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Population based glaucoma screening

Stoutenbeek, Remco

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Chapter 5

Glaucoma screening during regular optician visits: can the population at risk of developing glaucoma be reached?

GLAUCOMA SCREENING DURING REGULAR OPTICIAN VISITS: CAN THE POPULATION AT RISK OF DEVELOPING GLAUCOMA BE REACHED?

Remco Stoutenbeek and Nomdo M. Jansonius

Abstract

Aim: To determine the percentage of the population at risk of developing glaucoma, which can potentially be reached by conducting glaucoma screening during regular optician visits.

Methods: 1200 inhabitants aged >40 years were randomly selected from Dutch community population databases. A questionnaire was mailed to these inhabitants with questions on their latest optician visit and risk factors for glaucoma. A second questionnaire was sent to their opticians, who were asked about their willingness to conduct an additional glaucoma screening programme in the future.

Results: The questionnaire was returned by 959 of 1200 inhabitants and 37 of 50 opticians. The percentage of inhabitants who visited an optician during a 5-year period was 83% (95% confidence interval (CI) 80% to 85%). This percentage was adjusted for the presence of risk factors for glaucoma to obtain the percentage of the population at risk of developing glaucoma. The percentage of opticians willing to cooperate in a glaucoma screening programme extended beyond a non-contact tonometry measurement alone was 91% (95% CI 77% to 98%).

Conclusion: By conducting glaucoma screening during regular optician visits, a large section of the population at risk of developing glaucoma can be reached.

5.1 Introduction

Glaucoma is a chronic disease that may cause irreversible blindness. Owing to its insidious nature, the early stages of glaucoma do not cause any symptoms, treatment of glaucoma may arrest or slow down its progress.¹ Therefore, screening might be advisable. The essential conditions required for a successful implementation of any screening programme were listed by Wilson and Jungner² almost 40 years ago. With regard to glaucoma screening, several of these conditions have been met, whereas others are still under debate. One of the Wilson and Jungner criteria deals with economic feasibility, which largely depends on how a screening programme is organised.

Currently, ophthalmologists carry out glaucoma screening on all patients. Although many patients with glaucoma are diagnosed in this way, only a limited proportion of the general population is being reached and, as a result, only about half of the people with glaucoma are detected.³⁻⁵

At the other end of the spectrum lies straightforward implementation of a large-scale screening programme. This presumably would allow for the largest proportion of the population to be screened, but it is expensive and requires substantial and ongoing logistic efforts.

Opticians are a third possibility for glaucoma screening. In fact, they already carry out some screening by means of non-contact tonometry during regular patient visits. However, only about half of the patients with glaucoma have raised intraocular pressure at a single visit.⁶ Screening could be improved by adding a second test. For example, frequency doubling perimetry (Carl Zeiss Meditec, Dublin, California, USA) in screening mode offers a short and simple test. With an appropriate cut-off point, it combines high specificity (typically 95%) with acceptable sensitivity for early glaucoma (about 50%) and high sensitivity for moderate (about 90%) and severe (100%) glaucoma.⁷⁻⁸

A prerequisite for effective glaucoma screening is that a sufficient proportion of those at risk of developing glaucoma regularly visit an optician. Therefore, the first aim of the present study was to determine how often people at risk of developing glaucoma visit an optician. This was achieved by sending a questionnaire to a large randomly selected group of inhabitants of the city of Groningen and its surrounding rural area. As some people are more likely than others to develop glaucoma, questions on known risk factors for glaucoma were included in the questionnaire and used as weights in the analyses. A second prerequisite is the willingness of the participating opticians to extend the screening programme beyond non-contact tonometry. Thus, a second questionnaire was sent to the relevant opticians.

5.2 Materials and methods

Frequency of visiting an optician

The ethics board of the University Medical Center Groningen, Groningen, The Netherlands, approved the study. In all, 1200 inhabitants aged >40 years were randomly selected from the community population databases of Groningen, Veendam, Roden and Siddeburen. Groningen is a city of 180 000 inhabitants. Veendam and Roden are towns with 28 000 and 15 000 inhabitants, respectively, both of which have several opticians. Siddeburen is a village situated in a rural area with 2000 inhabitants; there are several small supermarkets but no local optician. All inhabitants received a questionnaire in the post. Non-responders received a reminder after 6 weeks. Data collection was discontinued after 12 weeks.

The questionnaire consisted of 17 questions, covering gender, age, time since latest optician and ophthalmologist visit, use of spectacles or contact lens, cataract surgery, and educational level. As we were interested in the proportion of potential patients with glaucoma that can be detected via the optician, we also asked about established and possible risk factors for glaucoma (myopia, family history of glaucoma, diabetes, hypertension, migraine and ethnicity).⁹⁻¹⁶ If a risk factor has a higher prevalence in the group that regularly visits an optician (visitors) than in the group that does not regularly visit an optician (non-visitors), then the actual proportion of patients with glaucoma that can be detected during regular optician visits exceeds the proportion as estimated from the raw visiting frequency data. Arbitrarily, we considered at least one visit in 5 years as regular. A shorter screening interval is unlikely to be efficient.⁴

Cooperation of participating opticians

A second questionnaire was sent to all opticians visited by at least two inhabitants. They were asked about their willingness to conduct specific glaucoma screening during regular patient visits in the future, in addition to the non-contact tonometry carried out at present. A reasonable fee for this additional service was offered (ie, to cover costs but not to provide a profit). Names and locations of the opticians were obtained from the first questionnaire. Non-responders received a reminder after 4 weeks. Data collection was discontinued after 10 weeks.

Analysis

For the univariate analyses we used the χ^2 test for proportions, Yates corrected when appropriate, and the Mann–Whitney U test for continuous variables. For the multivariate analysis, logistic regression was carried out using SPSS V.12.0. Fisher's exact 95% confidence intervals for proportions were calculated using PEPI V.4.1.17 $p < 0.05$ was considered to be significant.

For logistic regression analysis, the parameter age was stratified into six groups comprising one decade per group. The parameter educational level was ranked on an ordinal scale from 1 (primary school) to 8 (university graduate). The parameter address was analysed by using two dummies 'town' and 'village'. Likewise, refraction was analysed as 'myopia' and 'hypermetropia'. With regard to the parameter ethnicity, we discriminated only between African origin and non-African origin. The dependent variable was visitor: optician visit yes or no during the 5 years before our study.

5.3 Results

Frequency of visiting an optician

The questionnaire was returned by 959 of 1200 inhabitants (80%). Table 5.3.1 shows a comparison of responders and non-responders. On average, responders were older and more often women. The response percentages were similar in all three subregions (city, town and village).

Table 5.3.1 Demographics of responders and non-responders.

parameter	responders (n = 959)	non-responders (n = 241)	p value
age, years*	58 (48 – 69)	55 (46 – 66)	0.011
female gender, %	53	45	0.019
city,%	78	22	
town,%	82	18	0.452
village,%	80	20	

*median (25th and 75th centiles).

Figure 5.3.1 shows the frequencies of visits to opticians and ophthalmologists. Of the 959 inhabitants who returned the questionnaire, 764 (80%, 95% CI 77% to 82%) visited an optician during the 5 years before our study; 359 (37%, 95% CI 34% to 41%) visited an ophthalmologist during this period; and 804 (84%, 95% CI 81% to 86%) visited one or the other.

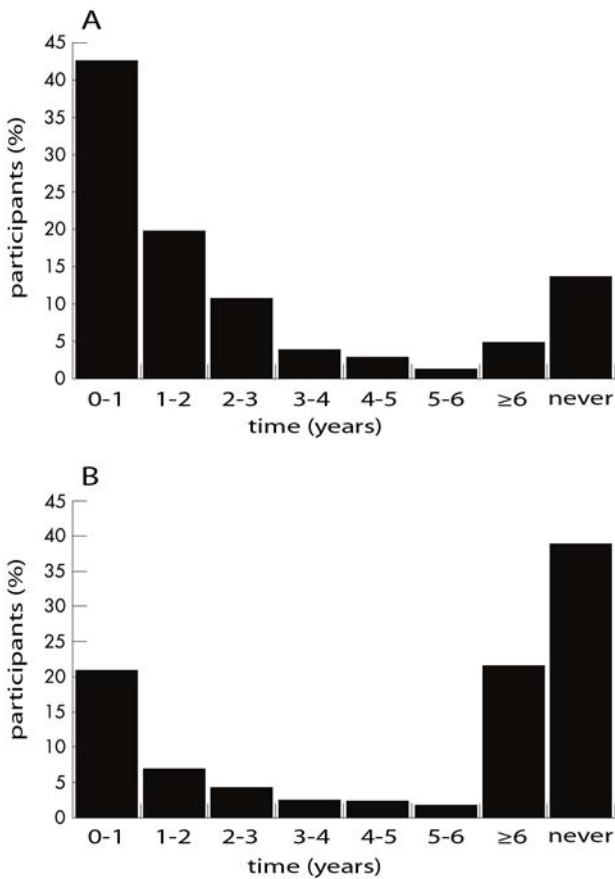


Figure 5.3.1 Distributions of time since most recent optician visit (A) and most recent visit to an ophthalmologist (B).

Table 5.3.2 shows univariate comparisons of all investigated parameters (demographics and self-reported prevalences of risk factors) between visitors (defined as latest optician visit ≤ 5 years) and non-visitors. Table 5.3.3 shows the corresponding multivariate analysis. A significant difference between visitors and non-visitors was found for the parameters myopia, hypermetropia, age and previous cataract surgery. Of these, only myopia and age are presumed risk factors for open-angle glaucoma.

Table 5.3.2 Demographics and glaucoma risk factors for responders, stratified for time since most recent optician visit, univariate analyses.

parameter	visitors (≤5 years; n = 764)	non-visitors (>5 years; n = 195)	p value
myopia, %	31	6	<0.001
hypermetropia, %	34	7	<0.001
age, years*	60 (51 – 70)	51 (44 – 64)	<0.001
male gender, %	44	55	0.007
cataract surgery, %	8	4	0.077
hypertension, %	29	23	0.114
village, %	33	38	0.199
town, %	34	30	0.279
city, %	33	32	0.888
migraine, %	28	25	0.410
family history, %	9	10	0.699
diabetes, %	8	8	0.888
educational level*	3 (2 – 4)	3 (2 – 5)	0.969
ethnicity, %	1	1	1.000

*Median (between 25th and 75th centiles).

Table 5.3.3 Demographics and glaucoma risk factors for responders, multivariate analysis with latest optician visit ≤ 5 years as the dependent variable

parameter	odds ratio	p value	95% CI
myopia	17.5	<0.001	9.3 to 33.0
hypermetropia	12.7	<0.001	7.0 to 22.9
cataract surgery	4.7	0.001	2.0 to 11.1
age	1.2	0.043	1.0 to 1.4
family history	0.6	0.174	0.3 to 1.2
gender	0.8	0.176	0.5 to 1.1
village	1.2	0.399	0.8 to 1.9
ethnicity	1.9	0.469	0.3 to 10.2
hypertension	1.2	0.477	0.7 to 1.9
diabetes	0.8	0.574	0.4 to 1.6
town	1.1	0.719	0.7 to 1.7
migraine	1.1	0.774	0.7 to 1.6
educational level	1.0	0.836	0.9 to 1.1

*Median (between 25th and 75th centiles).

On the basis of an estimated relative risk of 2 for people with myopia of developing glaucoma,⁹⁻¹¹ we calculated that the visitors (80% of total) represent 83% (80–85%) of the population at risk for developing glaucoma. Inhabitants who visited either an optician or an ophthalmologist (84% of total) represent 86% (84–88%) of the population at risk. We did not adjust for age in our analysis as

although the prevalence and incidence of glaucoma increases with age,^{4,5} younger people presumably benefit more from screening.

Cooperation of participating opticians

Of the 959 inhabitants who returned our questionnaire, 826 had visited an optician at least once; 770 remembered the name of the optician last visited. Of the 50 opticians, 37 (74%) returned the questionnaire. Of these 37 opticians, 32 (91%, 95% CI 77% to 98%) expressed willingness to participate in an extended glaucoma screening programme.

5.4 Discussion

We investigated whether glaucoma screening during regular optician visits could be a suitable way to reach the population at risk for glaucoma. We found that 83% (95% CI 80% to 85%) of the population at risk for glaucoma visited an optician during a 5-year period. Most opticians expressed willingness to cooperate in some kind of extended screening programme for patients with glaucoma.

Most of the criteria for appraising the validity of a screening programme as stated by Wilson and Jungner² have been met. The fact that screening during a regular optician visit seems to be feasible, as shown by our study, is a step forward with regard to Wilson and Jungner's criterion of economic feasibility. However, the extra clinical workload for ophthalmologists resulting from any screening programme must also be taken into account. Shifting the cut-off criterion for any screening test towards a high specificity is an important first measure and, hence, it should be accepted that some cases will be missed.

Finally, it is the community that determines the amount of money that may be spent to prevent a single case of visual impairment or blindness. In the case of limited resources, this should be weighed against other beneficial measures that could be adopted for the same cost.

In conclusion, by conducting glaucoma screening during regular optician visits, a large section of the population at risk of developing glaucoma can be reached.

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