

Incidence of cataract, glaucoma and myopia in Lublin Province – a survey-based study

Justyna Kłos-Rola¹, Zbigniew Zagórski¹, Henryk Siwiec², Witold Olszański², Marcin Szymański²

¹ Department of Ophthalmology, Medical University, Lublin, Poland

² Department of Otolaryngology, Medical University, Lublin, Poland

Abstract: The incidence of cataract, glaucoma and myopia, together with demographic characteristics of the affected populations, was studied in Lublin region using a self-developed questionnaire. The incidence of eye diseases increased with age. Cataract and myopia were more frequent in women than in men. The prevalence of cataract and glaucoma among farmers and inhabitants with elementary education was higher than among other professions and inhabitants with higher education. Cataract was more common in rural areas than in towns. On the other hand, the incidence of myopia was higher among town inhabitants and white-collar workers with higher education than among village residents, farmers and inhabitants with elementary education.

Key words: cataract, glaucoma, myopia, epidemiology

INTRODUCTION

Eye diseases remain one of the most important public health problems. According to a WHO report [1] there are 44,800,000 blind people (visual acuity of a better eye less than 3/60) in the world's population. Moreover, due to the rapidly growing number of people and higher life expectancy this number will increase in the future. The most common causes of blindness include: cataract (43%), glaucoma (15%), trachoma (11%), vitamin A deficiency (6%), onchocercosis (1%), and other eye diseases (24%) such as diabetic retinopathy, degenerative macular diseases and refractive errors [1]. Most of these diseases can be controlled with proper prophylaxis and/or treatment allowing functional visual acuity. In order to accomplish this, however, it is necessary to know the epidemiology of ocular diseases globally, as well as in smaller, local populations. This was the reason for the authors deciding to study the prevalence of cataract, glaucoma and myopia, together with epidemiological data of subjects, in the population of Lublin Province.

MATERIALS AND METHODS

In order to make the research cost-effective, it was performed by two units: the Department of Ophthalmology and the Department of Otolaryngology Head and Neck Surgery at the Medical University in Lublin, using a self-developed questionnaire. Some questions were directed towards hearing disorders. One question referring ophthalmologic disorders was formulated as follows: 'Have you ever received treatment due to: a) myopia, b) cataract, c) glaucoma?' Other data, such as age, sex, place of residence, present or past profession and education of each subject were also collected. The questionnaire was posted to 35,500 adult inhabitants of Lublin

Province, randomised from the database of the Department of Public Affairs. We received 17,503 (49.8%) responses that were subsequently screened in order to eliminate incomplete or faulty questionnaires. Consequently, 16,717 questionnaires were statistically analysed with SPSS stat software.

RESULTS

The population analysed consisted of 7,555 men and 9,162 women. Age distribution is given in Table 1.

Table 1 Age groups by sex

Age (years)	Female		Male		All	
	N	%	n	%	n	%
≤20	523	5.7	370	4.9	893	5.3
21-30	1,523	16.6	1,497	19.8	3,020	18.1
31-40	1,625	17.7	1,344	17.8	2,969	17.8
41-50	1,993	21.8	1,552	20.5	3,545	21.2
51-60	1,344	14.7	1,135	15	2,479	14.8
61-70	1,226	13.4	1,053	13.9	2,279	13.6
71-80	666	7.3	465	6.2	1,131	6.8
>80	262	2.9	139	1.8	401	2.4
All	9,162	100.0	7,555	100.0	16,717	100.0

Sex and age distributions were within the norm for sex and age distributions among the population in Lublin Province. Residence was reported by 16,714 persons, of whom 12,833 (76.8%) lived in Lublin, 240 (1.4%) in small towns of Lublin Province, and 3,641 (21.8%) in rural areas. Occupation was given by 16,668 persons: 6,759 (40.6%) were white-collar (w-c) workers, 5,306 (31.8%) were labourers and 1,757 (10.5%) farmers. 2,848 persons (17.1%) declared 'other occupation'. Data on education was provided by 1,256 persons; the relevant question was asked of all subjects who reported to the Department of Otolaryngology for further examination after random written invitation. 649 individuals (51.7%) had high school education, while 314 (25%) elementary and 293 (23.3%) university education.

Corresponding author: Dr. Justyna Kłos-Rola, MD, PhD, I Department of Ophthalmology, Chmielna 1, 20-079 Lublin, Poland.
E-mail: jklosrola@poczta.onet.pl

Received: 17 November 2007; accepted: 15 December 2007

Cataract was found in 634 respondents (3.8%) – 392 women (4.3% of all women) and 241 men (3.2% of all men). The difference between the incidence of cataract in men and in women was significant ($\chi^2=13.77$; $p<0.01$). Age distribution is shown in Table 2. The incidence of cataract increased significantly with age ($\chi^2=1434.2$; $p<0.001$).

Table 2 Prevalence of cataract, glaucoma and myopia by age

Age (years)	Cataract		Glaucoma		Myopia	
	n	%	n	%	n	%
≤20	0	0	2	0.2	207	23.2
21-30	13	0.4	5	0.2	637	21.1
31-40	22	0.7	12	0.4	572	19.3
41-50	42	1.2	23	0.7	766	21.8
51-60	76	3.1	46	1.9	561	22.8
61-70	189	8.4	44	1.9	454	20.1
71-80	195	17.5	43	3.9	275	24.6
>80	97	24.6	16	4.1	100	25.4
All	634	3.8	191	1.1	3,572	21.5

458 (3.6%) of positive responses came from the city of Lublin, 10 (4.2%) from other towns in the region and 166 (4.6%) from rural areas. The prevalence of cataract in rural areas was significantly higher than in the city of Lublin ($\chi^2=7.70$, $p<0.01$). The occupations of respondents with cataract were: 196 (2.9%) w-c workers, 229 (4.3%) labourers, 144 (8.3%) farmers and 65 (2.3%) 'other occupation', respectively. The incidence of cataract in farmers was significantly higher than in w-c workers ($\chi^2=103.38$, $p<0.01$), higher than in labourers ($\chi^2=40.23$, $p<0.01$) and higher than in the 'other occupation' ($\chi^2=88.30$, $p<0.01$). 31 subjects (10.1%) with elementary education, 28 (4.4%) with high school and 2 (0.7%) with higher education confirmed previous treatment for cataract. The incidence of cataract was significantly higher in subjects with elementary education than in those with high school ($\chi^2=11.82$, $p<0.01$) and higher than those with university education ($\chi^2=23.79$, $p<0.01$).

Glaucoma was reported by 191 (1.1%) responders – 111 women (1.2% of all women) and 80 men (1.1% of all men). Age distribution is shown in Table 2. The incidence of glaucoma increased significantly with age ($\chi^2=179.51$; $p<0.001$).

143 (1.1%) respondents with glaucoma lived in the city of Lublin, 3 (1.3%) in other towns and 45 (1.2%) in rural areas of Lublin Province. The prevalence of glaucoma did not depend on sex or place of residence. Present or previous treatment for glaucoma was reported by 70 (1.0%) professionals, 66 (1.3%) labourers, 37 (2.1%) farmers and 16 (0.6%) persons with 'other occupation'. The incidence of glaucoma in farmers was significantly higher than in w-c workers ($\chi^2=13.13$, $p<0.01$), higher than in labourers ($\chi^2=6.44$, $p<0.01$) and higher than in 'other occupation' ($\chi^2=22.94$, $p<0.01$). There were 13 (4.3%) persons with elementary education, 8 (1.2%) with high school and none with higher education among them. The rate of glaucoma among subjects with elementary education was significantly higher than among those with high school education ($\chi^2=8.68$, $p<0.01$).

The presence of myopia was reported by 3,574 persons (21.5%); this group comprised 2,185 women (24.0% of all women) and 1,389 men (18.5% of all men). The difference between men and women was significant ($\chi^2=73.97$, $p<0.01$). Age distribution is given in Table 2. The subpopulation of myopic respondents included 3,013 (23.6%) persons from

the city of Lublin, 56 (23.6%) from other towns and 505 (13.9%) from rural areas. The incidence of myopia among respondents from rural areas was significantly lower than among those from the city of Lublin ($\chi^2=155.48$, $p<0.01$), and lower than among those from smaller towns ($\chi^2=16.75$, $p<0.01$). In this group there were 1,673 (24.8%) w-c workers, 950 (18.0%) labourers, 245 (14.1%) farmers and 701 (24.7%) 'other occupation' respondents. The rate of myopia in farmers was significantly lower than in labourers ($\chi^2=14.25$, $p<0.01$), lower than in w-c workers ($\chi^2=91.20$, $p<0.01$) and lower than in other professions ($\chi^2=74.66$, $p<0.01$). The presence of myopia was reported by 67 (21.9%) subjects with elementary education, 150 (23.4%) with high school and 89 (30.5%) with university education.

DISCUSSION

634 individuals, i.e. 3.8% of the respondents, declared previous or current treatment for cataract. 599 of them were 40-years-old or older – which comprises 6.09% of this age group. Klein et al. in their study reported the presence of cataract in 44.4% of the population between 48-92 years of age [2]. Mitchell et al. found lens opacities in 53% of women and 50% of men in the nuclear and 26% of women and 21 % of men in the cortical zone as well as in 6% of women and 6.5% of men in posterior subcapsular zone, respectively. The population analysed consisted of subjects between 49-96 years of age [3]. The inconsistency between our results and those reported by others may arise from at least three independent variables. First of all, Klein as well as Mitchell, used the consistent Cataract Wisconsin Grading System [4], while the respondents included in our study had been examined earlier by a number of ophthalmologists who used various grading systems. Moreover, due to the relative insufficiency of ophthalmologists access, specialised medical services in our region are limited. And lastly, the low level of general health awareness of the population in our region leads to late presentation to the specialist, sometimes even with a mature cataract. Thus, the results of a posted questionnaire such as ours are usually underestimated compared with the results of a direct interview, and even more underestimated in comparison to an ophthalmological examination.

We demonstrated a distinct correlation between cataract incidence and age, starting from less than 1% for subjects younger than 40 through 1.2%, 3.1%, 8.4%, 17.5% and 24.6%, respectively, for subsequent age groups: 41-50, 51-60, 61-70, 71-80 and older. Other studies confirm this relationship. Giuffre et al. [5] showed an incidence of cataract from 4% in the age group 40-49, to 54.4% in a group of subjects over the age of 70. A study by Sasaki's [6] revealed a cataract incidence that varied from 4% in an group 40-49 to 83.3% in a group older than 80. According to our results, there is a correlation between cataract incidence and gender, i.e. women suffer from cataract more often than men. These results correspond with previous reports [2, 3, 5] demonstrating a higher incidence of cataract (up to 1.5 times) among women. However, others [7] did not find such a relationship. The origins of this discrepancy remain obscure [8].

The association between cataract incidence and place of residence is of special interest. We revealed a significantly higher incidence of cataract among inhabitants of rural areas, than in those who lived in the city of Lublin. A higher exposure

to UV is the most apparent explanation for this finding [9]. This can also account for the clearly higher occurrence of cataract among farmers (at least twice as high) in relation to other occupations. Education as well as income are generally connected with occupation. This may explain our findings that elementary education and low income are risk factors for the development of cataract. Our results confirm the evidence from previous studies [2].

In our study we found that 1.2% of respondents received glaucoma treatment without specification of the type of disease. It is worth noting that in the population over the age of 40 the incidence reaches 1.8%. Surprisingly, the results obtained from our questionnaire are similar to a previous two-stage study that involved clinical examination of respondents showing a 1.6% incidence of glaucoma without specification of the type of disease in a Wrocław population aged over 40 [10]. Our results are also in agreement with other previous findings that revealed a glaucoma incidence from 0.8% [11, 12] to 3% [13] for primary open-angle glaucoma (POAG). According to previous reports, primary angle-closure (PACG) and secondary glaucoma (SG), are relatively rare with the incidence varying from 0.1% for PACG [14] and 0.15% [13] for SG to 0.6% [15] for PACG, and 0.2% for SG [14].

Most researchers assert that approximately 50% of patients had no knowledge about their illness prior to examination [12, 13, 16, 17]. In our study, the data were obtained from the respondents' medical histories, without being confirmed by subsequent examination. Consequently, one can assume that the real incidence of glaucoma is higher in our region. Nevertheless, further population-based studies according to cohesive diagnostic criteria are needed. Our results disclosed significant correlation between incidence of glaucoma and age, rising from 0.2% in individuals under the age of 30 to 0.7% for the 41-50 age group of the population, to 4.1% for those aged over 80. This is in agreement with previous reports by Klein *et al.* and Nizankowska *et al.* [10, 18]. On the other hand, Wensor showed a 0.1% incidence of glaucoma in a population group aged 40-49, increasing to 9.7% in a population group aged 80-89, while Mitchell *et al.* found glaucoma in 0.4% of persons aged between 49-59 and rising to 11.4% in persons aged over 80 [15, 28]. In our study, we did not find any relationship between gender and incidence of glaucoma. This confirms results obtained by others [10, 18, 19]. On the other hand, some studies revealed a higher incidence of glaucoma among men [11, 20], even up to 4 times, while one-time revisions showed a higher incidence among women [13, 21]. The present study revealed significantly higher incidence of glaucoma among farmers as well as among people with elementary education, compared to other groups. Our findings extend the circumstantial evidence of previous studies [16] in this aspect. However, others state that socio-economical status does not appear to be a risk factor for glaucoma [18].

21.5% of respondents reported current or previous treatment for myopia. According to other reports, the incidence of myopia varies from 12-28% [22] in the adult population. It is well known, however, that myopia is more common among teenagers and young adults, compared to other age groups. Our results confirm this relationship since in younger subjects under 20 the incidence was 23.2% and 21.1% in the population aged between 21-30. Other studies showed even higher incidences of myopia, such as 49.7% in at least one eye in 12-13-year-olds in Sweden, or 49% among female students in Greece [23, 24]. Nonetheless, those studies included patients

examined according to restrictive definitions of myopia, which considered as myopic an eye with refractive error -0.25 , -0.5 or -1 D [23, 25-27]. In our study, the diagnosis was based on patient's self-knowledge and not on examination, which may explain the lower incidence of myopia found. It is surprising, however, that we did notice two other peaks of incidence in the group aged 41-60 and the group aged over 70. Most authors report a decrease in incidence of myopia with age [26, 28, 29], although Wensor [22] discovered a slight increase after the age of 80. Nevertheless, the discrepancies between our results and those reported by others cannot be explained by any observed age-dependent changes in refraction of the optical apparatus of the eye resulting from lens aging and cataract, especially with regard to the percentage of positive responses in the group aged over 70, which is higher than in the group under 20 years of age. We can only hypothesize that this may result from misunderstanding the term 'myopia' (e. g. misinterpretation for presbiopia or other causes of vision loss).

24% women and 18.5% men of our population reported myopia. This result is similar to previous reports [24, 30], although some studies did not show gender dependence of this refractive error [22]. Of interest is also the significantly higher proportion of myopia among city inhabitants (23.6%) in compared to rural areas (13.8%). It seems to be correlated with education and subsequently with occupation. Myopia is more common among white-collar workers with higher education in relation to labourers and farmers with elementary education. Longer education and professional occupation are considered as risk factors for myopia due to specific working conditions, i.e. reading and proximity of the workplace [22, 26, 28]. Relevant, very interesting data has come from Adams *et al.* [31]. They found that myopia incidence reaches 70% among people who work with microscopes. On the other hand, Mutti [29] states that such working conditions do not contribute to myopia development, while Wensor *et al.* [22] assumes that professional occupation is more often chosen by people with previous refraction error rather than the professional occupation itself contributing to myopia development.

CONCLUSIONS

Our results show that the incidence of eye diseases increases with age. Cataract and myopia are significantly more frequent among women than among men. The prevalence of cataract and glaucoma among farmers and respondents with elementary education is higher than among other professions and respondents with a higher education. Cataract is more common in rural than urban areas. On the other hand, the incidence of myopia is higher among towns inhabitants, white-collar workers with higher education than among rural inhabitants, farmers and respondents with elementary education. These results indicate the need for a well designed epidemiological study that could provide a solid base for a future information campaign and/or introduction of prophylactic measures in defined risk populations.

REFERENCES

1. *World Health Report* 1998, WHO.
2. Klein BE, Cruickshanks KJ, Nondahl DM, Klein R, Dalton DS: Cataract and hearing loss in a population-based study: The Beaver Dam studies. *Am J Ophthalmol* 2001, **132**, 537-543.

3. Mitchell P, Cumming RG, Attebo K, Panchapakesan J: Prevalence of cataract in Australia: The Blue Mountains eye study. *Ophthalmology* 1997, **104**, 581-588.
4. Klein BE, Klein R, Linton KL, Magli YL, Neider NW: Assessment of cataracts from photographs in the Beaver Dam Eye Study. *Ophthalmology* 1990, **97**, 1428-1433.
5. Giuffrè G, Giammanco R, Di Pace F, Ponte F: Casteldaccia eye study: prevalence of cataract in the adult and elderly population of a Mediterranean town. *Int Ophthalmol* 1994, **18**, 363-371.
6. Sasaki H, Asano K, Kojima M, Sakamoto Y, Kasuga T, Nagata M, Takahashi N, Sasaki H, Ono M, Katoh N: Epidemiological survey of ocular diseases in K Island, Amami Islands: prevalence of cataract and pterygium. *Nippon Ganka Gakkai Zasshi* 1999, **103**, 556-563.
7. Cedrone C, Culasso F, Cesareo M, Naricino R, Ricci F, Cupo G, Cerrulli L: Prevalence and incidence of age-related cataract in a population sample from Priverno, Italy. *Ophthalmic Epidemiol* 1999, **6**, 95-103.
8. Albert DM, Jakobiec FA: Principles and practice of ophthalmology (2nd ed). Philadelphia: Saunders 2000.
9. West S: Ocular ultraviolet B exposure and lens opacities: a review. *J Epidemiol* 1999, **9**, 97-101.
10. Nizankowska MH, Kaczmarek R: Prevalence of open angle glaucoma and ocular hypertension as a risk factor for primary open angle glaucoma in Wrocław population. Wrocław Epidemiology Study. *Klin Oczna* 2004, **106**, 147-152.
11. Leske MC, Connell AM, Schachat AP, Hyman L: The Barbados Eye Study. Prevalence of open angle glaucoma. *Arch Ophthalmol* 1994, **112**, 821-829.
12. Wolfs RC, Borger PH, Ramrattan RS, Klaver CC, Hulsman CA, Hofman A, Vingerling JR, Hithings RA, De Jong PT: Changing views on open-angle glaucoma: definitions and prevalences - The Rotterdam Study. *Invest Ophthalmol Vis Sci* 2000, **41**, 3309-3321.
13. Mitchell P, Lee AJ, Rochtchina E, Wang JJ: Prevalence of open-angle glaucoma in Australia. The Blue Mountains Eye Study. *Ophthalmology* 1996, **103**, 1661-1669.
14. Wensor MD, McCarty CA, Stanislavsky YL, Livingston PM, Taylor HR: The prevalence of glaucoma in the Melbourne Visual Impairment Project. *Ophthalmology* 1998, **105**, 733-739.
15. Bonomi L, Marchini G, Marraffa M, Bernadi P, De Franco I, Perfetti S, Varotto A, Tenna V: Prevalence of glaucoma and intraocular pressure distribution in a defined population. The Egna-Neumarkt Study. *Ophthalmology* 1998, **105**, 209-215.
16. Weih LM, Nanjan M, McCarty CA, Stanislavsky YL, Livingston PM, Taylor HR: Prevalence and predictors of open-angle glaucoma: results from the visual impairment project. *Ophthalmology* 2001, **108**, 1966-1972.
17. Quigley HA: Number of people with glaucoma worldwide. *Br J Ophthalmol* 1996, **80**, 389-393.
18. Klein BE, Klein R, Sponsel WE, Franke T, Cantor LB, Martone J, Menage MJ: Prevalence of glaucoma. The Beaver Dam Eye Study. *Ophthalmology* 1992, **99**, 1499-1504.
19. Tielsch JM, Sommer A, Katz J, Rovall RM, Quigley HA, Jaritt J: Racial variations in the prevalence of primary open-angle glaucoma. The Baltimore Eye Survey. *Jama* 1991, **266**, 369-374.
20. Kahn HA, Leibowitz HM, Ganley JP, Kini NM, Colton T, Nickerson RS, Dawber TR: The Framingham Eye Study: I. Outline and major prevalence findings. *Am J Epidemiol* 1977, **106**, 17-32.
21. Salmon JF, Mermond A, Irey A, Swanerelder SA, Hoffman M: The prevalence of primary angle closure glaucoma and open angle glaucoma in Mamre, Western Cape, South Africa. *Arch Ophthalmol* 1993, **111**, 1263-1269.
22. Wensor M, McCarty CA, Taylor HR: Prevalence and risk factors of myopia in Victoria, Australia. *Arch Ophthalmol* 1999, **117**, 658-663.
23. Villarreal MG, Ohlsson J, Abrahamsson M, Sjöström A, Sjöstrahd J: Myopisation: the refractive tendency in teenagers. Prevalence of myopia among young teenagers in Sweden. *Acta Ophthalmol Scand* 2000, **78**, 177-181.
24. Mavracanas TA, Mandalos A, Peios D, Golias V, Megalon K, Gregoriadou A, Delidon K, Katsougiannopolous B: Prevalence of myopia in a sample of Greek students. *Acta Ophthalmol Scand* 2000, **78**(6), 656-659.
25. Sveinsson K: The refraction of Icelanders. *Acta Ophthalmol (Copenh)* 1982, **60**, 779-787.
26. Wang Q, Klein BE, Klein R, Moss SE: Refractive status in the Beaver Dam Eye Study. *Invest Ophthalmol Vis Sci* 1994, **35**, 4344-4347.
27. Hyams SW, Pokotilo E, Shkurko G: Prevalence of refractive errors in adults over 40: a survey of 8,102 eyes. *Br J Ophthalmol* 1977, **61**, 428-432.
28. Katz J, Tielsch JM, Sommer A: Prevalence and risk factors for refractive errors in an adult inner city population. *Invest Ophthalmol Vis Sci* 1997, **38**, 334-340.
29. Mutti DO, Zadnik K: Age-related decreases in the prevalence of myopia: longitudinal change or cohort effect? *Invest Ophthalmol Vis Sci* 2000, **41**, 2103-2107.
30. Sperduto RD, Seigel D, Robert J, Rowland M: Prevalence of myopia in the United States. *Arch Ophthalmol* 1983, **101**, 405-407.
31. Adams DW, McBrien NA: Prevalence of myopia and myopic progression in a population of clinical microscopists. *Optom Vis Sci* 1992, **69**, 467-473.