnosed before the age of 45 yrs. in this study was 11.2%, with a mean age at onset of 40.21 yrs. The demographic characteristics of the participants in this study are similar to previously published results [19,20].

Obesity is the most important single risk factor for T2DM, the majority of individuals with T2DM being overweight or obese (80%) [21,22].

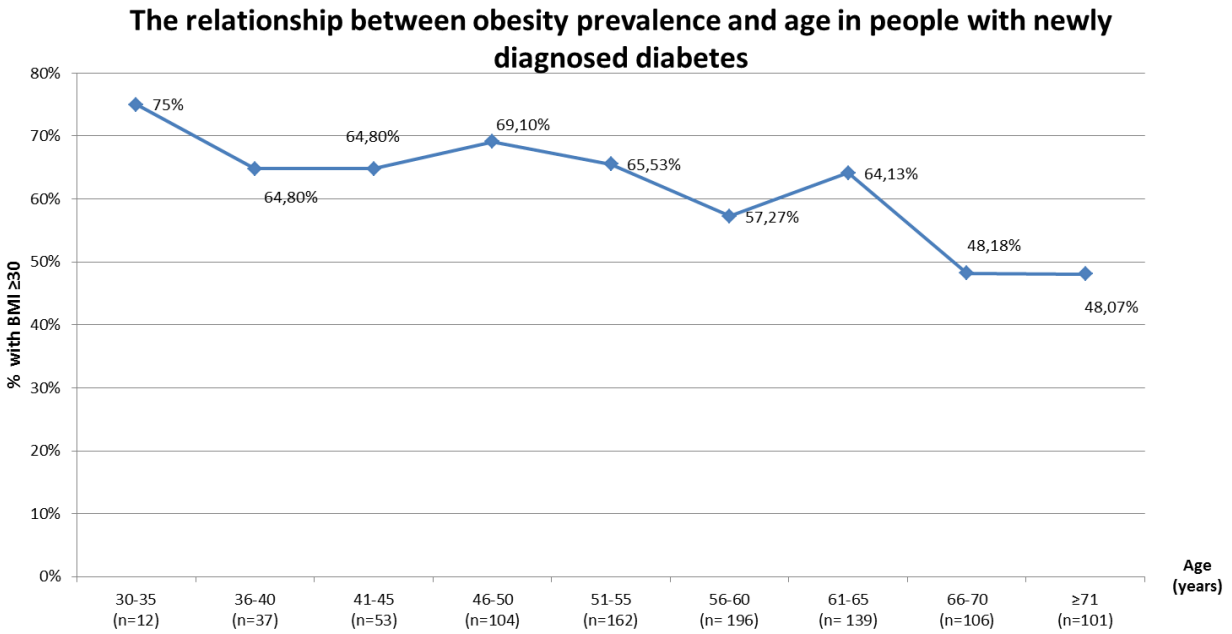

Fig 1. Relation between prevalence of obesity and age at diagnosis among patients with newly diagnosed T2DM.

This is confirmed by our study, 89.72% of the older adults being overweight or obese, while only 1.96% of the younger adults are normal weight. Abdominal obesity, an independent cardio-metabolic risk factor, was found in approximately 95% of the people with newly diagnosed T2DM in both groups.

The prevalence of obesity in this study was higher in younger onset T2DM and reached a maximum (75%) in the youngest age group (30-35 years). It was lower in older onset T2DM and reached a minimum after 70 years of age (48.7%). Thus, the mean BMI was significantly higher for younger adults with newly diagnosed T2DM than for older individuals. It should be noted that the age-related changes in total and visceral body fat makes BMI a less sensible marker of adiposity in the older age groups [23]. In fact, it is likely that early onset obesity and associated insulin resistance are the main risk factors for an earlier diabetes onset [24]. The inverse relationship between obesity and age of diagnosis of T2DM was shown in previous studies [25].

In accordance with this, the younger patients in the current study were on average 10 kg heavier at diagnosis than the older patients with later onset T2DM (94.25 kg vs. 84.04 kg, $p<0.001$).

Despite being two decades younger, it is remarkable that among the younger onset T2DM group a significant proportion had hypertension (57.84%) and dyslipidemia (74.50%), although the prevalence of hypertension (86.01%) and dyslipidemia (82.80%) was higher in the older group. These young people with T2DM had an adverse lipid profile with significantly higher triglycerides and lower HDL-cholesterol compared to older T2DM participants in our study. Low levels of HDL-cholesterol, frequently associated with elevated triglyceride levels, are the most prevalent pattern of dyslipidemia in

individuals with T2DM and are predictive for CVD [26,27].

Other markers of insulin resistance, the ratio of triglycerides/HDL-cholesterol and IRIS II score were higher in the younger group with newly diagnosed T2DM.

The estimated absolute 10 year CHD risk was higher for older adults, maybe because the estimation of the CHD risk by the UKPDS risk engine is heavily influenced by age and gender, the dominant factors that determine absolute risk level [28]. However, the high prevalence of cardiovascular risk factors observed at T2DM diagnosis in young adults is alarming as the incidence of macrovascular complications increases with diabetes duration.

The principal aim of diabetes management is to prevent complications and this is even more important in the young with newly diagnosed T2DM given the potential for longer disease duration and exposure to adverse risk factors [29].

Conclusions

Cardiovascular risk factors are very frequently found in newly diagnosed T2DM patients, which imply an increased cardio-metabolic risk and the need for multi-factorial and intensive clinical management. Despite being two decades younger, it is remarkable that many young individuals have a clustering of CVD risk factors. Optimizing cardiovascular risk reduction is particularly important in young people with newly diagnosed T2DM because increased lifelong risk of CVD and complications.

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