

## Evaluation of Differences regarding the Characteristics of Diabetic Retinopathy between 2007 and 2008

Mihaela MOCIRAN<sup>1\*</sup>, Cristian DRAGOȘ<sup>2</sup>, Nicolae HÂNCU<sup>1</sup>

<sup>1</sup> "Iuliu Hațieganu" University of Medicine and Pharmacy Cluj-Napoca, 8 Victor Babeș, 400012 Cluj-Napoca, Romania

<sup>2</sup> Babeș-Bolyai University of Cluj-Napoca, 1 Mihail Kogalniceanu, 400084 Cluj-Napoca, Romania.  
E-mail(s): mihaela.mociran@yahoo.com; cristian.dragos@econ.ubbcluj.ro; nhancu@umfcluj.ro

\* Author to whom correspondence should be addressed; County Hospital "C. Opreș" Baia Mare, Baia Mare, 31 George Coșbuc, Tel.: 0724044581

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### Abstract

*Aim:* to discover the incidence of diabetic retinopathy; to identify the influence of optimizing different parameters on progression of diabetic retinopathy in diabetic patients from Maramureș.

*Methods and material:* We done a prospective study of 1269 persons with diabetes mellitus registered in healthcare system in Maramureș County. We analysed the differences between 2007 and 2008 regarding different parameters (glycated haemoglobin - HbA1c, hypertension, lipid profile, body mass index - BMI and abdominal circumference). We analysed the influence of these modifications on the progression of diabetic retinopathy.

*Results:* In 2007 the total number of patients with diabetic retinopathy was 246 but in 2008 the total number of patients with diabetic retinopathy increased to 250. In 2007 the total number of patients with diabetic maculopathy was 40 but in 2008 the total number of patients with diabetic maculopathy increased to 46. There was no significant influence after one year in optimizing glycaemic control ( $p=0.302$ ) or cholesterol level ( $p=0.292$ ) or triglycerides levels ( $p=0.054$ ) or HDL level ( $p=0.831$ ) or hypertension ( $p=0.413$ ) or BMI (0.063) or abdominal circumference ( $p=0.068$ ).

*Conclusions:* diabetes retinopathy incidence was 4 in 1269 or 0.3%. After one year any improvement in diabetes management has no significant positive influence on progression of diabetic retinopathy.

**Keywords:** Diabetes; Retinopathy; Progression; Incidence.

### Introduction

Diabetic retinopathy, a specific microvascular complication of diabetes, is the primary cause of blindness among adults aged 20-74 in SUA [1]. The prevalence of diabetic retinopathy increases with duration of diabetes and nearly all persons with type 1 diabetes and more than 60% of those with type 2 diabetes have some retinopathy after 20 years [2].

Major risk factors associated with incidence and progression of this complication of diabetes were: diabetes duration, glycaemic control, hypertension control, lipid control [3].

Any new information regarding this complication of diabetes mellitus has significant influence in men's health. Dates about Romanian diabetic patients and this complication are few and inconsistent.

In this study our purpose was to identify the incidence of diabetic retinopathy in patients with diabetes mellitus from Maramureș County. In addition, we wanted to analyze the influence of optimizing different parameters (such as glycated haemoglobin, hypertension, lipid profile, body mass index - as mentioned above) on progression of diabetic retinopathy in this population in the interval between 2007 and 2008.

## Material and Methods

We included in our study all patients with diabetes who respected the inclusion criteria and who not presented any of the exclusion criteria.

Inclusion criteria: patients with diabetes mellitus from Maramureş County registered in healthcare system in December 2007. All participants gave oral informed consent to accept to participate in this study.

Exclusion criteria: patients with history of laser treatment, patients with cataract or other diseases which may affect the detection of retinopathy, patients with severe mental diseases, patients with glaucoma, patients whose medical records do not include all the necessary dates.

The study followed the recommendations of the Declaration of Helsinki.

This was a prospective study. We made four visits (twice a year, at six month intervals approximately) for to evaluate all the dates describe below. Only retinal digital photography was made once a year.

We investigated different parameters regarding demographics variables, diabetes and its complications, physical measurements and some laboratory determinations (HbA1c, cholesterol, triglycerides, HDL). All these were described in detail in a previous study published in 2009 by the same authors [4]. We also performed the retinal digital photography as mentioned in the above study.

We applied the International Diabetes Federation recommendations regarding daily exercise, HbA1c<6.5%, blood pressure < 130/80, LDL < 95mg/dl, triglycerides < 200mg/dl and HDL >39mg/dl [5].

Statistics: We used Ordered Logit Model and estimation of parameters (described below) using Maximum Likelihood. For these estimations we used STATA software package version 9.1. We applied these analyses for parameters: HbA1c, cholesterol, triglycerides, HDL, hypertension, BMI, abdominal circumference. We described the results in detail, in table, using coefficients (the coefficients of Ordered Logit Model).

A p-value<0.05 denoted statistical significance.

## Results

From a total of 12917 registered patients with diabetes in 2007 only 1269 were available for analysis (the rest were excluded because we haven't all the dates necessary for analyses as mentioned above). The sample was representative, the prevalence of the retinopathy having a confidence interval of  $\pm 2.1\%$  for a *p*-value of 0.05.

From our 1269 patients, a total number of 703 (55.4%) were female and a total number of 566 (44.6%) were male. Mean age of this population was 57.7 years (limits between 14 and 87 years; a median age of 59 years). Mean diabetes duration was 4.8 years (from newly diagnosed with diabetes mellitus to 42 years of diabetes duration; median diabetes duration was 4 years).

The differences between the parameters were detailed in table 1.

**Table 1.** Differences between parameters in 2007 and 2008

Parameters	2007	2008
HbA1c (%) (median)	7.7	7.2
Cholesterol (mg/dl) (median)	194	188
Triglycerides (mg/dl) (median)	154	153
HDL (mg/dl) (median)	46	48
BMI (kg)/m <sup>2</sup> (median)	30.8	31
Abdominal circumference (cm) (median)	110	112

In 2007 we recorded a number of 871 (68.6%) patients registered with hypertension. In 2008 this number increased to 933 (73.5%).

The results of the analysis in which we used Ordered Logit Model providing differences between parameters from 2007 to 2008 and their influence on diabetic retinopathy is presented in Table 2.

In 2007 the total number of patients with diabetic retinopathy was 246 and this number increased to 250 in 2008. The total number of patients with mild non proliferative diabetic retinopathy decreased

from 94 (38.2%) in 2007 to 83 (33.2%) in 2008. The total number of patients with moderate non proliferative diabetic retinopathy decreased from 78 (31.7%) in 2007 to 74 (29.6%) in 2008. The total number of patients with severe non proliferative diabetic retinopathy increased from 52 (21.1%) in 2007 to 60 (24.0%) in 2008. The total number of patients with proliferative diabetic retinopathy increased from 22 (8.9%) in 2007 to 33 (13.2%) in 2008.

**Table 2.** Influence of modification of different parameters on diabetic retinopathy incidence and progression

Parameters	Coef	p-value	[95%CI]	
HbA1c	0.0139729	0.302	-0.0125491	0.0404948
Cholesterol	0.0006133	0.292	-0.0005288	0.0017553
Triglycerides	-0.0002374	0.054	-0.000478	3.97e-06
HDL	0.0004748	0.831	-0.0038902	0.0048399
Hypertension	-0.0804481	0.413	-0.2733303	0.1124343
BMI	0.2685842	0.063	-0.0014673	0.5518421
Abdominal circumference	0.0869333	0.068	-0.0062657	0.1801323

Incidence of diabetic retinopathy was 4 to 1269 or 0.3%.

In 2007 the total number of patients with diabetic maculopathy was 40 but in 2008 the total number of patients with diabetic maculopathy increased to 46. In 2007 the total number of patients with mild diabetic maculopathy were 8 (20.0%) but in 2008 the total number of patients with mild diabetic maculopathy decreased to 7 (15.2%). In 2007 the total number of patients with moderate diabetic maculopathy were 8 (20.0%) but in 2008 the total number of patients with mild diabetic maculopathy decreased to 4 (8.6%). In 2007 the total number of patients with severe diabetic maculopathy were 24 (60.0%) but in 2008 the total number of patients with severe diabetic maculopathy increased to 35 (76.1%).

## Discussion

Diabetes Control and Complications Trial Study (DCCT) established that any decrease with 1% in HbA1c will decrease with 69% the risk of apparition of new diabetic retinopathy [6].

In CURES Eye Study the authors remark that for any increase of HbA1c with 2% the risk of development of any retinopathy will increase by 1.7 times [7].

In DCCT study, the reduction of risk for retinopathy appears only after 6.5 years of intensive treatment [8]. Similar results were finding for type 2 diabetic patients in UKPDS study. In this last study, the relative risk between intensive and conventional treatment was 0.83 (95% CI 0.67-1.01) after 6 years of follow-up and only after 12 years of follow-up the risk was 0.79 (95% CI 0.63-1.00) [9]. Both studies remarks that there is need for a good glycaemic control for a long period of time to appear significant reduction of relative risk for diabetic retinopathy.

More recently, the study "The Action in Diabetes and Vascular Disease: Preterax and Diamicon MR Controlled Evaluation (ADVANCE) Retinal Measurement after a period of 4.1 years established that there is no evidence of intensive glucose control and intensive blood pressure control on incidence and progression of diabetic retinopathy. Also, some modification (maculopathy or microanevrisme), modification which are strong correlated with diabetic retinopathy, are reduced after an intensive glycaemic control [10].

In our study, we obtained an improvement in glycaemic control (the difference between HbA1c in 2007 and 2008 was 0.5%). Unfortunately this small difference had no effect on incidence and progression of diabetic retinopathy (p=0.302). It is important to mention that in the vast majority of studies a significant influence appeared only after a long period of time.

As in majority of studies, any improvement in HbA1c was associated with weight increased. Therefore, in our case, an improvement in HbA1c of 0.5% was associated with an increased in BMI with 0.2 kg/ m<sup>2</sup> and an increased in abdominal circumference with 2 cm. Again, this had no significant influence on development of diabetic retinopathy (p=0.063 for BMI and respectively p=0.068 for abdominal circumference).

Some studies find a positive correlation between regression of hard exudates and the intensive and aggressive treatment for lipids control [11].

In our study we obtained a relative improvement in lipid control (cholesterol decreased from 194 mg/dl to 188 mg/dl, triglycerides decreased from 154 mg/dl to 153 mg/dl and HDL increased from 46 mg/dl to 48 mg/dl). Again, this very small difference in lipid profile has no significant influence on incidence and progression of diabetic retinopathy ( $p=0.292$  for cholesterol,  $p=0.054$  for triglycerides and  $p=0.831$  for HDL).

Regarding hypertensive patients we find no significant influence on diabetic retinopathy development ( $p=0.413$ ). This result is similar with the observation registered in ADVANCE study.

In our study there is no significant relation between any of these parameters and incidence and progression of diabetic retinopathy. The major problem was the too short period of time used for the evaluation of these differences (only one year). We need a long period of time for to obtain relevant results (more than 6 years).

## Conclusions

Diabetes retinopathy incidence was 4 in 1269 or 0.3%. After one year any improvement in diabetes management has no significant positive influence on progression of diabetic retinopathy.

There is necessary a long period of time with a good metabolic control for diabetic patients to obtain significant results regarding reduction of the progression of diabetic retinopathy.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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