Research Article

Ophthalmology Research

# 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. Escarião 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.

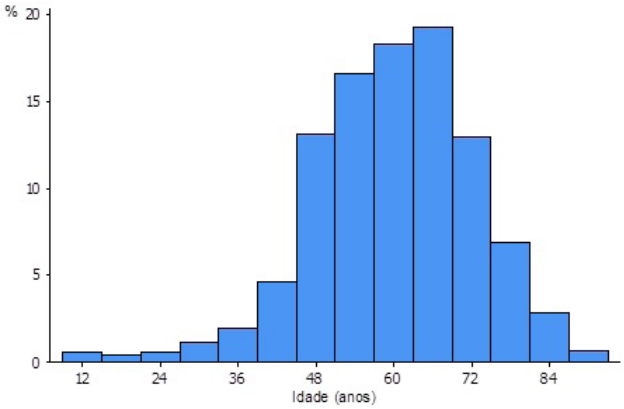


**Figure 1:** Histogram of patient age.

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 Vetorazzo (206 patients) and UBS Solo Sacred (356 patients) (Figure 2).

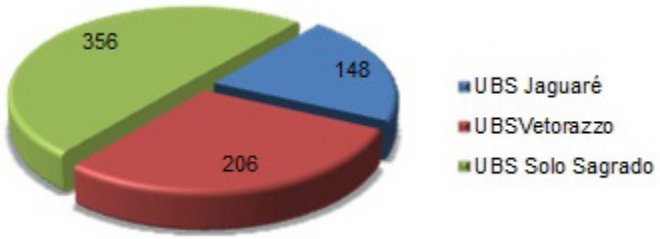


**Figure 2:** Patients' origin.

### 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 | χ | s | Median | Min | Máx | 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.

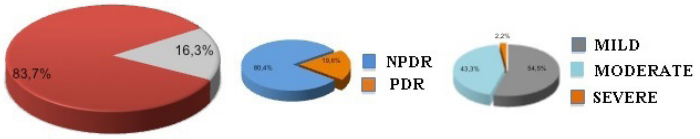


**Figure 3:** Prevalence of RD (a), type of RD (b) and severity of RDNPF (c).

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).

| Variable | | Result |
|---|---|---|
| Type of DM | I | 69 (9,7%) |
| | II | 641 (90,3%) |
| Medication | OA | 467 (65,8%) |
| | Insulin | 86 (12,1%) |
| | Both | 138 (19,4%) |
| Pathological antecedents | none | 19 (2,7%) |
| SAH | YES | 581 (81,8%) |
| | NO | 129 (18,2%) |
| Hyperlipidemia | YES | 288 (40,6%) |
| | NO | 422 (59,4%) |
| Nephropathy | YES | 60 (8,5%) |
| | NO | 650 (91,5%) |
| Previous Fundoscope | YES | 479 (68,7%) |
| | NO | 231 (31,3%) |

**Table 2:** Results regarding the qualitative clinical data associated with DM. Abbr: OA: Oral Antidiabetics; SAH: Systemic Arterial Hypertension.

## 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 exceded the limit of 7%, considered desirable for HbA1C, 24% presented retinal involvement (Table 3).

| Variable | | Group | | Total | Valor p |
|---|---|---|---|---|---|
| | | I | II | | |
| Gender | Female | 75 (16,2%) | 389 (83,8%) | 464 | p=0,746 |
| | Male | 37 (15,0%) | 209 (85,0%) | 246 | |
| Type of DM | I | 20 (29,0%) | 49 (71,0%) | 69 | p=0,003 |
| | II | 92 (14,4%) | 549 (85,6%) | 641 | |
| SAH | YES | 93 (16,0%) | 488 (84,0%) | 581 | p=0,790 |
| | NO | 19 (14,7%) | 110 (85,3%) | 129 | |
| Hyperlipidemia | YES | 51 (17,7%) | 237 (82,3%) | 288 | p=0,250 |
| | NO | 61 (14,4%) | 361 (85,6%) | 422 | |
| Nephropathy | YES | 18 (30,0%) | 42 (70,0%) | 60 | p=0,005 |
| | NO | 94 (14,5%) | 556 (85,5%) | 650 | |
| Previous Fundoscope | YES | 21 (9,1%) | 210 (90,9%) | 231 | p<0,001 |
| | NO | 91 (19,0%) | 388 (81,0%) | 479 | |
| Age (years) | >60 | 56 (16,1%) | 292 (85,9%) | 348 | p=0,450 |
| | ≤60 | 56 (15,5%) | 306 (84,5%) | 362 | |
| DM time (years) | [0 a 5) | 07 (3,1%) | 218 (96,9%) | 225 | p<0,001 |
| | [5 a 15) | 54 (16,4%) | 276 (83,6%) | 330 | |
| | [15 a +) | 51 (32,9%) | 104 (67,1%) | 155 | |
| HbA1C (%) | Desirable | 35 (9,0%) | 354 (91,0%) | 389 | p<0,001 |
| | Changed | 77 (24,0%) | 244 (76,0%) | 321 | |

**Table 3:** Percentage distribution of qualitative clinical data, according to

the Group.

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.

| Variable | RR | ICRR(95%) |
|---|---|---|
| Age_60 years | 1,040 | (0,740; 1,462) |
| Gender | 1,075 | (0,748; 1,544) |
| Type of DM | 2,020 | (1,334; 3,058) |
| AH | 1,087 | (0,690; 1,712) |
| Hyperlipidemia | 1,225 | (0,872; 1,721) |
| Nephropathy | 2,074 | (1,350; 3,185) |
| Previous Fundoscope | 2,088 | (1,335; 3,268) |
| HbA1C | 2,670 | (1,838; 3,861) |

**Table 4:** Relative risk estimates (RR) associated with possible risk factors for RD and corresponding ICRR confidence intervals (95%).

## Conclusion

The present study demonstrated that the prevalence of DR in a representative sample of diabetic patients from São José do Rio Preto was 16.3%, lower than that found in other studies with similar screening criteria [21,22]. According to this investigation, as well as according to the current literature, there is a strong association between the time of disease and the appearance of the retinal alteration [6]. In the studied sample, the disease time was, in 75% of cases, less than 12 years. This is one of the factors that may explain the lower prevalence of RD in the sample studied.

The prevalence of RD was 24%, including type 1 and type 2 diabetic patients, in a multidisciplinary care program at the Hospital das Clínicas de Ribeirão Preto. When assessing the prevalence of RD in a diabetic association, 28.2% of patients with retinopathy were found21. Escarião et al [8] evaluated 2,223 diabetic patients, who were divided into two groups: Group I, patients living in the city of Recife and in the Metropolitan Region, and Group II, patients living in the interior of the state of Pernambuco. In Group I, 477 (24.2%) patients had diabetic retinopathy, whereas in Group II, 89 (39.4%) patients were reported ($p<0.0001$). The authors attributed a higher prevalence of DR to patients from the interior of Pernambuco in relation to those in the city and surrounding Recife, due to the difficulty in first disclosing the need for these patients to undergo funduscopic examination; the difficulty of transporting these patients to a place where this examination could be carried out, and finally, by the difficulty to make the population aware of the risk of Blindness.

However, in our study, a greater proportion of RD was found among women. This finding was not statistically significant ($p = 0.379$), which is consistent with the the literature, in which there is no difference in the prevalence of RD between the sexes [23]. In our study, approximately 68.7% of the patients reported having undergone anterior fundus examination. According to Escarião et al [8], only 26.6% of the patients had undergone such examination, and a prevalence of RD was observed in 39.4% of the cases. This finding confirms the strong influence of this preventive measure, being, therefore, another factor that contributes to a lower prevalence of RD in relation to other studies. Among type 2 diabetics, in our study, 92 (14.4%) presented DR, whereas, for type 1, RD was found in twenty patients (29.0%) ($p = 0.003$). After the evaluation of 437 patients with type 1 DM, Esteves et al. [24] observed a prevalence of 44% RD. After multivariate analysis, the author attributed the high prevalence to traditional risk factors, such as disease time and glycemic control. In another stud [25], involving 7,989 diabetic patients, a prevalence of 56.3% was observed in type 1 patients and 37.4% in type 2 patients. In our study, glycemic control was an important risk factor. Of the RD patients, only 9% had a controlled level of HbA1c, whereas 24% were found to be elevated. Recently, a systematic review of the literature has shown that rigid glycemic control (HbA1c at normal rates) reduces the incidence and progression of RD [26].

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].

## References


1. Wild S, Roglic G, Green A, et al. Global Prevalence of Diabetes: Estimates for the year 2000 and projections for 2030. Diabetes Care 2004; 27: 1047-1053.
2. World Health Organization: Guidelines for the prevention, management and care of diabetes mellitus. EMRO Technical publications series 32. Geneva 2006.
3. Vilela MP, Saadi AK, Pletsch L, et al. Inquérito entre pacientes e médicos sobre as estratégias aplicadas na prevenção e tratamento da retinopatia diabética. Arq Bras Oftalmol. 1997; 60: 152-155.
4. Nehemy MB. Retinopatia diabética. Arq Bras Oftalmol. 1998; 61: 366-370.
5. Fong DS, Aiello LP, Gardner TW, et al. Retinopathy in diabetes. Diabetes Care. 2004; 27: 84S-87S.
6. Silva VB, Temporini ER, MoreiraFilho DC, et al. Tratamento da retinopatia diabética: percepções de pacientes em Rio

Claro (SP) - Brasil. Arq Bras Oftalmol. 2005; 68: 363-368.
7. Garcia CA, Gomes AH, Nunes IM, et al. Monteiro J.Incidência e fatores de risco da retinopatia diabética em pacientes do Hospital Universitário Onofre Lopes Natal-RN. Arq Bras Oftalmol 2003; 66: 355-358.
8. Escarião PH, Arantes TE, Figueiroa NC, et al. Epidemiologia e diferenças regionais da retinopatia diabética em Pernambuco-Brasil. Arq Bras Oftalmol. 2008; 2: 172-175.
9. Klein R, Klein BE, Moss SE, et al. Relationship of hyperglycemia to the long-term incidence and progression of diabetic retinopathy. Arch Intern Med. 1994; 154: 2169-2178.
10. Leske MC, Wu SY, Hennis A, et al. Hyperglycemia, blood pressure, and the 9-year incidence of diabetic retinopathy. The Barbados Eye Studies. Ophthalmology 2005; 112: 799-805.
11. Klein R, Klein BE, Moss SE, et al. Is blood pressure a predictor of the incidence or progression of diabetic retinopathy? Arch Intern Med 1989; 149: 2427-2432.
12. Chew EY, Klein ML, Ferris FL III, et al. for the ETDRS Research Group. Association of elevated serum lipid levels with retinal hard exudate in diabetic retinopathy. Early Treatment Diabetic Retinopathy Study (ETDRS) report 22. Arch Ophthalmol. 1996; 114: 1079-1084.
13. The Diabetes Control and Complications Trial/Epidemiology of Diabetes Intervention and Complications Research Group. Retinopathy and nephropathy in patients with type 1 diabetes four years after a trial of intensive therapy. N Engl J Med. 2000; 342: 381-389.
14. The Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications Research Group. Effect of intensive therapy on the microvascular complications of type 1 diabetes mellitus. JAMA. 2002; 287: 2563-2569.
15. UK Prospective Diabetes Study Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet. 1998; 352: 837-853.
16. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. Br Med J. 1998; 317: 703-713.
17. Sugano DM, Serra DC, Barros RA, et al. Impacto da retinopatia diabética em campanha de prevenção da cegueira. Arq Med ABC. 2001; 24: 47-50.
18. Wilkinson CP, Ferris FL, 3rd, Klein RE, et al. Proposed international clinical diabetic retinopathy and diabetic macular edema disease severity scales. Ophthalmology. 2003; 110: 1677-1682.
19. The Diabetic Retinopathy Study Research Group: a modification of the Arlie House classification of Diabetic retinopathy (DRS report no. 7). Invest Ophthalmol Vis Sci. 1981; 21: 210-226.
20. Ramos SR, Sabbag FP, Busato D, et al. Retinopatia diabética: estudo de uma associação de diabéticos. Arq Bras Oftalmol. 1999; 62: 735-737.
21. Foss MC, Paccola GMGF, Souza NV, et al. Estudo analítico de uma amostra populacional de diabéticos tipo II da região de Ribeirão Preto (SP). AMB Rev Assoc Med Bras. 1989; 35: 179-183.
22. Diabete Melito. Guia Básico Para Diagnóstico e Tratamento. Ministério da Saúde do Brasil. Sociedade Brasileira de Diabete. Programa Harvard/Joslin/ SBD. Brasília, 1996; 5: e57.
23. Esteves JF, Kramer CK, Azevedo MJ, et al. prevalence of diabetic retinopathy in patients with type 1 diabetes mellitus. Rev Assoc Med Bras. 2009; 55: 268-273.
24. Javadi MA, Katibeh M, Rafati N, et al. Prevalence of diabetic retinopathy in Tehran province: a population-based study. BMC Ophthalmology. 2009; 9: 12.
25. Mohamed Q, Gillies MC, Wong TY. Management of diabetic retinopathy: a systematic review. JAMA. 2007; 298: 902-916.
26. Leske MC, Wu SY, Hennis A, et al. Hyperglycemia, Blood Pressure, and the 9-Year Incidence of Diabetic Retinopathy. Ophthalmology. 2005; 112: 799-805.
27. Skyler JS. Microvascular complications. Retinopathy and nephropathy. Endocrinol Metab Clin North Am. 2001; 30: 833-856.