
EPIDEMIOLOGÍA DE LA RETINOPATÍA DIABÉTICA EN PACIENTES TIPO II. CAMBIOS OBSERVADOS EN UNA POBLACIÓN ENTRE LOS AÑOS 1993 Y 2005, TRAS LOS NUEVOS CRITERIOS DIAGNÓSTICOS Y UN MAYOR CONTROL DE LOS PACIENTES

ROMERO-AROCA P1, FERNÁNDEZ-ALART J2, BAGET-BERNALDIZ M3, MÉNDEZ-MARÍN I4, SALVAT-SERRA M3

ABSTRACT

Objective: The aim of the study was to compare the results with those of a previous study by the same author in 1993 when 741 type II diabetic patients were recruited. We determined the prevalence of diabetic retinopathy and the impact of the new diagnostic criteria and stricter control of diabetes on the results obtained.

Methods: The study sample was obtained by hazard selection of 741 type II diabetic patients, from the total diabetic patients visited in the interval between January 1 and December 1 in 2005.

Results: We observed a decrease in the prevalence of diabetic retinopathy between the two studies. In the first study the incidence was 39.41% while in the present study it was 27.55%. The diabetic macular edema prevalence was similar in both studies (7.15% in the past and 7.90% in the present)

RESUMEN

Objetivo: Comparar los resultados obtenidos en una muestra de población de 741 pacientes diabéticos tipo II en el año 1993 con una muestra actual de 741 pacientes diabéticos tipo II, determinando la prevalencia de retinopatía diabética, y valorando el impacto sobre la misma de los nuevos criterios diagnósticos y el mayor control de los pacientes diabéticos.

Métodos: Estudio transversal en el que la muestra fue recogida mediante selección al azar de 741 pacientes afectos de diabetes mellitus tipo II del total del archivo de pacientes visitados regularmente a lo largo del período comprendido entre el 1 de enero y el 31 de diciembre del año 2005.

Resultados: Se observa un descenso de prevalencia de retinopatía diabética del 39,41% en el primer estudio al 27,55% actual, manteniéndose igual el

Received: 28/4/07. Accepted: 26/3/07.


3 Graduate in Medicine.
4 Ph.D. in Medicine.

Correspondence:
Pedro Romero Aroca
C/. Ample, 55, 1.º
43202 Reus (Tarragona)
Spain
E-mail: promero@grupsagessa.com
study). There was also a decrease in the number of blind patients (11.20% in 1993 and 4.90% in the current study). The number of patients treated with laser photoagulation increased (13.49% in the current study compared to 6.20% in the previous study). Statistic analysis revealed the risk factors for retinopathy: diabetes mellitus duration, elevated HbA1C levels and the need for insulin treatment.

**Conclusions:** A better control of diabetes mellitus may lead us to observe an increase in visual acuity, and a better control of diabetic retinopathy. The incidence of diabetic retinopathy certainly decreased between the study periods; however the overall incidence of diabetes in the community has increased during the last few years, making firm conclusions difficult (Arch Soc Esp Oftalmol 2007; 82: 209-218).

**Key words:** Diabetic retinopathy, Type II Diabetes Mellitus, diabetic macular edema, diabetic retinopathy epidemiology.

---

**INTRODUCTION**

Diabetic retinopathy epidemiology studies published in our country have given prevalence numbers ranging between 20.9% and 51.4% (1-14). The reason for such disparity is that the studies were carried out in different times and some are clinical series not based on population studies. In addition, it must be taken into account that some are prior to 1998, when the World Health Organization (WHO) modified diagnostic and classification criteria for diabetes mellitus.

The WHO published the first recommendations on diagnostic and classification of diabetes mellitus in 1980, updating them in 1985 (15). The diagnostic criterion for diabetes mellitus was established at 140 mg/dL of glucose as a threshold number on an empty stomach. As from 1998, the WHO established glycemia equal to or above 126 mg/dL as a diagnostic for diabetes. In addition, it published a new classification of diabetes (16).

The application of the above new diagnostic criteria, which have clearly modified the prevalence of diabetes mellitus complications, has been supplemented in recent years with the application of the results obtained on strict control of glycemia. Several multi-center studies such as DCCT (17) and UKPDSG (18) evidenced that glycemia delayed the appearance of complications in diabetes mellitus such as diabetic retinopathy.

The ophthalmology service of our hospital implemented in 1999 a follow-up plan of diabetic patients in our area. In 1993 the first ocular epidemiological data were obtained in the form of diabetic retinopathy (6,8).

The objective of this study is to compare the results obtained in a population sample of 741 patients affected by diabetes mellitus type 2 in 1993, with a current sample of 741 type 2 diabetic patients (2006) through a diabetic retinopathy prevalence study, assessing the impact of the new diagnostic criteria for diabetes mellitus (the above mentioned 1998 WHO criteria) as well as to determine whether a stricter control of patients (recommendations derived from the DCCT and UKPDSG studies) have led to an improvement in the ocular parameters of patients.

**SUBJECTS, MATERIAL AND METHODS**

**Design of the study**

The Sant Joan University Hospital of Reus is the only hospital in the area, covering a population of...
175,410 inhabitants. The area can be classified as urban and semi urban. It is calculated that 6.4% of the population over 30 (19) exhibit diabetes mellitus type 2 (6,212 patients). The eye fundus exploration of said patients is made during an annual visit to the ophthalmology center of the hospital, in the retina vitreous unit thereof after being referred from the basic areas by primary care doctors and also from the endocrinology unit of the hospital. Said unit has a registry of about 3,720 patients who regularly come for their checkup. The diagnostic criteria for diabetes mellitus which are applied in the basic areas which depend from our hospital include the 1998 WHO recommendations.

This transversal prevalence study was made utilizing the same methodology as the first study, with random selection of 741 diabetes mellitus type 2 patients from the patient file and who regularly came for checkups between January 1 and December 31, 2005. The patients included in the first 1993 sample were excluded from the study.

Potency of the study

The sample for the study was obtained by the application of the corrected formula for finite populations, with a preset risk of 95% and a precision interval of 3%. This formula requires a sample of 672 patients which has been increased up to 741 to facilitate the comparison between the current study and the 1993 results, which also comprised 741 patients, and also to stratify the sample according to epidemiological risk factors such as gender, age and time of evolution of diabetes mellitus.

Assessment of patients

All patients were subjected to a full clinical record and basic ophthalmological assessment to determine visual acuity with Snellen E-type optotypes, intraocular pressure by applanation tonometry and exploration of the anterior and posterior segments. Legal blindness was determined when vision in the best eye was equal to or below 0.1 and low vision if VA was comprised between 0.2 and 0.4 of Snellen's scale.

The diabetic retinopathy diagnostic was made by means of eye fundus retinographies in two 50° fields, one focused on the macula and the other at the nasal level of the papilla, using a TOPCON TRC NW 7SF angiograph (20). Fluorescein angiography was made on the patients who so required and the interpretation thereof was trusted in all cases by the same ophthalmologist.

Other risk factors which were recorded and analyzed included gender, age, evolution time of diabetes mellitus (grouped as under and over 15 years), presence of high blood pressure (defining as such the prior diagnostic thereof made by the patient’s doctor), metabolic control via determination of the mean HbA1c value obtained at 3 month intervals in the year prior to the study, determination of the LDL cholesterol level and the microalbumin level in 24-hour urine samples.

Diagnostic criteria

Diabetes mellitus was diagnosed by primary health care doctors as per the 1998 WHO recommendation (16). The diabetic macular edema diagnostic was made by applying the criteria recommended by the Early Treatment Diabetic Retinopathy Study Research Group (مترونت والاستر) (21). In turn, retinopathy was classified according to the recommendation of the American Academy of Ophthalmology in 2000 (22), even though, as it will be compared to the epidemiological study made in 1993, the type of diabetic retinopathy exhibited by patient has been compared as follows:

- Slight and moderate diabetic retinopathy forms were compared with the intra-retinal form;
- Severe retinopathy was compared with pre-proliferative retinopathy;
- Proliferative retinopathy is the same for both classifications and therefore no special sub-classification was required.

The diabetic macular edema was classified as focal and diffuse. Patients with previous focal photocoagulation were classified as focal macular edema. Similarly, patients with laser panphotocoagulation were classified under the form of diabetic retinopathy with led to said laser treatment.

Statistical study

The statistical study was carried out with the SPSS- Windows 13.0 for Windows program (SPSS Inc., Chicago, Illinois, USA) taking as significant values
equal to or below 0.05. The comparative analysis of mean data was expressed in the form of mean standard deviation ± applying the statistical t for Student for quantitative values and the Chi square test for qualitative values, determining the relative risk for each risk factor with its confidence intervals (CI 95%). Finally, a multivariant study was made applying logistical regression, in which we have introduced the risk factors of the study, determining their statistically significance and relative risk for each.

RESULTS

The mean age of patients was 65.5 years (SD 10.99) divided in 410 women (55.30%) and 331 men (44.70%). The mean evolution time of diabetes mellitus was 10.42 years (SD 8.30). The presence of high blood pressure was associated in 507 patients (68.42%).

In the first study (1993) the mean age of patients was of 62.03 SD 10.59 years, 412 women (55.60%) and 329 men (44.40%). The mean time of evolution of diabetes mellitus was of 9.76 SD 8.33 years. The presence of high blood pressure was associated in 499 patients (67.34%).

The differences observed in the above factors (gender, age, evolution time and high blood pressure) between both studies were not statistically significant after the application of the t for Student (table I).

In addition, table I shows the differences in the treatment of diabetes mellitus between both groups. In our study a lower presence of patients controlled only with diet has been noticed in comparison to the 1993 study. In turn, the number of patients treated with oral antidiabetics is higher in this study. In any case, comparing the number of patients treated with insulin with those who were not, the differences were not statistically significant when applying the t for Student (p = 0.130).

### Visual acuity study

Upon completing the study, the visual acuity of 36 patients (table II) was equal or below 0.1 (legal blindness secondary to diabetic retinopathy) in the best eye (4.90%). In turn, 103 patients (13.90%) had low vision secondary to the presence of diabetic retinopathy (other causes such as cataracts, optic nerve atrophy, etc. were excluded). Visual acuity was above 0.4 in 602 patients (81.24%). Macular edema was the cause of blindness in 19 patients (52.77%) and low vision in 40 cases (38.83%).

In the 1993 study, the visual acuity of the sample was: equal to or below 0.1 (legal blindness) in the best eye in 83 patients (11.20%), 143 patients with low vision secondary to diabetic retinopathy (19.29%), with visual acuity being above 0.4 in 515 patients (69.50%).

Comparing the percentage of blind or low vision patients against the total of patients with diabetic retinopathy (table II), it can be seen that the number of blind patients went down from 28.42% in 1993 to 17.56% in this study. This is not the case with low vision patients, who account for 50.24% in this study against 48.97% in 1993.

Study of diabetic retinopathy prevalence

Retinopathy was observed in 205 patients (27.55%) while in the 1993 study the number was

<table>
<thead>
<tr>
<th>Table I. Demographic data of the study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>This study</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Men/Women</td>
</tr>
<tr>
<td>(55.30% / 44.70%)</td>
</tr>
<tr>
<td>Age in years (mean ± SD)</td>
</tr>
<tr>
<td>Diabetes evolution time in years (mean ± SD)</td>
</tr>
<tr>
<td>Presence of high blood pressure</td>
</tr>
<tr>
<td>Treatment of diabetes mellitus</td>
</tr>
<tr>
<td>Diet</td>
</tr>
<tr>
<td>Oral antidiabetics</td>
</tr>
<tr>
<td>Insulin treatment</td>
</tr>
<tr>
<td>Mean HbA1c</td>
</tr>
</tbody>
</table>

*= Degree of significance of averages by application of t-Student test; **= The statistically significance refers to the differences between patients treated with insulin with non-insulin treated patients in both studies.
of 292 patients (39.41%). According to the type of diabetic retinopathy, in this study 169 patients (16.10%) exhibited slight fundus retinopathy while 21 patients (2.80%) had slight retinopathy, 35 (4.70%) had a severe form of retinopathy and 30 (4.00%) exhibited proliferative retinopathy. The differences with the previous study can be appreciated in Table 3, which shows a reduction in the number of patients with slight or intra-retinal diabetic retinopathy. In addition, there is a reduction in the number of patients with proliferative diabetic retinopathy. However, there is an increase of those with severe (pre-proliferative) retinopathy.

Univariant diabetic retinopathy study (table IV)

The application of the Chi square test showed that gender (p=0.613) and age (p=0.123) were not related to the presence of diabetic retinopathy. However, the association with high blood pressure (p=0.023), treatment with insulin (p<0.001), evolution time exceeding 15 years (p<0.001), high HbA1c levels (p<0.001) and high LDL cholesterol levels (p<0.001) were significant.

Multivariant diabetic retinopathy study (table IV)

The application of logistical regression to the variables of the study showed that gender, age, the presence of high blood pressure and high cholesterol-LDL levels had no significant relationship with the appearance of diabetic retinopathy. However, the evolution time of diabetes mellitus exceeding 15 years (p<0.001), treatment with insulin (p<0.001) and high levels of HbA1c (p<0.001) were significant.

Diabetic macular edema prevalence study

Macular edema was observed in 59 patients (7.90%) with the focal form being most frequent

Table II. Patient visual acuity and laser treatment data

<table>
<thead>
<tr>
<th></th>
<th>This study</th>
<th>1993 study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visual acuity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1</td>
<td>36 (4.90%) (17.56%)*</td>
<td>83 (11.20%) (28.42%)*</td>
</tr>
<tr>
<td>0.2-0.4</td>
<td>103 (13.90%) (50.24%)*</td>
<td>143 (19.29%) (48.97%)*</td>
</tr>
<tr>
<td>&gt; 0.4</td>
<td>602 (81.24%)</td>
<td>515 (69.50%)</td>
</tr>
<tr>
<td><strong>Laser treatment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panphotocoagulation</td>
<td>61 (8.23%) (29.75%)**</td>
<td>28 (3.77%) (9.58%)**</td>
</tr>
<tr>
<td>Focal laser photocoagulation</td>
<td>39 (5.26%) (19.02%)**</td>
<td>18 (2.43%) (15.75%)**</td>
</tr>
</tbody>
</table>

* Percentage of patients with legal blindness or low vision in relation to the sample of patients with diabetic retinopathy; ** Percentage of patients treated with laser photocoagulation against the total number of patients with diabetic retinopathy.

Table III. Prevalence of diabetic retinopathy and macular edema, and classification of their forms

<table>
<thead>
<tr>
<th></th>
<th>This study</th>
<th>1993 study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diabetic retinopathy prevalence</strong></td>
<td>205 / 741 (27.55%)</td>
<td>292 / 741 (39.41%)</td>
</tr>
<tr>
<td><strong>Diabetic retinopathy type:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>slight/moderate fundus*</td>
<td>140 (18.90%)</td>
<td>220 (29.68%)</td>
</tr>
<tr>
<td>severe fundus **</td>
<td>35 (4.70%)</td>
<td>15 (2.02%)</td>
</tr>
<tr>
<td>proliferative</td>
<td>30 (4.00%)</td>
<td>57 (7.69%)</td>
</tr>
<tr>
<td><strong>Macular edema prevalence</strong></td>
<td>59 (7.90%)</td>
<td>53 (7.15%)</td>
</tr>
<tr>
<td><strong>Macular edema type:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>focal</td>
<td>49 (6.60%)</td>
<td>45 (6.07%)</td>
</tr>
<tr>
<td>diffuse</td>
<td>10 (1.30%)</td>
<td>8 (1.08%)</td>
</tr>
</tbody>
</table>

* = The slight and moderate forms of this study are equivalent to the intraretinal form of the 1993 study; ** = the severe form of this study is equivalent to the pre-proliferative form of the 1993 study.
(49 patients, 6.60%), while the diffuse form affected 10 patients (1.30%).

Univariant study of diabetic macular edema (table IV)

The application of the Chi square test showed that gender (p=0.080) age (p=0.190) and the presence of high blood pressure (p=0.570) were not associated to the presence of macular edema. However, treatment with insulin (p<0.001), evolution time exceeding 15 years (p<0.001), high HbA1c levels (p<0.001) and high LDL cholesterol levels (p<0.001) were significant.

Multivariant macular edema study (table IV)

The application of logistical regression to the variables of the study showed that gender, age, the presence of high blood pressure, the evolution time of diabetes mellitus and high cholesterol-LDL levels had no significant relationship with the appearance of diabetic retinopathy. However, treatment with insulin (p<0.031) and high levels of HbA1c (p<0.001) were significant.

The patients of the sample who had been treated previously with laser photocoagulation were (table II):

1. Patients treated with laser panphotocoagulation: in this study, we observed treatment with laser...
panphotocoagulation in 61 cases (8.23%). The indication of laser photocoagulation was the presence of severe diabetic retinopathy in 33 cases and the presence of proliferative retinopathy in 27 patients. In the 1993 study, only 28 patients (3.77%) had been treated with laser panphotocoagulation, six of which due to severe diabetic retinopathy (preproliferative according to the classification at the time) and 16 for exhibiting proliferative diabetic retinopathy.

2. Focal laser photocoagulation: in this study, the presence of prior focal laser treatment was observed in 39 patients (5.26%), whereas in the previous study focal laser photocoagulation was observed in 18 cases (2.43%) prior to the study.

The statistical study of patients treated with laser panphotocoagulation prior to the study shows that gender is not a significant factor (p=0.529 OR=0.601-1.725) as well as age (p=0.08 OR = 0.778-1.091) or high blood pressure (p=0.319 OR = 0.673-2.157). However, the evolution time of diabetes mellitus (p<0.001 OR=4.978-15.884), high levels of HbA1c (p<0.001 OR=8.110-40.515) and treatment with insulin (p<0.001 OR 7.29-27.116).

DISCUSSION

Several epidemiological studies have been made in Spain to determine the prevalence of diabetic retinopathy as well as the associated risk factors (table V). Initially, said studies had some drawbacks such as having been made in hospitals and therefore not representative of the actual population. Accordingly, Pastor in Navarra in 1980 (1) obtained a prevalence number of 43.80% for diabetic retinopathy, while Barahona in Salamanca (2) obtained in 1985 a percentage of 53.30%. One of the most important problems when comparing studies arises in the different methodologies applied in each one. Even so, the more recent studies utilized direct ophthalmoscopy to diagnose diabetic retinopathy.

With time, studies based on population were made, thus reducing the prevalence percentages. Fernández Vigo (3,4) obtained 43.30% in Galicia, and also 30.11% in Extremadura. In 1993 we carried out a diabetic retinopathy prevalence population study in the area of our hospital (6,8), obtaining a prevalence rate of 39.42% in type 2 diabetes mellitus patients with diabetic retinopathy. In 1999 we also made a prevalence study in one of the basic areas depending from our hospital (9) in which we included 92.78% of type 2 diabetics registered in said primary health care center. The resulting diabetic retinopathy prevalence was of 24.40%, much lower than the first study. This lead us to carry out a new study with similar characteristics to the 1993 study, but we waited for the deployment of the new diagnostic recommendations for diabetes mellitus issued by the WHO.

In what concerns this study, it must be noted that it comprises a number of important characteristics: it was made with the same reference population as the first 1993 study; the methodology for selecting the sample was the same, and the diabetic retinopathy diagnostic was made utilizing the same technique. Finally, the research team chiefs were the same.

From the data, it is striking that the prevalence of diabetic retinopathy has gone down from the 1993 figures of 39.41% to 27.55%. We believe this could be because, in the first place, in 1993 there weren’t as many basic areas as now and therefore the diagnostic and control of diabetic patients by primary health care doctors was not as close as nowadays. It can be assumed that the population who wasn’t diagnosed in 1993 has emerged. Secondly, the diabetes mellitus diagnostic criteria changed in 1998 and this lead to the emergence of a higher diabetic population, mostly controlled with dieting or oral antidiabetics. Finally, we believe that the greater control over diabetes mellitus patients may have reduced the appearance of chronic complications such as diabetic retinopathy.

The percentage obtained in this study (27.55%) in patients with diabetes mellitus type 2 is lower to that of other recent population-based studies made in our country, such as the Santos study in Extremadura (13) which gives a percentage of 34.50% and Terual-Macias en Girona (14) with only 34.29%. In turn, Goldaracena gives prevalence percentage below ours, 23.5%, in the study made in Pamplona in 1995 (11) while López in Valladolid (12) gave in 2002 a percentage of 20.41% in diabetic patients type 2. However, in the latter the mean evolution time of diabetes mellitus is only 5 years. Overall, it can be seen that the diabetic retinopathy prevalence data have gone down progressively over time in all the studies.

In what concerns the differences observed in the results with the first 1993 study, it can be said that

ARCH SOC ESP OFTALMOL 2007; 82: 209-218
visual acuity loss was under or equal to 0.1 (legal blindness secondary to diabetic retinopathy) in the best eye of 36 patients (4.90%) and 103 patients (13.90%) were affected by poor vision secondary to the presence of diabetic retinopathy. These percentages would be better than those obtained in the first study, in which legal blindness (VA ≤ 0.1) was present in 11.27% of cases, while poor vision (VA 0.2-0.4) affected 19.40% of patients. However, it must be said that even though visual acuity of patients can be partly improved through better controls of diabetic patients, the above percentages would also be influenced by the effect produced by a higher number of patients diagnosed with diabetes mellitus and an ensuing relative reduction of visual acuity loss vis-à-vis the total number of diabetic patients.

It might be more interesting to observe the type of diabetic retinopathy exhibited by patients. In this approach, the presence of patients with proliferative diabetic retinopathy has gone down from 57 (7.69%) to 30 (4.00%), with an increase of patients with severe fundus retinopathy (preproliferative according to the definition of the first study) from 15 (2.02%) to 35 (4.70%). This could lead us to think that the diagnostic is being made at an earlier stage of the diabetic retinopathy and therefore improving the possibilities for treating it. It is also noteworthy that the number of patients with slight-moderate (intraretinal) fundus retinopathy is lower in the present study, which can lead us to think that an improved control of diabetes has reduced the number of patients with retinopathy. Even so, this conclusion must be taken with caution because the number of patients diagnosed with diabetes mellitus has surely increased.

Equally interesting is that the number of laser treatments made in the patients of both samples before the study, as well as the number of patients treated by laser photocoagulation is 61 (8.23%), whereas in the 1993 study the number was only 28 (3.77%). Similarly, the number of patients treated by focal laser photocoagulation was also lower in the 1993 study, with only 18 cases (2.43%) compared to 39 patients (5.26%) in our study. This seems to confirm the idea that there is greater control applied on diabetic patients.

In what concerns risk factors which influence the development of diabetic retinopathy, we have noticed factors profusely described in the literature. The significant factors are the evolution time of diabetes mellitus, the faulty metabolic control thereof (assessed through HbA1c levels) and treatment with insulin. As for the prevalence of current diabetic macular edema, it is similar to that of the first study (7.30% in this study and 7.15% in the previous one). These values are somewhat higher to those of some studied published in our country, such as that of López (12) who found a prevalence of 5.7% in Valladolid, and Santos (13) with a prevalence of 5.6% in Extremadura, and similar to that of Flores in Seville with 7.5% (7). Even so, it must be underlined that there are very few epidemiological data published for diabetic macular edema. The statistical study of risk factors shows that only high levels of HbA1c and insulin treatment are significant, but it must be said that both factors could be related to a poor control of diabetes mellitus.

Accordingly, it is very important to exercise strict control of glycemia in diabetic patients, as stated in a number of studies (17,23-25) including DCCT (17) which proved that strict control of glycemia during an extended period of time reduces the prevalence of macular edema with a relative risk of 0.78, with the percentage of change being -22.1%. However, the same study also evidenced that the group of patients under strict control of glycemia (either via insulin pump or multiple insulin injections) and above all in the subgroup of patients with glycemia levels, macular edema appeared in the first year in 2.78% against 1.72% for the group of patients under conventional control for diabetes mellitus (26). This worsening no longer existed in the next period of time so, after the first and up to the third year of follow-up, the presence of macular edema occurred in 3.58% of cases in the group of patients under conventional treatment against 2.61% in the group under intensive treatment. Therefore, it can be concluded that strict control established suddenly in diabetic patients could give rise to macular edema, thus enhancing the importance of avoiding this.

By way of conclusion and considering the results of this study, we have observed a reduction in the prevalence of diabetic retinopathy, but we believe this could be due more to an increase in the population of known diabetics than to improved controls on them. At any rate, it seems we can observe an improvement in the characteristics of our patients because there is a reduction in the number of patients with blindness and a higher number of patients receiving correct treatment. Even so, diabetic retinopathy continues to be an important cause for loss of visual acuity, as witnessed by 4.9% of
blind patients and 13.9% with poor vision, both related to diabetic retinopathy.

REFERENCES