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Original Research

Prevalence of diabetes and diabetes complications in a south-eastern county from Romania

Voineag Cristiana[1-3]*, Barbu Raisa-Eloise[4], Bogdan-Goroftei Roxana Elena[2,4], Iuliana Moraru[2,4], Bogdan Pompiliu Mircea[5], Elkan Eva Maria[4], Stefan Diana Simona[1,7], Popescu Nicolae[6], Radulian Gabriela[1,7]

[1] Carol Davila University of Medicine and Pharmacy, Bucharest, Romania
[2] Faculty of Medicine and Pharmacy, "Dunărea de Jos" University of Galați, Romania
[3] County Emergency Hospital of Brăila
[4] County Emergency Pediatric Hospital "Sfântul Ioan", Galați, Romania
[5] County Emergency Hospital "Sf. Apostol Andrei", Galați, Romania
[6] County Emergency Hospital Oradea, Romania
[7] National Institute of Diabetes, Nutrition and Metabolic Diseases "N. Paulescu", Bucharest, Romania

*Correspondence to: Dr. Cristiana Voineag, County Emergency Hospital of Brăila, 1, Pietatii St, Braila County,
E-mail id: voineag.cristiana@gmail.com, Phone: +4 074 016 3653

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Abstract

Background and Aims: The literature confirms that, due to the global increase in the incidence of obesity and sedentary lifestyle, there has been an increase in the number of cases of type 2 diabetes (T2DM) among children. Thus, this pathology has the potential to become a global health problem with devastating effects on health. Through the present clinical research we sought to determine the role that individual variables play in increasing the risk of complications. **Materials and Methods:** This retrospective, consecutive case study, enrolled 2493 adult patients diagnosed with diabetes, attending scheduled visits in the diabetes outpatient or hospitalized in the Diabetes Clinic between January 2017 and December 2019. Data was collected from the patient's record and further analyzed using SPSS IBM Statistics V26 statistical package. **Results:** The peak of incidence of diabetes complications was in the 60–65 years age-group, respectively polyneuropathy (63.6% for newly diagnosed patients vs. 83.4% in patients with previously known diabetes). The most common comorbidities were arterial hypertension (61.7% for newly diagnosed patients vs. 64.3% in patients with previously known diabetes) and dyslipidemia (33.2% for newly diagnosed patients vs. 43.8% in patients with previously known diabetes). Complications were associated with poor glycemic control (serum blood glucose above 220 mg/dL, respectively HbA_{1c} of more than 9.36 ± 2.2%). **Conclusions:** In our study, there was in increased number of complications, the most frequent being the polyneuropathy. Also, even the newly diagnosed diabetes patients had multiple comorbidities associated.

Keywords: adult patients, changes in eye examination, diabetes mellitus, diabetic neuropathy, microvascular complications

Introduction

Diabetes mellitus (DM) is a major public health problem that is rapidly approaching epidemic proportions worldwide. The International Diabetes Federation estimates an increase in the number of cases to 578 million by 2030, compared to 463 million 2019 [1, 2]. In this study, a major concern is the increasing incidence of type 2 diabetes (T2DM) in young people, including the presence of obesity among pre-adolescents. In the case of developed countries, most diabetics

are older than 64 years, compared to developing countries, where the most affected people are in the productive years of their lives, aged between 35 and 64 years [3].

Approximately 7 million new cases of diabetes are reported annually, and the most dramatic increases in T2DM have occurred in populations that have experienced sudden and major lifestyle changes [4]. Numerous researches in the field have concluded that diabetes remains one of the main pathologies incriminated for deaths worldwide, this being largely due to the presence of subsequent complications.

At the same time, studies show that one of the most common complications of diabetes, as seen in the observational analysis of patient progression is represented by diabetic neuropathy, while diabetic retinopathy is the leading cause of visual impairment among diabetic patients [1, 5]. The existence of the so-called diabetic foot is due to pathophysiological changes in the circulatory system and also to nerve damage. The corroboration of all these elements proves that the risk of ulcers and even amputation of the limb (total or segmental) is an element to be taken into account, a continuous concern of specialists in the field. Research shows that diabetes is the most common cause of non-traumatic lower limb amputation [1, 5].

According to studies, the evolution of patients diagnosed with diabetes includes the risk of these complications in a period of about 15 years from the time of diagnosis. Thus, after this time, even if the subjects declare the existence of optimal glycemic control, it can be seen that 2% of patients completely lose their visual capacity, while about 10% develop a severe visual impairment [1, 5].

Diabetes is also recognized as the main promoter of renal failure, although it is important to remember that its incidence is dependent on two factors: the severity of symptoms and the duration of the disease [6, 7].

According to clinical studies in the literature, in both patients with type I diabetes and those with T2DM, it is highlighted that HbA_{1c} may be responsible for increasing the incidence of diabetes complications, being also considered a maker for the development of microangiopathic pathologies and, at the same time, a risk factor for cardiovascular diseases. Glycolized hemoglobin has a very high specificity, compared to FPG (fasting plasma glucose) and OGTT (oral glucose tolerance test), its sensitivity is lower [8].

According to data from 2019, it is estimated that by 2030 the number of patients diagnosed with diabetes will reach 578.4 million, and by 2045 about 700.2 million adults aged 20–79 years will be diagnosed with diabetes. It is also estimated that 351.7 million people in the 20–64 years age group suffer from diabetes, whether diagnosed or undiagnosed [9].

The present study aimed to evaluate the impact of a several parameters in the risk of mortality among patients with known type 1 or type 2 diabetes. Socio-demographic variables were analyzed to determine the role of socio-economic implications, as well as the prevalence of diabetes. This will emphasize the need for a plan to prevent it, or at least reduce the risk of unfavorable developments for patients in the study group. At the same time, aimed to analyze in a comparative way the incidence of complications, in relation to the duration of diabetes.

Material and Methods

*Study design*This clinical research received the approval of the Ethics Commission of the hospital unit. Data of interest was collected, during a 3-years timeframe, from January 2017 to December 2019. In the study 2493 adult patients, of which 371 were newly diagnosed, were enrolled. Each of these patients completed a study participation agreement, prepared according to the Helsinki Declaration.

As inclusion criteria – the age of patients over 18 years, patients with a definite diagnosis of diabetes, subjects who accepted participation in this study, by signing an informed consent.

Statistical analysis

The present study possesses the characteristics of an observational, retrospective research, performance based on the information

obtained by analyzing the observation sheets of patients diagnosed with diabetes. The data processing was performed in the statistical program SPSS IBM Statistics (V.26) performing contingency and frequency tables, after centralizing the information using Microsoft Excel 2020.

Results and Discussions

The final group was formed as previously stated from a number of 2493 patients, divided in two subgroups; subgroup A: 371 patients with newly diagnosed diabetes (14.9%) and subgroup B: 2122 patients previously diagnosed with diabetes (85.1%) already in the databases of Brăila county.

The maximum incidence of presentations, as a whole was detected in 2019, however, discussing separately for each subgroup in question, it will be noted that the two incident curves have different slopes during the study. Subgroup A is characterized by an upward curve, with approx. tripling of cases by the end of 2019 (with a percentage difference of 28.84% compared to the number of cases in 2017), while subgroup B has a decreasing curve (32.57% of patients known to DM). Sig.=0.000 * confirms that there are statistically significant differences between the years of presentation and the two subgroups. From the point of view of the distribution by sex, the predominance of female subjects is noticeable (55.3% of the patients of subgroup A, respectively 61.3% of subgroup B). The chi-square test confirms by MR<0.29 the existence of statistically significant differences. The urban environment predominates in the case of patients from subgroup B (53.2%) – a fact justifiable from the perspective that DM is a pathology that requires regular checks and the continuous administration of treatment (sig. 0.172).

The mean age of patients in subgroup A is 61.82 years, with SD ± 13.37 years, with a maximum age of 89 years. In subgroup B patients have ages between 18 and 97 years (63 ± 12.67 years). Differences in the number of hospitalization days were observed as follows: subgroup A has a maximum of 17 days of hospitalization (mean 6.95 days ± 2.87 years), while subgroup B subjects required stabilization. A maximum number of 65 days of hospitalization (6.79 days and SD ± 3.16 days) (Table 1).

In both subgroups overweight patients predominate, followed by those with grade I obesity. The HbA_{1c} value does not show significant differences between the two population groups: 10.85 ± 2.45% for newly diagnosed patients, respectively, 9.15 ± 2.18% for subgroup B. Blood glucose was 264.57 ± 70.18 mg/dL for subgroup A, while for subgroup B blood glucose was 216.03 ± 62.56 mg/dL. None of the above variables represent statistically significant differences compared to the two groups (Table 2).

In Table 3 the changes detected in the ophthalmological examination by eye examination are presented. There were statistically significant differences for a number of variables as follows: normal eye examination according to age (sig = 0.000 *), the presence of retinopathy (sig. 0.000 *), proliferative retinopathy (sig. 0.000 *), but also angiopathy (sig. 0.000 *).

Discussions

Complications of diabetes occur at the systemic level, and diabetes is still one of the leading causes of cardiovascular morbidity and mortality, kidney failure and amputation. In addition, studies have found an important association between early diagnosis of T2DM (15–40 years) and the more aggressive form of the disease, with premature development of complications [6].

Type 2 diabetes consists of a series of dysfunctions characterized by hyperglycemia, resulting from a combination of insulin resistance, inadequate insulin secretion, and excessive or inadequate glucagon secretion. Therefore, inadequate control of T2DM is associated with a number of microvascular, macrovascular and neuropathic complications [10].

The total lack of insulin hormone or resistance to this hormone means that glucose will remain free in the bloodstream. Over time, high blood glucose levels cause tissue damage, leading to the development of disabling and life-threatening complications [6, 11].

In recent years, more detailed analyzes of beta cell response and regulation have shown

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Table 1: Diabetes groups depending on the time of diagnosis.

		Diabetes groups depending on the time of diagnosis								Sig. (Chi patrat)
		Newly diagnosed diabetes (subgroup A)				Patients known to have diabetes at the time of registration				
		Count	Mean	Row valid n%	Column valid N%	Count	Mean	Row valid n%	Column valid N%	
The years in which the presentations took place	2017	70		8.5	18.9	757		91.5	35.7	0.000*
	2018	124		15.5	33.4	674		84.5	31.8	
	2019	177		20.4	47.7	691		79.6	32.6	
Gender of patients enrolled in the study	Female	205		13.6	55.3	1300		86.4	61.3	0.029*
	Male	166		16.8	44.7	822		83.2	38.7	
The origin of the patients enrolled in the study	Urban	183		14.0	49.3	1128		86.0	53.2	0.172729
	Rural	188		15.9	50.7	994		84.1	46.8	
Age of patients at the time of registration (expressed in years completed)			62				62			
	<20	2		16.70	0.5	10		83.30	0.5	0.005*
	20–30	7		15.90	1.9	37		84.10	1.7	
	30–40	12		11.80	3.2	90		88.20	4.2	
	40–50	65		21.50	17.5	238		78.50	11.2	
	50–60	59		10.60	15.9	499		89.50	23.5	
	60–70	131		15.50	35.3	714		84.50	33.6	
	70–80	74		14.70	19.9	431		85.30	20.3	
	>80	21		16.90	5.7	103		83.10	4.9	

Table 2: Diabetes groups depending on the time of diagnosis.

		Diabetes groups depending on the time of diagnosis							
		Newly diagnosed diabetes (subgroup A)				Patients known to have diabetes at the time of registration			
		Count	Mean	Row valid n%	Standard deviation	Count	Column valid N%	Mean	Standard deviation
IMC Groups	Underweight	4		1.1		35	1.7		
	Normal weight	70		18.9		425	20.2		
	Overweight	135		36.5		761	36.2		
	Grade I obesity	103		27.8		576	27.4		
	Grade II obesity	34		9.2		204	9.7		
	Morbid obesity	24		6.5		102	4.9		
HbA1C			10.85		2.45			9.15	2.18
Blood glucose values			264.57		70.18			216.03	62.56

Table 3: Diabetes groups depending on the time of diagnosis.

		Diabetes groups depending on the time of diagnosis				
		Newly diagnosed diabetes		Patients known to have diabetes at the time of registration		Sig.
		Count	Column valid n%	Count	Column valid N%	
Associated with hypertension	No	142	38.3	757	35.70	0.336
	Yes	229	61.7	1365	64.30	
Associated with polyneuropathy	No	135	36.4	353	16.6	0.000*
	Yes	236	63.6	1769	83.4	
Dyslepidemic changes	No	123	33.2	929	43.8	0.000*
	Yes	248	66.8	1193	56.2	
Occurrence of chronic kidney disease	No	371	100	2115	99.7	0.268
	Yes	0	0	7	0.3	

*=statistically signficant

that most subjects at risk for T2DM, i.e. those with resting glucose disorders and glucose tolerance, already have a significant loss of about 80% of the ability of the pancreas to secrete insulin [7].

According to the literature, the application of medical interventions for the prevention of T2DM may be the only way to prevent its complications. The most common chronic complications of diabetes are represented by: cardiovascular spectrum pathologies, stroke-type neurological disorders and even cognitive disorders, chronic kidney disease, diabetic neuropathy, diabetic retinopathy, diabetic foot [4, 5].

Due to its chronic nature, as well as the severity of complications and the means needed to control them, diabetes is an expensive

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pathology, both for the patient and his family, and for the health system [12, 13]. Diabetic foot is due to pathophysiological changes in the circulatory system and nerves, which often leads to ulceration and even amputation of the limb. Research shows that diabetes is the most common cause of non-traumatic lower limb amputation [14, 15].

The study limitations are: lack of application of a questionnaire, hence lack of subjective analysis and insufficient documentation of the patient's evolution due to lack of information.

As future research perspectives, it is suggested that to continue the analysis of the incidence of symptoms for drawing a profile of the adult patient (elderly and young) diagnosed with diabetes and carrying out clinical studies, through detailed collaboration with other specialties, on the role and effectiveness of treatment in preventing complications associated with DM.

Conclusions

There is an increased prevalence of complications in the whole group (with the predominance of cases in subgroup B subjects), with a peak incidence around the age of 60–65 years. At the level of the analyzed lot the highest share of patients had hypertension (independent of the subgroup belonging 61.7% subgroup A, respectively 64.3% subgroup B) without statistically significant differences (sig. 0.336); polyneuropathy is mostly detected as a complication of patients with old diabetes (83.4%) (sig.0.000 *); alteration of lipid metabolism was detected predominantly in newly diagnosed patients (66.80%, compared to 56.2% subgroup B) (sig.0.000 *). Complications were associated with the evolution of DM (newly diagnosed, or with variable age) and with a poor glycemic control (serum blood glucose above 220 mg/dL and HbA_{1C} above 9.36 ± 2.2%). The predominance of cases in subgroup B in the urban environment suggests an increased attention on the evolution of patients, respectively a higher incidence of female patients.

Conflict of Interest

The authors declare no conflict of interest.

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