Suspected retinopathies in optometric practice with emphasis on patients with diabetes: a cross-sectional study

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Abstract

Background
The scope of optometry differs worldwide. In Norway the vast majority of optometrists perform ophthalmoscopy as part of their routine examinations. The aim of this study was to describe the frequency of suspected retinopathy in patients seen for routine optometric examination and to determine how optometrists deal with these patients.

Methods
212 optometrists participated in both a survey and a practice registration. In the practice registration, details for 20 consecutive patient encounters were recorded. Data were collected during November 2004 – May 2005.

Results
All optometrist stated that ocular history taking was an integrated part of their routine examination, while general health and diabetes history were routinely addressed by 59% and 42% of the optometrists, respectively. During the practice registration 4,052 patient encounters (57% females) were recorded. Ophthalmoscopy was performed in 88% of the patients, of which 2% were dilated fundus examinations. Retinopathy was suspected in 106 patients of whom 31 did not report a previous history of ocular or systemic disease. Old age (75+), hypertension and diabetes strongly predicted retinopathy with odds ratio (95% CI) of 6.4 (4.2 to 9.9), 3.8 (2.4 to 6.0) and 2.5 (1.4 to 4.7), respectively. Diabetic retinopathy was seen in 10% of diabetic patients and suspected in 0.2% of patients with no established history of diabetes. Of 18 patients with a history of diabetic retinopathy, retinopathy was not confirmed in nine; seven of
these had undergone laser treatment. Out of the 106 patients with findings of retinopathy, 28 were referred to an ophthalmologist or a general practitioner (GP), written reports were sent to a GP in 16 cases, ten patients were urged to contact their GP for further follow up, while 52 were considered in need of routine optometric follow up only.

**Conclusions**

Optometric practice provides a low threshold setting for detecting cases of ocular disease and retinal manifestations of systemic disease in the population. However, a routine optometric examination does not rule out the possibility of retinopathy. Some optometrists appear to take on undue medical responsibility which may reflect lack of established collaboration with medical practitioners.

**Background**

The scope of optometry differs worldwide [1] and, more specifically, in Europe [2] ranging from dispensing of optical aids to the diagnosis and treatment of certain ocular diseases. In various countries, there is disparity in the legal recognition of optometry as a health care profession. In Norway optometric practice is regulated by The Health Personnel Act, founded on the principles of responsible conduct.

In the Scandinavian population, retinal disorders are the most common reason for visual impairment (66%), and in the working age population, diabetes represents a leading cause (13%) [3]. Most diabetic patients will develop some degree of
retinopathy, and 11-30% will develop sight threatening retinopathy during the course of their illness [4-8].

The vast majority of Norwegian optometrists perform ophthalmoscopy as part of their routine examinations [9], and dilated fundus examination can be undertaken by optometrists certified to use ocular diagnostic drugs. Certification requires approved education in the use of ocular diagnostic drugs.

The aim of this study was to establish the prevalence of possible retinopathy in diabetic and non-diabetic individuals as seen during routine optometric practice, to determine the proportion of previously unknown ocular and systemic disease in these patients and finally to explore how optometrists deal with such patients during everyday practice. The study did not aim to assess or validate the optometrists’ findings. This article reports the prevalence of possible retinopathy and how optometrists deal with patients with suspected retinopathy.

**Methods**

During November 2004 – May 2005, 212 Norwegian optometrists participated in a questionnaire survey and a practice registration [9]. In the questionnaire, the optometrists were asked about their practice habits (routine history taking and examination), and their collaboration with general practitioners (GPs) and ophthalmologists.

In the practice registration, each optometrist recorded the following data for 20 consecutive patients: patient’s history, best corrected visual acuity (BCVA), intra-
ocular pressure (IOP), ocular diseases, and how the patients were dealt with (e.g. referral, written report to physicians). Recorded ocular diseases were: established history of cataract, glaucoma and/or age related macular degeneration (AMD) and suspected cataract and/or suspected retinopathy. Available data regarding hypertension, cardiovascular disease and diabetes were also recorded. For diabetic patients additional details asked for were: type of diabetes, illness duration, treatment, HbA1c-values, blood pressure, diabetic retinopathy, and laser treatment.

The study was not subject to approval of the Regional Committee for Medical Research Ethics.

Differences between proportions were analysed using chi-square tests. Features associated with suspected retinopathy were analysed by univariate and multiple logistic regression. The statistical package SPSS version 12.0.2 was used.

Results

All optometrists reported that a history of vision and ocular health was a part of their routine examination. Respectively, 59% and 42% of the optometrists also addressed general health and diabetes in the patient history taking for all patients.

During the practice registration, 4,052 patient encounters were recorded, of which 2,216 (57%) were females. The patients’ age distribution is shown in figure 1. In this sample, 166 of the patients had a known history of diabetes, 439 patients had known hypertension while 125 had some other known cardio-vascular disease.
Ophthalmoscopy was performed in 3,576 (88%) of the patients, of which 78 (2%) were dilated fundus examinations. In patients with known diabetes, ophthalmoscopy was performed significantly more often than in non-diabetics (p=0.002). Findings suggestive of retinopathy were found in 106 (3%) patients, of whom 57 (59%) were females. Almost half of these patients were 75 years or older, and none were younger than 16 years. For patients with diabetes, 35% of the possible retinopathies were found in the age group 16-64 years. In the patients with clinical findings of retinopathy there were no statistically significant differences between diabetic and non-diabetic patients with regard to gender, age, and known history of hypertension and/or cardiovascular disease.

The most common tentative diagnosis made during fundus examination was macular disease (Table 1). More than half of the cases were patients with no previous history of AMD. Diabetic retinopathy was suspected in 23 patients among whom six had no established history of diabetes and 14 had no previous history of retinopathy. In patients with suspected hypertensive/vascular retinopathy 10 out of 27 had no history of hypertension and/or cardiovascular disease, and none had a history of diabetes.

Multiple logistic regression analysis showed that old age (75+), hypertension and diabetes were independent predictors of retinopathy (all kinds), with odds ratio (95% CI) of 6.4 (4.2 to 9.9), 3.8 (2.4 to 6.0) and 2.5 (1.4 to 4.7), respectively. For vascular retinopathy only diabetes and hypertension were independent predictors with odds ratio (95% CI) of 7.2 (3.7 to 14.1) and 4.9 (2.6 to 9.3), respectively.
Of the 166 diabetic patients, 93 were in the age group 16-64 years. Type of retinopathy was reported in 129 patients of whom 94 had type 2 diabetes. Diabetic retinopathy was seen in 17 (10%) of the diabetic patients, in nine of them the diagnosis of retinopathy had previously been established. However, 9 out of 18 cases of diabetic retinopathies reported by diabetic patients were not described by the optometrists. In seven of these nine cases the patient had undergone laser treatment. There were no significant differences between diabetic patients with suspected retinopathy (n=17) and diabetic patients with no retinopathy (n=147) with regard to gender, age, type of diabetes, diabetes treatment, history of hypertension or cardiovascular disease.

In total 439 (12%) of 3,576 patients who underwent fundus examination were judged by the optometrists to be in need of some medical follow up (referral, report or patient consultation) of the ocular findings (Table 1). Patients with retinopathy were prompted to contact a physician significantly more often if the retinopathy was not previously known (41/71 vs. 13/35, p=0.003).

**Discussion**

Retinopathy was suspected in 3% of the patients seen in optometric practice; of who two thirds had no previous history of retinopathy. More than half of all suspected cases were considered to be in need of some further management by a medical practitioner.
In our study population, the proportion of vascular retinopathy seen in non-diabetics was lower than expected according to figures reported in epidemiological studies [10]. This may be due to a higher sensitivity of photographic grading compared to ophthalmoscopy [11] and a higher sensitivity of dilated versus undilated fundus examination [12].

Reported prevalence of diabetic retinopathy varies widely. In Scandinavia, prevalence between 13.8 and 75.1% have been reported [13], which are higher than the proportion detected by the optometrists in their practice. However, we do not know how well diabetic patients seen in optometric practice correspond with the diabetic population in the community. The lower number of retinopathies among diabetics seen in optometric practice may reflect a selection bias, since diabetic patients managed according to current guidelines should have their retinas regularly examined by an ophthalmologist [14] and may therefore be less likely to encounter optometrists. Nine reported cases of retinopathy were not described by the optometrists; however, most of these patients had undergone laser treatment. A possible explanation may be that scarring from laser treatment has not been regarded as retinopathy by the optometrists. However, retinopathies not detected by the optometrists and the overall low numbers of retinopathies observed among both non-diabetics and diabetics may also represent a poor diagnostic sensitivity. Our data did not permit us to validate the quality of the optometrists’ diagnostic work.

The optometrists’ follow-up decisions in cases with suspected retinopathy should raise some concern. One quarter of the patients with suspected vascular retinopathy and without a known history of retinopathy or related systemic disease were
considered to be in need of optometric routine following up only. This may not be acceptable. In general, these patients should be seen by a physician as retinal microvascular changes are related to long-term hypertension, type 2 diabetes, impaired glucose metabolism, obesity, dyslipidemia, stroke and an increased cardiovascular mortality [15]. This may therefore suggest that optometrists make medical judgements and that patient management depends on their evaluation of the ocular findings, not solely on the patient's history. However, our numbers are low and all relevant information may not have been recorded, therefore this interpretation should be considered with caution. If some optometrists do take on undue medical responsibility, one possible explanation for this may be inadequate report and referral routines and lack of formally established collaboration with medical practitioners.

Based on the reported prevalence of diabetic retinopathy (13.8%) in the Norwegian diabetic population [16] and the number of retinopathies missed (n=9) and detected (n=17) by the optometrists we propose that the diagnostic specificity must be high and that it is unlikely that report/referral of cases of suspected retinopathy will impose undue pressure on the health care services. This is supported by a previous study by Riise et al [17] which concluded that 94% of referrals from Norwegian optometrists were clinically relevant.

Some limitations of the study should be taken into consideration. First, as compared to the non-participants, the optometrists who took part in this study tended to be younger, more were females, and they had in general higher education and worked in smaller communities. Hence their frequency of ophthalmoscopy use and collaboration habits may differ from that of the non-participants. Second, practice registration data
was recorded for consecutive patients to avoid selection bias, however, the reported patient histories relied on patients’ self-report and memory recall. Third, the practice registration may have influenced the way the optometrists performed their routine examination. Finally, we did not actually observe the optometrists’ work and their conclusions were not verified.

**Conclusions**

Optometric practice is a low threshold setting for case-finding of ocular pathology and retinal manifestations of systemic disease in the population. However, a routine optometric examination does not rule out retinopathy. There is the potential for improving both optometrists’ patient management patterns and their collaboration routines with medical doctors.
Competing interests

The author(s) declare that they have no financial competing interests.

VS is a member of the Norwegian Optometric Associations’ board of continuing education and board of optometric rehabilitation.

Authors' contributions

VS conceived of the study and participated in its design, acquisitioned and statistically analysed the data and drafted the manuscript. PG participated in the design of the study and interpretation of data, and helped to draft the manuscript RB, LSB and JJ participated in the design of the study and critically revised the manuscript. JS participated in the design of the study and helped to draft the manuscript. All authors read and approved the final manuscript.

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Figures

Figure 1. Age distribution of patient encounters in Norwegian optometric practice and the Norwegian general population

- Diabetic patients seen in optometric practice
- Non-diabetic patients seen in optometric practice
- The Norwegian general population

Tables

Table 1. Clinical findings in 3,576 fundus examined encounters and management by tentative diagnosis and history.

Abbreviations: GP, general practitioner, CVD, cardio-vascular disease, HTN, hypertension

* Fisher's Exact Test p<0.001 between patients with findings of retinopathy and patients with no findings of retinopathy

† Fisher's Exact Test p=0.003 between patients with retinopathy findings and known history of retinopathy and patients with retinopathy findings and no history of retinopathy.
Figure 1. Age distribution of patient encounters in Norwegian optometric practice and the Norwegian general population.
Table 1 Clinical findings in 3,576 fundus examined patients seen in optometric practice and optometrists’ management* by tentative diagnosis and patient history, n

<table>
<thead>
<tr>
<th>Optometrists’ tentative diagnosis and patients’ history</th>
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<th>Referral/report/patient urged to contact doctor</th>
<th>No/routine optometric follow up</th>
</tr>
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<tr>
<td>Diabetic retinopathy</td>
<td>23</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>No history of retinopathy</td>
<td>14</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>History of retinopathy</td>
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<td>4</td>
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<td>11</td>
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<tr>
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<tr>
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<td>17</td>
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<tr>
<td>No retinopathy</td>
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<td>385</td>
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</tbody>
</table>

Abbreviations: GP, general practitioner, CVD, cardio-vascular disease, HTN, hypertension

* Fisher’s Exact Test p<0.001 between patients with findings of retinopathy and patients with no findings of retinopathy
† Fisher’s Exact Test p=0.003 between patients with retinopathy findings and known history of retinopathy and patients with retinopathy findings and no history of retinopathy.