CLINICAL STUDY

Prevalence of blindness and visual impairment in a population of people with diabetes

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Abstract

Purpose **To assess the prevalence of visual impairment and the underlying causes in a population of people with diabetes.**
Method **A population-based study of a defined population of people with diabetes in a district in the North West of England was done. There were 7652 known people with diabetes, representing 2.12% of target general population of 361 050. The main outcome measures were the prevalence of blindness and significant visual impairment (less than 6/18 corrected vision in their better eye) and the underlying causes.**
Results **Visual acuity data on 6482 (84.7%) of the 7652 individuals were obtained. Of these, 184 had significant visual impairment (prevalence 2.84%) including 49 who were blind (vision of less than 3/60 in their better eye, prevalence 0.75%); if blindness was defined as vision less than or equal to 6/60, prevalence was 1.13% ($n = 73$). Details of 3 individuals could not be ascertained. Only 67 were registered, either as partially sighted ($n = 42$) or as blind ($n = 25$). In the majority ($n = 133$; 68%) of these 181 individuals the visual impairment was due to causes other than diabetic retinopathy.**
Conclusions **The prevalence of blindness and visual impairment in our population of people with diabetes was low. Non-diabetic eye disease accounted for the majority of this visual impairment. This provides essential baseline data against which future progress can be assessed. Screening and treatment can greatly reduce the incidence of visual impairment due to diabetic retinopathy, but its impact on overall visual impairment rates in the population of people with diabetes will be more modest.**

Key words Blindness, Diabetic retinopathy, Prevalence, Visually impaired persons

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Currently available data on the prevalence of visual impairment in the population of people with diabetes have come from blindness registration systems, large multipurpose health surveys and detailed surveys of small limited populations. Each of these approaches has well-recognised limitations. Changes in the prevalence of diabetes and the demographics of the population, together with the impact of widely available, effective treatment for diabetic retinopathy in recent years, implies that the present pattern of visual impairment in the diabetic population is likely to be different from that reported in the past. Following the 1990 St Vincent Declaration and the recent proposal in the United Kingdom to organise nationally coordinated screening of people with diabetes for sight-threatening eye disease as part of the national service framework on diabetes,[1] it is essential to obtain current baseline data on prevalence of visual impairment in this population in order that the impact of such screening programmes may be evaluated.

This report presents the profile of visual impairment in the population of people with diabetes in a district.

Materials and methods

Case identification

The Wirral District Diabetes Register was established in 1997, with the participation of all hospital units and 64 of 65 general practices in the area. In 18 months (July 1997 to December 1998) it had enrolled 7652 people with diabetes (2.12% of the total target population of 361 050). An optometrist-based diabetic retinopathy screening programme was launched simultaneously. By December 1998, 4904 people with diabetes had been screened for diabetic retinopathy by this scheme. For this study we re-examined all subjects who had a reported distance vision of less than 6/12 in either eye at the screening examination.

A number of people with diabetes were already attending the hospital eye service (HES) for diabetic or other eye disease. Notification of ophthalmic examination in the HES for patients with known diabetes was available by a copy of the letter sent to the patient's general practitioner after each consultation. This was supplemented by a search of a computer database that was used to generate all letters to general practitioners during the study period and the preceding 12 months to identify any

missed cases. Subjects with a visual acuity < 6/18 in their better eye were identified from these data.

Ocular examination

Briefly, the screening examination consisted of a eye test including measurement of visual acuity and refraction, together with a dilated biomicroscopic fundus examination by locally accredited optometrists. Results were reported to the Diabetes Register according to a locally agreed protocol. All subjects who had a reported distance vision of less than 6/12 in either eye were re-examined by one of the authors. Findings recorded were distance visual acuity with spectacles and pinhole, and examination findings including a biomicroscopic fundus examination. Patients were asked if they were already registered blind or partially sighted, and case records were examined to ascertain causes of visual impairment and registration. Data on all subjects with a distance vision of < 6/18 in their better eye were used for analysis.

Data collection

Data from the re-examination of patients identified as having impaired vision were entered into a database. Case notes for all patients already attending the HES with a distance vision of less than 6/18 in their better eye were reviewed to ascertain the same dataset that was recorded for subjects examined through the screening scheme. If records were unclear patients were recalled for examination by one of the authors. The main diagnostic groups of the causes of blindness were: diabetic retinopathy, age-related macular degeneration (ARMD), cataract, glaucoma and myopic degeneration, with any other cause being placed into an 'other' group. Posterior capsular opacification in pseudophakic patients was grouped with cataract.

We therefore ascertained the number of individuals with distance acuity of < 6/18 in their better eye and the cause of their reduced vision. The Diabetes Register excludes people who had died or moved out of the area. We excluded these subjects at the end of the study period.

Definitions

We considered a person blind if the corrected vision in their better eye was < 3/60, in accordance with UK blindness registration guidelines. For comparison with other studies we also report the numbers of patients with a vision of ≤ 6/60 in their better eye, as this has been used as a definition of blindness in previous reports.[2–7] As utilised by others, we considered significant visual impairment as a corrected vision of ≤ 6/24 in the better eye.[6] We defined type 1 diabetes as a subject with age at onset < 30 years or definite insulin dependence, and type 2 diabetes as age at onset ≥ 30 years without insulin dependence.

Analysis

The main pathology for each person by the better eye was assigned as the cause of visual loss. If two or more diseases were present, the disease with the most significant and irreversible influence was assigned as the principal cause. If both eyes had the same acuity, diabetic retinopathy was considered to be the cause if it was the most clinically significant cause in either eye. When the cause differed between fellow eyes and neither had visually significant diabetic retinopathy we counted that patient as 0.5 for the main cause in either eye. Reversible pathology (e.g. cataract) was considered the principal cause if there was no other visually significant pathology. The data were analysed to determine the overall prevalence of blindness and visual impairment in the population of people with diabetes and the prevalence in the main age groups. The causes of visual impairment and the prevalence of each were also ascertained.

Results

In 18 months we collected visual acuity data on 6482 of the 7652 (84.7%) known people with diabetes. The screening scheme yielded data on 4904 individuals and the HES records provided a further 1578. Forty-nine had an acuity of less than 3/60 in their better eye and 135 had an acuity between 6/24 to 3/60 in their better eye. The prevalence of visual impairment was 2.84% (184/6482), and that of blindness 0.75% (49/6482). Clinical details of 3 (all with vision between 6/24 and 6/60) could not be ascertained, leaving 181 for analysis. If blindness was defined as a visual acuity of less than or equal to 6/60 in the better eye, prevalence was 1.13% (73/6482).

In the working age population (16–64 years of age) there were 11 blind individuals (0.03% prevalence in this age group), with diabetic retinopathy accounting for the majority of this blindness (10/11). When considering overall visual impairment there were 38 individuals (0.11% prevalence in this age group), 20 of whom (52.6%) were visually impaired because of diabetic retinopathy. In the older age group (≥ 65 years) there were 38 blind individuals, of whom 6 (15.79%) were blind as a result of diabetic retinopathy. The prevalence of blindness in this age group was 0.94% and that of overall visual impairment 3.53% (n = 143). Diabetic retinopathy accounted for 19.6% (28/143) of this visual impairment. The distribution of blindness and visual impairment and their causes by type of diabetes are set out in Tables 1, 2 and 3.

Table 1. *Distribution of visual impairment by type of diabetes (n = 181)*

	Blind	Visually impaired[a]
Type 1 diabetes	5	14
Type 2 diabetes	43	166
Secondary diabetes	1	1
Total	49	181

[a]This includes the blind individuals.

Table 2. *Principal causes of blindness in the study population*

	Type 1 diabetes		Type 2 diabetes		Total	
	<3/60	≤6/60	<3/60	≤6/60	<3/60	≤6/60
ARMD	0	0	22	30	23[a]	31[a]
Diabetic retinopathy	4	4	13	20	17	24
Cataract	0	0	2	4	2	4
Glaucoma	0	0	1	5	1	5
Myopic degeneration	0	0	0	0	0	0
Other	1	1	5	8	6	9
Total	5	5	43	67	49 (0.75%)[a]	73 (1.13%)[a]

ARMD, age-related macular degeneration
[a]One patient with secondary diabetes, blind from bilateral age-related macular degeneration, is included in the total but not in the previous columns.

Amongst the 49 blind individuals, 19 were known to be registered blind and 6 partially sighted, with 24 not registered. After excluding the blind from our visually impaired group there were 132 individuals. Six were registered blind and 36 partially sighted, with the remaining 90 not being registered.

Discussion

We provide essential baseline data about the prevalence of visual impairment in a defined population of people with diabetes. We report a low prevalence of visual impairment (2.84%) and blindness (0.75%) in this population. If blindness was defined as a visual acuity of ≤ 6/60, the prevalence was 1.13%.

The prevalence of blindness due to diabetic retinopathy is generally believed to be much higher than reported here (of the order of 5%, range 3–7%).[8,9] Previous studies have reported a blind registration rate of up to 2% per annum.[10–14] We believe that the reasons for the low prevalence reported here are manifold. Currently accepted and quoted rates are based on studies that are over a decade old. Increasing awareness about diabetic retinopathy amongst both the healthcare professions and patients, together with the availability of laser treatment and improved management of diabetes, are likely to have reduced the impact of diabetic eye disease as a cause of visual impairment in recent years.

Current data are essential for planning future screening and healthcare delivery. Contemporary screening schemes do not deal with a 'virgin' population as opportunistic screening has been taking place for some time. In our area this was performed by diabetologists, general practitioners and optometrists, largely using direct ophthalmoscopy Non-mydriatic fundus photography was used at one hospital site. The impact of such screening is difficult to measure since it is performed without central co-ordination, but the large number of people with diabetes already under the care of the HES reflects this (1578/6482, 24.3%). The situation is likely to be similar to other locations in the UK.

Table 3. *The causes of visual impairment in the study population*

	Type 1 diabetes	Type 2 diabetes	Total
ARMD	0	66	67[a]
Diabetic retinopathy	11	37	48
Cataract	0	31	31
Glaucoma	0	7	7
Myopic degeneration	0	5	5
Other	3	20	23
Total	14	166	181[a]

ARMD, age-related macular degeneration.
[a]One patient with secondary diabetes, blind from bilateral age-related macular degeneration, is included in the total but not in the previous columns.

The prevalence of diabetes in our population (21.2/1000) is sufficiently close to those reported in other recent reports to justify confidence in the near completeness of case acquisition. This prevalence is comparable to recent reports from other UK regions: Manchester, 14.6/1000;[15] Lanarkshire, 20.8/1000;[16] Tayside, 19.4/1000;[17] Borders, 19.5/1000;[18] and North Tyneside, 22.0/1000.[19] Studies using case acquisition based on general practice registers are less likely to be truly representative of the situation. These registers have been shown to miss up to 18% of known people with diabetes.[17] This is supported by our own experience. In our area the completeness of individual general practice registers varied from 28% to 100%. A single eye department provides National Health Service ophthalmology services in our area; this facilitated identification of patients attending the HES. Consultants have also kept the diabetes register updated with details of the patients they see privately. We are therefore unlikely to have missed patients with significant eye disease.

Comparison of the prevalence rates of blindness in our study with those of previous reports is interesting. The Wisconsin Epidemiolgic Study of Diabetic Retinopathy (WESDR) found a 3.6% prevalence of vision ≤ 6/60 in the better eye in type 1 and 1.6% in type 2 diabetes.[2] Kristinsson and co-authors[3,4] reported a prevalence of vision ≤ 6/60 in the better eye in 1.0% of those with type 1 and 1.6% of those with type 2 diabetes in Iceland. In the Melton Mowbray study a vision of < 6/60 was found in 4.0%; 1.5% of insulin-taking patients and 6.0% of non-insulin-treated people with diabetes.[5,6] More recent population-based data are not available. The Liverpool Diabetic Eye Study examined patients from four general practice registers with a prevalence of diabetes of 12.4/1000 (21.2/1000 in our study). In their study group of 357, they found a vision of ≤ 6/24 in the better eye in 12 (3.4%) and ≤ 6/60 in 3 (0.8%).[7] The comparable figures for our

study are 2.84% and 0.95% respectively. Unpublished data from Leicester have reported a prevalence of blindness of 0.92% using capture–recapture methods,[20] compared with 0.75% in our study.

A limitation of our study is that data on about 15.3% of known people with diabetes were not available. It is difficult to make meaningful comparisons between this small group and the majority on whom data were available, since demographic, treatment and clinical data were not available for many of these individuals.

Our data indicates that blindness registration figures are likely to grossly under-report the prevalence of blindness. Of the 49 individuals eligible for blind registration in our study, only 25 (51.0%) were registered (19 as blind, 6 as partially sighted). Partial sight registration rates amongst individuals with significant visual impairment were even lower (42/132, 31.8%). This may be partly explained by the fact that the eligibility for partial sight registration depends on the certifying ophthalmologist's subjective judgement to a greater extent than that for blind registration.

The majority of blindness (32/49, 65.3%) and visual impairment (133/181, 73.5%) in our study was due to causes other than diabetic retinopathy. If we exclude the individuals who were visually impaired due to cataracts, this being a reversible cause, the percentages of blindness and visual impairment due to causes other than diabetic retinopathy fell slightly to 63.8% (30/47) and 68% (102/150) respectively. In the working age population diabetic retinopathy accounted for almost all blindness (10/11, 90.9%), and slightly over half of overall visual impairment (20/38, 52.6%). For the group over 65 years of age, 15.8% (6/38) of blindness and 19.6% (28/143) of overall visual impairment was ascribable to diabetic retinopathy. With the ageing of the population the number of people in the older age group is likely to expand, which will imply that diabetic retinopathy is likely to be responsible for an even smaller proportion of visual impairment in the population of people with diabetes.

To summarise, we report population-based figures for visual impairment in a large defined population of people with diabetes in England. These data provide an essential baseline to evaluate the progress being made towards the targets of the St Vincent Declaration regarding diabetic retinopathy. Previous reports have relied on blindness registration records; this underestimates the true prevalence of visual impairment. Our data confirm that a large proportion of those who are visually impaired are not registered. Non-diabetic eye disease accounted for the majority of visual impairment. Efficient screening and timely treatment can greatly reduce the incidence of visual impairment due to diabetic retinopathy. Our study confirms that diabetic retinopathy remains the leading cause of visual impairment in the working age population of people with diabetes, and for this group improvement in screening may have a strong impact on prevalence of visual impairment. However, in the older age group of people with diabetes the impact of efficient screening on visual impairment is likely to be more modest.

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