Prevalence of Diabetic Retinopathy in Public Health Care Units of São José do Rio Preto-SP-Brazil

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ABSTRACT

Objective: To determine the prevalence of DR in public health care units of São José do Rio Preto-SP-Brazil.

Material and Methods: Population-based cross-sectional study that included 710 diabetic patients. All patients underwent an eye examination by indirect ophthalmoscope to check for any signs of DR. Participants were also interviewed and examined to determine their demographic characteristics, medical conditions and the realization of previous fundoscopic eye examination. Statistical studies were done with t-Student test, Fisher test or chi-square test.

Results: Among 710 screened patients, 112 had some degree of diabetic retinopathy, and the overall standardized prevalence of any retinopathy was 16.3%, including 90 (80.4%) with non-proliferative and (22) 19.6% with proliferative diabetic retinopathy.

Conclusions: The prevalence of DR in São José do Rio Preto is 16.3%. The main risk factors associated with DR were time of disease and glicemic control. Type of DM and nephropathy were considered secondary risk factors. The presence of high blood pressure, in this study, was not a risk factor associated with DR.

Keywords
Diabetic Retinopathy, Retinopathy, Prevalence, Population.

Introduction
Recent studies indicate that, by the year 2000, there were 171 million of diabetics in all or world. In 2030, an estimated increase in the number of diabetics, particularly in developing countries, was 366 million [1]. While most people with Diabetes mellitus (DM) in developed countries are elderly, most of these in developing countries are in the age range of 46-64 years, which aggravates even more concern in these countries [2]. Diabetic retinopathy (RD) is one of the main microvascular complication of the disease [3,4]. During the first few decades of disease, practically all patients with type 1 diabetes and more than 60% with type 2 diabetes develop retinopathy [5]. The prevalence of RD, after 15 years of diabetes, varies from 97% for those with insulin-dependent DM and 80% for non-insulin-dependent diabetics [6]. Garcia et al. [7], in a study with 978 diabetic patients, found an incidence of 28.31% of RD and associated a greater risk of ophthalmological complications to the duration of the systemic disease. Escariañ e cols [8], through a retrospective study revealed a prevalence of 25.46% of RD. Several studies have been carried out to identify risk factors for the development of RD and visual loss, such as: hyperglycemia, arterial hypertension, and hypercholesterolemia [9-12]. In accordance with these studies, it has been demonstrated that a reduction in glycosylated hemoglobin (HbA1c) to less than 7% decreases the incidence of RD in patients with diabetes type 1 [12-15], as well as microvascular complications, Prevention is based on rigorous clinical control and early detection of vision-threatening fundoscopic changes such as diabetic macular edema...
and retinal neovascularization [16]. The treatment of these alterations, when instituted early, is effective in the prevention of blindness [17]. The present study aims to determine the prevalence of diabetic retinopathy in diabetic patients attended at the Basic Health Units of São José do Rio Preto, SP (SJRP).

Method

For the accomplishment of this cross-sectional descriptive epidemiological study, 710 diabetic patients enrolled in the HIPERDIA (Hypertensive and Diabetic) program of the Municipal Health Secretariat of SJRP. The mean age was 59.5 years, with a standard deviation of 12 years, (Figure 1) of which 464 (65.4%) were males and 246 (34.6%) were females.

Figure 1: Histogram of patient age.

The ocular exams were performed in three Basic Health Units (BHUs), through the prior appointment of the participants. All patients were submitted to the pupillary dilation procedure and answered a questionnaire about age, duration of diabetes, medication used for glycemic control (oral antidiabetic or insulin), treatment for systemic arterial hypertension, hyperlipidemia or nephropathy, and knowledge about ocular changes related to DM. Complementary data, such as the HbA1c value, with a maximum of four months of its completion, and type of diabetes (type 1 or 2) were extracted from the respective charts. After pupillary dilatation, indirect eye ophthalmoscopy. Pupillary dilation was achieved by inserting into the patient's eyes one drop of the eye drops described below in the following order: 1% tropicamide eye drops, procedure repeated after ten and twenty minutes, and, after 30 minutes, 10% phenylephrine eye drops. The RD was classified by a single researcher (CECJ), using the scale developed by the Global Diabetic Retinopathy Group19. The first level was the absence of DR, without fundoscopic changes; the second, mild non-proliferative RD (RDNP) (only presence of microaneurysms); the third, of moderate non-proliferative RD, including more than just microaneurysms and less than severe non-proliferative RD; the fourth, of severe non-proliferative RD, including any of the following: first, more than twenty intraretinal hemorrhages in each of the four quadrants; then venous sheathing, in two or more quadrants; then intraretinal microvascular abnormality in one or more quadrants; and also, absence of signs of proliferative RD. The fifth level of proliferative RD (PDR) included one or more of the following characteristics: evident neovascularization, vitreous or pre-retinal haemorrhage [18-20]. The classification of the RD patient was based on the most severe degree of retinopathy in the most affected eye. The statistical methods used for the analysis were comparisons between sample groups defined by RD, which were performed by Student's t-test, Fisher's test or chi-square test. For the identification of the statistically significant risk factors related to DR, previous to the multivariate analysis, relative risk estimates (RR) were used, with ICRR confidence intervals (95%). In all statistical tests, the level of significance was 5%.

Results

General characterization of the sample

The study involved a sample of 710 patients from the Diabetes program of São José de Rio Preto. The patients came from the three Basic Health Units (UBS): UBS Jaguaré (148 patients), UBS Votorazzo (206 patients) and UBS Solo Sacred (356 patients) (Figure 2).

Figure 2: Patients' origin.

Diabetic retinopathy

We examined 1,420 eyes of 710 diabetics. For the analysis of the findings of the research on diabetic retinopathy (RD), the studied patients were divided into two groups: Group I, with 112 (16.3%) patients with RD, and Group II, with 597 (83.7%) patients patients without the microvascular complication of diabetes. Regarding the RD classification, presented by the patients in Group I, it was verified that eighty (80.4%) patients presented the non-proliferative form of the disease (RDNPF), and 49 patients presented the disease in a mild degree; 39 patients, in moderate degree, and 2 patients, to a severe degree. In 22 (19.6%) of the patients, the proliferative form (FPRD) of the disease was found (Figure 3). The association of the quantitative variables of age, time of DM and HbA1C, with RD, was analyzed by means of the t-Student test of comparison of means (Table 1).

| Variable          | Group | n    | x    | s    | Median | Min | Max | P Value (t-student test) |
|-------------------|-------|------|------|------|--------|-----|-----|--------------------------|
| Age (years)       | I     | 112  | 60.8 | 11.6 | 61.0   | 29  | 86  | p=0.202                  |
|                   | II    | 598  | 59.3 | 12.8 | 60.0   | 10  | 90  |                          |
| DM time (years)   | I     | 112  | 14.17| 7.82 | 13.0   | 1.0 | 40.0| p<0.001                  |
|                   | II    | 598  | 7.96 | 7.06 | 6.0    | 0.021|50.0|                          |
| HbA1C (%)         | I     | 112  | 8.15 | 1.70 | 8.05   | 5.0 | 15.1| p<0.001                  |
|                   | II    | 598  | 7.22 | 1.84 | 6.70   | 1.0 | 18.0|                          |

Table 1: Results on association of RD with age and DM time.

HbA1C(%) Glycosylated hemoglobin.
The mean age estimated was 59.5 years, with a standard deviation of 12.8 years. The results of the t-test revealed that the mean age of patients in the two groups did not differ statistically (p = 0.202). The mean duration of disease in Group I patients was 14.17 years, with standard deviation (SD) of 7.82. In Group II patients, the mean was found to be 7.96 years, with a standard deviation of 7.06 (p <0.001). In Group I, the mean HbA1C dosage was 8.15, with DP of 1.70. In Group II, the mean was 7.22, with PD of 1.84 (p <0.001) (Table 1). Regarding the therapy used for glycemic control, 467 (65.8%) of the patients used ADO; 86 (12.1%), insulin, and 138 (19.4%) ADO associated with insulin. Only 19 patients (2.7%) did not use any anti-glycemic medication (Table 2). Regarding the presence of pathological antecedents, Systemic Arterial Hypertension (SAH) affects 581 (81.8%) patients. Hyperlipidemia was observed in 288 (40.6%) and nephropathy in sixty (8.5%) of them. Of the total of 710 patients, 92 (13%) did not present the antecedents cited in Table 2. Approximately 479 patients (68.7%) reported having undergone anterior fundus examination, while 231 of them (31.3%) reported never having undergone such procedure (Table 2).

### Disease time and glycemic control

As for the duration of DM, it was found that it is 8.9 years, on average, with a standard deviation of 7.5 years. The high values of the mean and standard deviation are justified by the presence of cases in which the disease has been present for more than 25 years. Overall, and for about 530 (75%) patients, their duration was up to 12 years. The disease duration ranged from 0.021 to 50 years, with a median of seven years. Laboratory tests for the measurement of glycosylated hemoglobin (HbA1C) showed that the percentage of HbA1C in the blood ranged from 1 to 18%, with mean and median, respectively, of 7.4% and 6.8%, and with a standard deviation of 1, 8%. In Group I, 75 (16.2%) patients were female, and 37 (15%) were male; in Group II, 389 (83.8%) and 209 (85.0%) were respectively male and female (p = 0.746) (Table 3). According to the type of diabetes, 69 (9, 7%) were type 1, and 641 (90.3%) patients were type 2. Type 1 diabetics had a higher prevalence of RD than type 2 diabetes. Among type 2 diabetics, RD in 92 of them (14.4%), whereas for type 1, twenty (29.0%) had RD (p = 0.003) (Table 3). In Group I, 93 (16.0%) had SAH, whereas in 19 (14.7%) no SAH was observed (p = 0.790) (Table 3). Hyperlipidemia was present in 51 (17.7%) of the patients in Group I, while 61 (14.4%) did not present it (p = 0.250) (Table 3). Nephropathy was reported in 18 (30.0%) of the patients in Group I, while 94 (14.5%) did not present this comorbidity (p = 0.005). Previous Fundoscopic exams was reported as performed in 21 (9.1%) of the patients in Group I and as not performed in 91 (19.0%) of the cases (p <0.001). DM and HbA1C times were statistically associated with the presence of DR, considering the statistically significant difference between the means of Groups I and II (p <0.001 and p <0.001, respectively). The correlation between disease time and its prevalence showed that 32.9% of patients, patients for at least 15 years, are in Group I and that, for proportionally shorter duration periods, the number of patients in Group I is statistically lower (16.4% between 5 and 15 years and 3.1% for less than 5 years of DM) (p <0.01) (Table 3). The lack of glycemic control by HbA1C is another variable that contributes significantly (p <0.001). Among those who exceeded the limit of 7%, considered desirable for HbA1C, 24% presented retinal involvement (Table 3).

### Results regarding the qualitative clinical data associated with DM. Abbr: OA: Oral Antidiabetics; SAH: Systemic Arterial Hypertension.

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Table 4 shows that the variables whose relative risk estimates (RR) implied an estimation of the confidence interval with a higher lower limit are those that provide statistical evidence of possible risk factors for RD. By the univariate analysis performed above, the possibly predictive variables of RD are: type of DM, nephropathy, previous fundoscopic examination, HbA1C and DM time. Logistic regression, for the identification of the most significant predictor variables associated with DR, corroborated the hypothesis that DM and HbA1C time are the most relevant.

The presence of arterial hypertension (AH) in this study did not prove to be a risk factor for RD. Of the patients with RD, 16% had SAH, whereas 14.7% of those without RD had AH. This disagreement may be due to the more rigorous pressure control. The patients in the sample are part of the program of periodic control of SAH and DM. A prospective population stud [27] concluded, after nine years of follow-up, that treatment with antihypertensives halved the risk of developing RD. Patients with elevated systolic or diastolic hypertension were at increased risk. At each 10 mmHg increase in systolic pressure, there was a 30% increase in the risk of RD 27. Of the patients with RD, 30% presented nephropathy, revealing a statistically significant difference in relation to patients with RD and without nephropathy (14%). This finding demonstrates, as literature does, a correlation between renal and microvascular disease of the retina [28].

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