Glaucoma is defined as “a progressive optic neuropathy involving characteristic structural damage to the optic nerve and characteristic visual field defects.” Glaucoma can be classified into primary, secondary, and developmental glaucomas. This study concentrated on the incidence and prevalence of primary open angle glaucoma (POAG).

Glaucoma is the second most common cause of blindness as estimated from blindness certification. It accounts for 11.7% of all certifications for 1990–1 in England and Wales. Prevalence of primary open angle glaucoma (POAG) can be classified into primary, secondary, and developmental glaucomas. This study concentrated on the incidence and prevalence of primary open angle glaucoma (POAG).

METHOD

The ophthalmology department at Peterborough District Hospital provides a general ophthalmic service and does not have an ophthalmologist specialising in glaucoma care. Referrals are received from general practice, optometrists, and other hospital specialists.

New cases of POAG diagnosed in this department between 1 April 1999 and 31 March 2000 were identified through the department’s ongoing audit programme. This programme includes the completion of a diagnostic code by a consultant ophthalmologist for every new patient. This process of diagnostic coding has been established for 3 years. The clinical diagnosis was made based on the evidence from the optic disc appearance, ocular pressure, and visual field testing as well as any changes that have occurred over time.

For each new POAG case, the age, sex, and primary care trust (PCT) of registration was recorded. Only new cases from North and South Peterborough PCTs were included in this study. Referrals from these two PCTs to other local ophthalmology departments were also checked for new POAG cases. The denominator population was defined as those registered with the two PCTs in July 1999.

The observed incidence was calculated. Ninety-five per cent confidence intervals (95% CI) for the incidence and prevalence figures were calculated using the method outlined by Lilienfeld. Prepvalence of POAG for the registered population in North and South Peterborough PCTs could not be established from the audit data and was therefore calculated from the incidence figures. The relation between prevalence and incidence is represented by the equation:

\[ \text{Prevalence} = \text{Cumulative incidence} \times \text{Average duration of the disease} \]

This equation is used to calculate the prevalence from the cumulative incidence.

There are three important assumptions in the calculation of the prevalence for POAG. The first is that the incidence is fixed or constant over time; secondly, that people with POAG have a normal life expectancy; and the third is that the population is a stable one. There is some evidence to support the second assumption. For the purposes of calculating the duration of illness for each case, the most recent life tables for England and Wales were used. The date of onset is assumed to be the same as the date of diagnosis. This is also an important assumption because POAG is asymptomatic until a late stage and therefore presentation for diagnosis will on average be after a long period of disease development. This assumption will therefore result in an underestimate in the duration of the disease and hence a lower prevalence estimate for the true population prevalence figure.

RESULTS

The number of new cases of POAG diagnosed in the registered populations of North and South Peterborough PCTs in the year 1 April 1999 until 31 March 2000 is shown by age band in Table 1. The prevalence for POAG in the study group was 978 per 100 000 people aged 40–89 years (95% CI 753 to 1272).

DISCUSSION

The results of this study were compared with the expected prevalence obtained from a recent epidemiological model developed by Tuck and Crick which is based on data from eight major population surveys and is applicable to white populations. The prevalence of POAG in the study population...
was 978 per 100 000 people aged 40–89 years (95% CI 753 to 1272) compared to the expected prevalence from the Tuck/Crick model of 1230 per 100 000 people aged 40–89 years. The difference in prevalence estimates was not statistically significant.

These findings were surprising given that we were comparing an audit of patients known to services with a population based survey. Previous surveys which were population or community based rather than based on people using services have found that about 50% of the POAG cases were unknown to medical services.\textsuperscript{7,10,15,16}

We considered the possibility that these finding were due to error either in the denominator population or in the completion of coding forms. These sources were not thought to be significant and, if they existed, would be more likely to lead to an underestimate of prevalence rather than an overestimate. The results obtained could be an artefact because of a recent change in the practice of optometrists or ophthalmologists during the year resulting in a sudden and possibly temporary increase in POAG cases referred and diagnosed. However, clinicians confirmed that there was no recent change in ophthalmic practice nor a dramatic increase in referrals from optometrists in the time period of the study.

After discounting these main sources of error, we were left with three main possibilities to account for the high level of POAG. Firstly, that our clinic was detecting a higher proportion of cases in the community than usual. In other words, there was a larger proportion of the clinical iceberg of total cases being recognised. This appears to be unlikely since local population screening practice by optometrists is broadly similar to elsewhere in the United Kingdom.\textsuperscript{2,10,15,16}

Finally, the results could reflect a true increased prevalence of "definite" POAG among the population of the two PCTs. This could only be investigated by an ophthalmic survey of the two PCT populations. However, there are no features of the combined population of the two PCTs to suggest a reason for an increased incidence and prevalence of POAG. The population defined has a normal cross section of socioeconomic status, contains a mix of urban and rural communities with an age distribution similar to the national population, and is 94% white.

**CONCLUSIONS**

We found an estimate of POAG prevalence known to a local district hospital which may be of use to those planning services. This estimate is higher than that which would be predicted using a theoretical epidemiological model based on measured population prevalences, since it is usually held that only half the cases of POAG are known to services. What proportion of the cases in the NHS clinic are "true" POAG depends on what definition is used. However, even if, as is likely, a proportion of these cases are false positives and do not have the condition, their treatment by the NHS ophthalmology outpatient service is an important finding and must be taken into account by commissioners of services and ophthalmologists when planning services. This study provides evidence that the actual number of cases being treated as POAG in the NHS is much higher than expected.

In the long run, for the better assessment of need and to facilitate local audit, it would be advantageous to reach a consensus on a workable clinical definition of POAG in the United Kingdom. This definition can then be used to develop a new model for estimating the prevalence of POAG.

**Table 1**

<table>
<thead>
<tr>
<th>Age band (years)</th>
<th>Total number of cases</th>
<th>Number of registered population</th>
<th>Incidence per 100 000/year observed (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>1</td>
<td>114 089</td>
<td>28.68 [7.80 to 73.42]</td>
</tr>
<tr>
<td>40–44</td>
<td>4</td>
<td>13 945</td>
<td>13.32 [0.29 to 29.20]</td>
</tr>
<tr>
<td>45–49</td>
<td>0</td>
<td>13 332</td>
<td>7.60 [0.19 to 42.33]</td>
</tr>
<tr>
<td>50–54</td>
<td>1</td>
<td>13 155</td>
<td>60.70 [22.28 to 132.33]</td>
</tr>
<tr>
<td>55–59</td>
<td>6</td>
<td>9884</td>
<td>33.57 [6.92 to 98.05]</td>
</tr>
<tr>
<td>60–64</td>
<td>3</td>
<td>8934</td>
<td>122.24 [58.68 to 224.94]</td>
</tr>
<tr>
<td>65–69</td>
<td>10</td>
<td>8180</td>
<td>136.29 [62.43 to 258.97]</td>
</tr>
<tr>
<td>70–74</td>
<td>10</td>
<td>7337</td>
<td>226.86 [123.87 to 381.14]</td>
</tr>
<tr>
<td>75–79</td>
<td>14</td>
<td>6171</td>
<td>210.21 [84.29 to 433.03]</td>
</tr>
<tr>
<td>80–84</td>
<td>7</td>
<td>3330</td>
<td>395.31 [169.52 to 774.82]</td>
</tr>
<tr>
<td>85–89</td>
<td>8</td>
<td>2034</td>
<td></td>
</tr>
<tr>
<td>&gt;90</td>
<td>2</td>
<td>972</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>66</td>
<td>201 363</td>
<td></td>
</tr>
</tbody>
</table>

Oberved incidence for age group 40–89 years, 73 (56.21 to 94.90)

**Authors’ affiliations**

M Kroese, Eastern Region Public Health Observatory, Institute of Public Health, Box 113, University Forvie Site, Robinson Way, Cambridge, CB2 2SR, UK

H Burton, Public Health Genetics Unit, Strangeways Research Laboratory, Worts Causeway, Cambridge, CB1 8RN, UK

S Vardy, T Rimmer, D McCarter, Department of Ophthalmology, Peterborough District Hospital, Thorpe Road, Peterborough PE3 6DA, UK

**Correspondence to:** Mark Kroese

Competing interests: none declared.

Accepted for publication 10 April 2002

**REFERENCES**


Adding insult to injury?

Visually impaired people are continuing to suffer accidental injuries related to their impairment because epidemiological research of the subject lacks rigour and intervention studies are almost non-existent.

A recent review of published data calls for comprehensive studies to identify the causes of injury and evaluate preventive measures, and it recommends minimum standards for future studies. These include formal ophthalmological assessment of visual acuity and visual fields, measurement of injuries as outcomes, and adjustment for confounders.

Of 31 studies that conformed to the review's inclusion criteria, about two thirds concerned falls, eight traffic related injuries, and three occupational injuries. Other types of accidents were not covered. Most studies were inconclusive—through having insufficient power or no adjustment for confounders, or both. Those few studies with meaningful results dealt with falls in older people. The risk of falls in visually impaired people aged >75 years was 1.7 times that of sighted people. Multiple falls were 1.2–2.1 times more likely, depending on the type of impairment. The risk of hip fracture was 1.3–1.9 times higher for people with lowered visual acuity.

Research studies published during 1980–2000 were identified by MeSH and free text searches of 10 bibliographic databases. Only those which satisfied two or more of the following criteria were included in the review: formal ophthalmic assessment; adjustment for confounders; large sample size, with numbers of visually impaired subjects; and clear definitions and outcomes.

Visually impaired people are at increased risk of injury and therefore an important consideration in any measures to reduce injuries in general.

\[\text{Injury Prevention 2002;8:155–160.}\]
Prevalence of primary open angle glaucoma in general ophthalmic practice in the United Kingdom
M Kroese, H Burton, S Vardy, T Rimmer and D McCarter

Br J Ophthalmol 2002 86: 978-980
doi: 10.1136/bjo.86.9.978

Updated information and services can be found at:
http://bjo.bmj.com/content/86/9/978

These include:

References
This article cites 12 articles, 3 of which you can access for free at:
http://bjo.bmj.com/content/86/9/978#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections
Articles on similar topics can be found in the following collections

Angle (1006)
Glaucoma (988)
Intraocular pressure (1002)
Epidemiology (1068)
Public health (476)

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/