GENERAL PRACTICE

Demand incidence and episode rates of ophthalmic disease in a defined urban population

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Abstract

Objectives—To estimate demand incidence and episode rates of ophthalmic disease in a defined urban population over one year.

Design—Study of patients presenting with eye problems to general practice and eye casualty department.

Setting—General practice and ophthalmic services in west Nottingham.

Subjects—36 018 people from the combined practice lists of 17 Nottingham general practitioners.

Main outcome measures—Ophthalmic disorder, age and sex of patient, and where presented.

Results—2587 consultations were recorded for ophthalmic problems, 1771 with general practitioners and 816 with eye casualty. Most consultations to general practice were by females (1066 (60%)), whereas men aged 15-44 accounted for most work in eye casualty. These men commonly presented with trauma. Infective conjunctivitis, the commonest condition, had an episode rate of 13·5/1000 population/year. Demand incidence for cataracts was 1·9/1000 population/year. Demand incidence for chronic conditions increased with age.

Conclusions—As the average age of the population increases demand for ophthalmic services will rise. Planning and provision of resources to meet this increased demand should be considered now.

Introduction

As increasing numbers of general practitioners become fundholders, hospitals wanting to maintain their income will need to work harder to provide the services required by general practices. Knowing exactly what these needs are and how they are likely to change with time will be essential for efficient and effective planning and provision of resources by hospitals and general practices alike.

Incidence, prevalence, episode rates, and consultation rates provide useful measures of disease within a community. These can be used as objective measures when planning health service requirements. To date few such data exist for ophthalmic disease.[1-6] The main sources are national morbidity statistics[7] and studies of new patients attending eye clinics[10-12] or accident and emergency departments.[13-16] Data from all of these sources have problems.

The national morbidity statistics are based on general practitioners' diagnoses over three 12 month periods. Ophthalmic diseases are grouped into 12 broad diagnostic categories that are useful for showing general trends but of little value for following specific conditions. Since general practitioners make diagnoses, their accuracy is questionable.[12 17-19]

The main criticisms of hospital based studies are the select population they represent and the unquantifiable denominator population. Prevalence data derived from population studies have been manipulated to derive estimates of 'age specific incidence' for the main chronic ophthalmic conditions.[20] Until now the validity of such estimates has been unknown as there have been no incidence data for comparison.

We examined eye disease in a defined community—patients presenting to the general practitioner and a hospital eye service—to determine demand incidence and episode rates for ophthalmic conditions and the workload these represent for medical services. For the commoner conditions age specific demand incidence has also been calculated.

Patients and methods

We sent a letter to all general practices (25) in the sector of Nottingham radiating from the city centre to the M1 motorway inviting them to participate in a study investigating eye disease in the community. The area includes a broad spectrum of social class and social conditions. Fourteen practices that responded favourably were approached with further details of the study and were recruited only if all partners agreed to participate. We used family health services authority records of practice list sizes to determine the size of the study population recruited.

DATA FROM GENERAL PRACTITIONERS

Twenty three general practitioners began the study. Seventeen doctors (seven practices with a combined list size of 36 018 people) completed the study. Serious ill health of two doctors resulted in two practices withdrawing and three singlehanded practitioners repeatedly failed to follow the protocol. Data from all of these practices were excluded. The general practitioners were asked to log all consultations for eye disease during March 1989 to February 1990. Data were recorded in books of questionnaires that we provided and included patients' age and sex; whether the consultation was a first or follow up visit; a working diagnosis of patients' presenting conditions; whether the condition was new, a recurrence, an exacerbation or a chronic condition; treatment and referral of the patient. Practitioners were asked whether they had checked visual acuity or used fluorescein staining.

Patients with new disease or new recurrences of eye disease were invited to see an ophthalmologist as part of a research project. General practitioners were asked to initiate treatment and management in their usual way.

The completeness of the case recording by doctors was determined by retrospectively checking for evidence of eye consultations in the notes of all patients consulting their general practitioner during randomly selected weeks over the 12 month period. Doctors were not warned when these checks would occur.

Diagnostic accord between general practitioners and

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the study ophthalmologist was examined and has been reported.[10]

DATA FROM HOSPITAL

Lists of the participating general practitioners were posted in the eye casualty department of University Hospital, the only accident and emergency service in the city. Patients from these practices who attended the department were identified on arrival and similar data sheets to those used by the general practitioners were completed by accident and emergency staff. All accident and emergency notes for the year of the study (about 25 000 cases) were retrospectively searched for missed cases. Data on missed cases were collected as completely as possible from the records.

DATA FROM OPHTHALMOLOGIST

All patients accepting the general practitioners' offer to see an ophthalmologist as part of a research project were assessed by one ophthalmologist (JHS). Patients received a problem oriented ophthalmic examination with a portable slit lamp, Perkins hand held tonometer, direct ophthalmoscope, and diagnostic pharmaceuticals as required. Visual acuities were assessed with a three metre Snellen chart. Visual fields were tested by confrontation, red topped neurology pin, and Amsler's charts. Referring practitioners were promptly notified of salient history, findings, and diagnosis. Any changes thought necessary in the acute management were directed through the referring general practitioner. In urgent cases where this was not possible the ophthalmologist referred the patient directly to eye casualty.

ANALYSIS

Data were analysed with the statistical package SPSSX on the university mainframe computer. The term demand incidence[11] is used to represent the fact that only patients presenting for medical attention, and thus the proportion creating the workload, were considered. While incidence is the more meaningful term for the chronic ophthalmic conditions such as cataracts and open angle glaucoma, episode rates are more useful in acute recurrent conditions—such as, infective conjunctivitis as these give a more accurate picture of the morbidity within the population (box).

Results

OPHTHALMIC DISEASE IN GENERAL PRACTICE

During the study period general practitioners logged 1771 consultations for eye problems, a consultation rate of 49·2 consultations per 1000 population per year. This represented 1·5% (1771/120 000) of all general practice consultations.

Retrospective checks on the notes of 1991 patients

$$\text{Demand incidence} = \frac{\text{number of cases of new disease*}}{\text{number of people in population or age group}\dagger}$$

$$\text{Demand episode rate} = \frac{\text{number of cases of new or recurrent disease}}{\text{number of people in population or age group}\dagger}$$

*Only using diagnoses of those ophthalmically assessed.
†Age group if age specific demand incidence or episode rates

seen by 16 general practitioners during 16 weeks randomly selected from the data collection period showed 40 ophthalmic consultations. Nine cases had not been recorded, suggesting an underreporting rate of 22·5% (95% confidence interval 8% to 37%). The unrecorded cases included three cases of infective conjunctivitis, two of allergic conjunctivitis, and four requests for repeat prescriptions of drugs for dry eye or glaucoma. The planned retrospective check proved impossible for one general practitioner who did not have an appointment system. No adjustments were made for underreporting of cases.

General practitioners identified 1630 patients with new or new recurrences of ophthalmic disease, and these patients were invited to see the study ophthalmologist (JHS). In all 1272 patients accepted the offer, an uptake rate of 78%. In 73% of cases (929) patients were seen within three days after their initial presentation to the general practitioner (mean three days, median two days, mode one day). In 94·3% (1199/1272) of consultations the ophthalmologist diagnosed new disease or new episodes of recurrent ophthalmic disease. The remaining 73 consultations (5·7%) were deemed to be follow up consultations for chronic ophthalmic conditions or exacerbations and were not included in calculations of demand incidence or episode rate.

Table I shows the age and sex distribution of patients consulting their general practitioner with eye problems. Most consultations were by females (60%).

DATA FROM EYE CASUALTY

A total of 816 consultations were logged for the study population by the eye casualty department, a consultation rate of 22·7 consultations per 1000 population per year. Seventy nine people (4% of patients presenting to general practitioner with eye problems) were seen both by their general practitioner and in eye casualty for the same problem. Men, particularly young men, were responsible for most consultations (table I). Most of the consultations (741 (91%)) were for new disease or new episodes of recurrent disease.

COMBINED DATA

A total of 2587 consultations for eye problems were recorded by general practitioners and eye casualty for 36 018 people, a consultation rate of 71·8 consultations per 1000 population per year. In 2470 consultations (95·5%) the patient had ophthalmic symptoms. In 101 consultations (3·9%) the patient was asymptomatic, and had disease detected at screening by a general practitioner or, more commonly, an optometrist. Symptoms or lack of them were not recorded for 16 patients (0·6%).

The commonest eye problem in working aged men was trauma. Rates of trauma were significantly higher than those in women (p < 0·001, table II). Almost all patients with trauma presented to eye casualty and this played a large part in the different sex distribution of consultations to general practitioners and eye casualty. Inflammatory disease was most common in the under 5s, by far the largest contributor being infective conjunctivitis.

TABLE I—*Age-sex distributions of study patients according to where they presented*

Age (years):	General practitioners		Eye accident and emergency		Total	
	No (%)	Consultation rate/ 1000 population	No (%)	Consultation rate/ 1000 population	No (%)	Consultation rate/ 1000 population
0-14	486 (8·2)	81·8	87 (1·5)	14·6	573 (9·6)*	96·4
15-29	276 (3·4)	33·9	248 (3·0)	30·4	524 (6·4)	64·3
30-44	249 (3·5)	34·7	185 (2·6)	25·8	434 (6·0)*	60·5
45-59	211 (3·6)	36·1	129 (2·2)	22·1	340 (5·8)	58·1
60-64	111 (5·5)	54·8	53 (2·6)	26·2	164 (8·1)	81·0
65-69	105 (4·4)	43·8	39 (1·6)	16·3	144 (6·0)	60·1
70-74	103 (6·3)	62·7	32 (1·9)	19·5	135 (8·2)	82·1
75-79	91 (6·4)	63·5	17 (1·2)	11·9	108 (7·5)*	75·4
≥80	104 (7·4)	74·2	24 (1·7)	17·1	128 (9·1)	91·4
Age missing	35 (0·1)		2 (0·005)		37 (0·1)	
Sex:						
Males	696 (39)	39·8	506 (62)	28·9	1202 (46)	68·7
Females	1066 (60)	57·5	310 (38)	16·7	1376 (53)	74·2
Missing data	9 (1)				9 (0·3)	
Total	1771	49·2	816	22·7	2587	71·8

*Rounding errors.

TABLE II—*Rates of ophthalmic disorders per 1000 patients per year according to age and sex. 95% Confidence intervals of differences are shown in parentheses*

Disorder	Age (years)					
	0-14	15-29	30-44	45-59	60-74	≥75
Trauma:						
M	12·3	30·3	23·0	17·8	6·9	6·0
F	3·7	7·9	6·8	6·3	4·8	4·9
Difference	8·6	22·4	16·2	11·5	2·1	1·1
	(4·1 to 13·1)*	(16·5 to 28·3)*	(10·7 to 21·7)*	(6·0 to 17·0)*	(0 to 5·9)	(0 to 6·8)
Inflammation:						
M	46·6	19·0	20·0	16·1	21·7	11·0
F	47·6	31·9	27·6	27·9	30·9	20·6
Difference	1·0	12·9	7·6	11·8	9·2	9·4
	(0 to 11·7)	(6·1 to 19·7)*	(0·6 to 14·6)*	(4·3 to 19·3)*	(1·2 to 17·2)*	(0·3 to 18·5)*
Others:						
M	9·7	7·1	7·9	13·8	31·8	40·1
F	5·8	10·4	13·9	21·9	38·5	51·5
Difference	3·9	3·3	6·0	8·1	6·7	11·4
	(0 to 8·3)	(0 to 7·4)	(1·2 to 10·8)*	(1·3 to 14·9)*	(0 to 15·9)	(0 to 26·6)

*Significant difference between rates.

DEMAND INCIDENCE AND EPISODE RATES

Table III shows demand incidences and episode rates per 1000 population per year for the most common conditions in the infective, traumatic, and degenerative disease categories. Estimates of demand incidence and episode rates have been calculated directly from the data on patients from general practice who had a new episode or recurrence confirmed by the

TABLE III—*Annual demand incidence and episode rates of commoner conditions diagnosed expressed as cases per 1000 population per year (95% confidence interval)*

Ophthalmic condition	Demand incidence	Episode rate
Corneal abrasion		3·2 (2·6 to 3·8)
Corneal foreign body		2·7 (2·2 to 3·2)
Subtarsal foreign body		2·0 (1·6 to 2·4)
Subconjunctival haemorrhage		1·2 (0·8 to 1·6)
Infective conjunctivitis		13·5 (12·5 to 14·5)
Allergic conjunctivitis		4·4 (3·7 to 5·1)
Chalazion		2·1 (1·6 to 2·6)
Blepharitis		1·8 (1·4 to 2·2)
Allergic blepharitis (contact type)		0·7 (0·4 to 1·0)
Anterior uveitis		0·6 (0·3 to 0·9)
Dry eyes		3·1 (2·5 to 3·7)
Refractive problems		1·1 (0·8 to 1·4)
Cataracts	1·9 (1·5 to 2·3)	
Age related macular degeneration	0·7 (0·3 to 1·1)	
Suspected glaucoma	0·5 (0·3 to 0·7)	
Open angle glaucoma	0·4 (0·2 to 0·6)	

TABLE IV—*Estimates of age specific demand incidence for major chronic ophthalmic conditions. Values are cases per 1000 population per year (95% confidence interval)*

Age (years)	Senile cataract	Age related macular degeneration	Open angle glaucoma	Ocular hypertension
50-59	0·8 (0 to 1·7)	0·3 (0 to 0·8)	0·3 (0 to 0·8)	0·5 (0 to 1·2)
60-69	3·6 (1·9 to 5·3)	0·9 (0 to 1·8)	1·4 (0·3 to 2·5)	1·6 (0·4 to 2·8)
70-79	8·1 (5·1 to 11·1)	2·9 (1·0 to 4·8)	0·6 (0 to 1·7)	1·9 (0·4 to 3·4)
≥80	16·4 (10·5 to 22·3)	7·9 (3·5 to 12·3)	4·3 (1·0 to 7·6)	0·7 (0 to 2·1)

TABLE V—*Estimates of age specific episode rates for common acute ophthalmic conditions. Rates are numbers of cases per 1000 population per year with 95% confidence intervals in parentheses*

Age (years)	Conjunctivitis		Dry eyes	Blepharitis	Chalazion
	Infective	Allergic			
0-4:					
Rate	63·8 (58·2 to 69·4)	2·5 (0·4 to 4·6)		2·5 (0·4 to 4·6)	2·0 (0·1 to 3·9)
No of cases	129	5		5	4
5-14:					
Rate	17·3 (14·1 to 20·5)	8·4 (5·8 to 11·0)		1·0 (0 to 2·0)	1·5 (0·3 to 2·7)
No of cases	68	33		4	6
15-29:					
Rate	9·6 (7·7 to 11·5)	6·6 (5·0 to 8·2)	0·2 (0 to 0·5)	0·9 (0·3 to 1·5)	2·9 (1·8 to 4·0)
No of cases	78	54	2	7	24
30-44:					
Rate	10·0 (7·9 to 12·1)	4·0 (2·6 to 5·4)	1·4 (0·5 to 2·3)	1·0 (0·3 to 1·7)	2·8 (1·6 to 4·0)
No of cases	72	29	10	7	20
45-59:					
Rate	8·2 (6·1 to 10·3)	3·2 (1·8 to 4·6)	4·6 (2·9 to 6·3)	1·9 (0·8 to 3·0)	1·7 (0·7 to 2·7)
No of cases	48	19	27	11	10
60-74:					
Rate	10·9 (8·5 to 13·3)	2·6 (1·3 to 3·9)	7·7 (5·6 to 9·8)	3·8 (2·3 to 5·3)	1·6 (0·6 to 2·6)
No of cases	66	16	47	23	10
≥75:					
Rate	8·5 (5·3 to 11·7)	0·7 (0 to 1·7)	8·8 (5·6 to 12·0)	3·2 (0 to 6·4)	1·1 (0 to 2·2)
No of cases	24	2	25	9	3

ophthalmologist and patients presenting to eye casualty. All diagnoses were made by staff with ophthalmic training. No corrections have been made for the exclusion of patients not seen by the study ophthalmologist.

Infective and allergic conjunctivitis were the commonest eye diseases, together accounting for 33·6% of all new eye disease or recurrences of eye disease. Sixty nine patients presented with previously undiagnosed age related cataracts. Cataract was defined as lens changes reducing the visual acuity to 6/9 or worse. Of the 69 patients with cataracts, 20 had bilateral cataracts that reduced visual acuities to less than 6/12, 23 had unilateral cataract with visual acuities in both eyes of 6/12 or better, and 26 patients had vision in one eye less than 6/12. In all cases the reduction in visual acuity was due to the cataract. Of the 26 patients who had visual acuity less than 6/12 in one eye, 13 had bilateral cataracts. Thus the demand incidence for eyes with cataracts was 2·8 eyes per 1000 population per year and for eyes with cataracts reducing the visual acuity to less than 6/12, 1·8 eyes per 1000 population per year.

Table IV shows estimates of demand incidence for the major chronic ophthalmic conditions according to age. Demand incidence increased considerably with age for all conditions except ocular hypertension.

Table V shows episode rates of the commonest acute ophthalmic diseases according to age. A high incidence of infective conjunctivitis was seen in the under 5 age group.

Discussion

As far as we are aware this is the first large scale prospective study to assess the extent of ophthalmic disease in a defined community presenting to both general practitioners and a hospital eye service. Previous studies have examined eye disease presenting only to general practitioners[18] or only patients attending eye casualty.[13 14]

Six and a half per cent of our study population consulted for eye problems in the year, most for new conditions or new episodes of recurrent conditions. Only 4% of patients seen were asymptomatic and had had disease detected by screening, usually by optometrists. This proportion might have been higher if free sight testing had not been discontinued at the beginning of the study, although the effect of ending free sight testing on the number of eye tests carried out and the subsequent referrals remains contentious.[21]

DISTRIBUTION OF DISEASE

Two thirds of patients with eye problems presented to their general practitioner. This figure may have been significantly higher if there had not been a local eye casualty service. There was little overlap between the group of patients who presented to their general practitioner and those presenting to eye casualty. Since few patients attending the eye casualty department were referred by their general practitioners, as noted in other studies,[13 14] reducing general practitioner referrals to eye casualty would have little effect on reducing the department's workload.

One fifth of all consultations were for trauma, and this was the commonest problem in eye casualty, as previously reported.[13-15] Education of young working men about preventing eye injuries could substantially reduce the workload of eye casualty.

The commonest ophthalmic conditions were infective and allergic conjunctivitis. Although allergic conjunctivitis was most common in the teenage and young adult population, peaking in the months of May and June, it was often seen outside of this age range and season. In Britain allergic conjunctivitis is usually due

to grass pollens[22] but the peak also coincides with the breeding season of the house dust mite.[23] It is interesting that elderly patients, particularly those aged over 75, were equally likely to present with dry eyes as with infective conjunctivitis.

COMPLETENESS OF DATA

We accept that the general practitioners in the study were self selected and as such their patients may not be representative of the eligible population. However, demand incidence was calculated according to age, enabling our figures to be applied to the general population. General practitioners could have recorded the interesting cases and overlooked routine cases but our search of patients' notes suggests that allowance for unrecorded cases would only increase the frequencies of infective and allergic conjunctivitis.

The availability of the study ophthalmologist, although not advertised to patients, may have encouraged people to consult their doctors with eye problems. Nevertheless, the ophthalmic examination was strictly problem oriented and not a screening examination.

Demand incidence and episode rates were calculated solely on the diagnoses made by the study ophthalmologist or trained staff in the eye casualty department. Those patients who consulted their general practitioner with new disease or new episodes of recurrent disease but who refused to see the study ophthalmologist were assumed to be disease free. This would clearly not have been the case. We assumed freedom from disease because the disease spectrum and frequency in the unseen group could not be determined without using general practitioners' diagnoses.

People with eye problems who consulted optometrists or industrial nurses and doctors will also have been excluded unless subsequently referred to their general practitioner or the eye casualty department. Family practitioner committee records of practice populations may overestimate list sizes by up to 6%.[24] Since our estimate of the size of the study population was based on figures from the family practitioner committee demand incidence and episode rates may have been underestimated. Our values of demand incidence and episode rates therefore represent minimum values.

VALUE OF DEMAND INCIDENCE AND EPISODE RATES

Though demand incidence underestimates the true incidence of ophthalmic disease, only patients presenting for medical attention create work for medical services. Demand incidence and episode rates are thus a practical basis on which to plan the provision and allocation of resources.

The demand incidence for cataract was 1·9 new cases per 1000 population per year (2·8 eyes per 1000 population per year) yet the rate of cataract extraction for the preceding year (April 1988 to March 1989) was only 1·4 eyes per 1000 population locally (Trent Statistical Information Service) and 1·7 eyes per 1000 nationally (Statistics and Management Information, Hospital Inpatient Enquiries, Department of Health).

Previous estimates of age specific incidence rates for cataracts, open angle glaucoma, and age related macular degeneration have been calculated from prevalence data.[20] Our values are consistently lower than those produced by such methods because we used a problem oriented examination in which only the ophthalmic conditions deemed to be the cause of the patients' symptoms were recorded. Other studies have used screening examinations in which evidence of chronic ophthalmic diseases was specifically looked for irrespective of the patients' symptoms.[20]

Demand incidence of open angle glaucoma, cataracts, and senile macular degeneration increased three, four, and eight times between the age groups 60 to 69 and ≥80. Over the next 15 years the number of people aged over 80 is set to increase by 16% in the United Kingdom.[25] This will substantially increase demand for hospital ophthalmic services, which already fail to meet current demands.

Our results indicate that demand incidence will alter as population demographics change. Demand for medical care, particularly in. degenerative diseases, increases as treatment advances and becomes more efficient. For example, the introduction of intraocular lens implantation increased the demand for surgery, with patients seeking medical care at better levels of acuity than 10 years ago.[26] As demand incidence was lower than reported prevalence, demand may increase independently of the population mix. Our study therefore provides data to aid the planning of what could be considered the miniumum ophthalmic service for the 1990s.

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