

# Common ophthalmic problems of urban and rural postmenopausal women in a population sample of Raciborz district, a RAC-OST-POL Study

Wojciech Rokicki<sup>1</sup>, Bogna Drozdowska<sup>2</sup>, Aleksandra Czekajło<sup>3</sup>, Władysław Grzeszczak<sup>4</sup>, Jacek Karpe<sup>5</sup>, Katarzyna Wiktor<sup>6</sup>, Wojciech Pluskiewicz<sup>7</sup>

<sup>1</sup> Department and Clinic of Ophthalmology, Medical University of Silesia, Katowice, Poland

<sup>2</sup> Department of Pathomorphology, Medical University of Silesia, Katowice, Poland

<sup>3</sup> Department of Nephrology, Raciborz, Poland

<sup>4</sup> Department and Clinic of Internal Diseases, Diabetology and Nephrology, Medical University of Silesia, Katowice, Poland

<sup>5</sup> Department of Anaesthesiology and Intensive Care, Medical University of Silesia, Poland

<sup>6</sup> KCR S.A., Warsaw, Poland

<sup>7</sup> Department and Clinic of Internal Diseases, Diabetology and Nephrology, Metabolic Bone Diseases Unit, Medical University of Silesia, Katowice, Poland

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## Abstract

**Introduction and objective.** We wished to establish the prevalence of eye diseases and eye disease risk factors at postmenopausal age and to compare ophthalmic problems in urban and rural areas of Raciborz.

**Patients and methods.** The study was performed in 2010. Out of the whole population of Raciborz, Poland, 10 percent (1750) of women were randomly selected for the reported study. Finally, ocular diseases, ophthalmic agents, health status (physical activity level, body mass index – BMI, reproductive history, the use of psychotropic drugs and hormone replacement therapy – HRT) were recorded in 623 women. The women underwent visual acuity test and anterior segment examination, applanation tonometry and indirect ophthalmoscopy.

**Results.** The mean age of the selected patients was 66.01±7.76 years, 275 (44%) of them originating from rural and 348 (56%) from urban regions. The average woman was obese (BMI=30.54±5.38 kg/m<sup>2</sup>), with near normal agility and reproductive history of 2.59±1.55 births, 147 (24%) subjects remained under regular HRT support. According to the WHO, the visual acuity was classified as normal or near normal in 87.5%, while no blindness was recorded at all. Visual acuity depended, first of all, on lens status and was better among subjects with good agility (R=-0.31, p=0.001).

Dry eye prevalence increased significantly over age of 67 years (p=0.000) and HRT seemed to be a dry eye protective factor (p=0.010). Except age, No other risk factors of cataract, other than age, were identified. Normal agility (p=0.003) and HRT (p=0.032) were associated with lower AMD (age-related macular degeneration) prevalence rates.

The differences between urban and rural participants were presented only in education, reproductive history, hypertension and frequency of ophthalmic examinations.

**Conclusions.** Older adult women living in neighboring urban and rural areas present no differential in ophthalmic health problems.

## Key words

Epidemiological study, women, vision, rural, urban

## STATE OF KNOWLEDGE

- Menopause is a new metabolic and physiologic chapter in the live of women.
- There have been only a few studies examining ophthalmic condition after menopause and postmenopausal risk factors for eye diseases in a representative sample.

## What this study adds:

- This study provides data on eye diseases prevalent in women over 55.
- Characterized ophthalmologically sample of large group of women, their needs, and eye problems.  
Studies of this type provide regional data for healthcare improvement.

## INTRODUCTION

Recent data suggest that the leading causes of global blindness include cataract, glaucoma and age related macular degeneration [1, 2]. Some evidence suggests that lifestyle, physical activity, health status and public awareness

Address for correspondence: Wojciech Rokicki, M.D., Department of Ophthalmology, Medical University of Silesia Address: Ceglana 35, 40-514 Katowice, Poland  
Tel. +48323581227, Fax. +48322518473

E-mail: wrjr@xl.wp.pl

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may affect the risk of developing these diseases [3, 4, 5]. Thus, exploring a representative group of people seems to provide a rational foundation for clinical and laboratory research.

The postmenopausal age is a new chapter in the health status of every woman, and the age-related risks of dry eye diseases [6], cataract [7], AMD [7, 8] and glaucoma [9, 10] demonstrate a considerable rising tendency.

The aim of the presented study was to examine the ophthalmic health status and ophthalmic care indicators in a representative sample of women aged over 55 years. The study additionally aimed to explore the incidence of selected ocular diseases, and of potential new risk factors for those medical conditions for urban and rural regions.

## MATERIALS AND METHODS

The presented study was a part of a large epidemiological study (RAC-OST-POL: Raciborz Osteoporosis Poland), performed in the district of Raciborz, southern Poland. In the entire district there were 17,500 women aged over 55. By courtesy of the local authorities, it was possible to collect numerical data of the population of these women, both within the district and the city of Raciborz. Women over 55 from all (8) communes of Raciborz district were randomly invited to undergo examination – 10% from each commune, constituting a group of 17,500 women altogether. Two weeks before the start of the study, all of the enrolled candidates received a letter of invitation.

Although the number of women who reported was considerably smaller than those invited, the regional distributions was maintained and finally analyzed. It is believed that the low response to the screening research resulted mostly through misunderstanding the health problems, and poor public awareness in Polish society.

The study was performed between 17 – 29 May 2010. The Study Protocol was accepted by the Ethics Committee at the Medical University of Silesia (KNW/0022/KB1/9/I/10, Katowice, dated 2 May 2010). Each enrolled woman gave a written informed consent for participation in the study.

The questionnaire issued included personal data collection (date of birth, origin, education, civil and employment status), medical history (age at menopause, number of births, hypertension, ischaemic heart disease, diabetes and the use of insulin, HRT (hormone replacement therapy) and the use of psychoactive drugs). Information was also collected, regarding diet and clinical risk factors for osteoporosis. A blood sample was obtained from each woman and their skeletal status evaluated by bone densitometry at the hip, and quantitative ultrasound at hand phalanges. The height and weight data of each participant were also measured and recorded.

In order to estimate physical activity levels in the studied respondents, they were submitted to the timed 'Up&Go' test by a professional physiotherapist [11].

The ophthalmological examination was performed by an experienced ophthalmologist.

The date of the last ophthalmologist visit, ocular history, eye surgical procedures, regular use of ophthalmologic medications, sensual dry eye symptoms and any vision/eye complications were recorded. Visual acuity was measured, using E Snellen's chart at 5 meters in a well-illuminated area, and assessed with the respondent's current glasses, if worn

permanently. Each eye was tested separately. Binocular vision was assessed at the end of the vision test. A reading test was performed, using the Near Vision Acuity Chart.

Slit lamp biomicroscopy (Bon Optics SL-85) was performed. All the respondents underwent an anterior segment examination, applanation tonometry (BON AT-870Z) and indirect ophthalmoscopy (lens 90D Ocular Standard), followed by pupil dilatation (1% tropicamide or 10% phenylephrine hydrochloride).

The actual status of tear film, conjunctiva, cornea, iris, anterior chamber, lens, vitreous, retina and of the head of optic nerve was currently documented.

Tear deficiencies were recorded when break-up time was  $\leq 10$  sec., tear meniscus height  $\leq 0.2$  mm, and regular "sand" sensation was reported by the examined subjects.

Significant cataract was defined as grade 2 – 3, according to the WHO lens grading system [12]. The AMD diagnosis was based on ophthalmoscopic identification of at least one of the following pathological changes: all sizes of drusen, RPE dropout and stippling, and geographic atrophy.

The respondents were classified as glaucoma neuropathy, based on optic nerve appearance alone. Glaucoma analysis of the study group was conducted by comparison of two subgroups: subjects with no evidence of glaucoma and patients with evident, advanced glaucomatous disk damage. Intermediate, unclear appearance stages of the optic nerve head were excluded from analysis.

## STATISTICS

A standardized form was used for each patient to collect demographic information, medical and ophthalmic history and the outcomes of clinical examinations. The respondents, not their eyes, were the subject of analysis. The study respondents were classified according to the status of the worst eye, defined by eye disease severity. When the worst eye was excluded due to optical inefficient examination, the fellow eye was considered for classification.

The Statistica 8.0 (StatSoft Inc.) programme was used for data e-collection and statistical analysis. Data are shown as mean  $\pm$  standard deviation (SD). Frequency analysis was calculated as the ratio of the number of individuals with analysed variable to the total number of evaluated patients. The analysis of statistical distribution preceded the Mann-Whitney U-test, which was used for comparisons of dichotomous data groups, and analysis of variance (ANOVA with *post-hoc* Tukey HSD test) was performed for non- dichotomous variables. Frequency in the analyzed subgroups was estimated by the Chi<sup>2</sup> test. Correlations between variables were determined by Spearman's rank correlation test. All the analyses employed 0.05 significance level.

## RESULTS

### Demographics

A group of 623 women, invited from various locations in the district of Raciborz, was enrolled into the reported study; 56% (348) from urban and 44% (275) originating from rural regions.

The mean age of the examined women was  $66.01 \pm 7.76$  years. The mean age of urban women was  $66.75 \pm 7.44$  and

rural women was  $66.33 \pm 8.13$ . No significant differences were found between urban and rural respondents ( $p=0.353$ ).

Almost 61% of respondents were poorly educated, 31% completed secondary education and 8% were university graduates. Significant differences in education were found between urban (40.52% with secondary education) and rural (52.36% with elementary education) subgroups ( $p=0.000$ ).

Of the 623 women, 89 (14.3%) were professionally inactive, 39% of the working women (208) were blue-collar workers and 61% (326) were office workers.

### State of health

The reproductive history averaged  $2.59 \pm 1.55$  births per woman. Respondents from rural regions reported significantly more births ( $p=0.003$ ).

The mean Body Mass Index (BMI) was comparable ( $p=0.258$ ) between urban and rural respondents –  $30.54 \pm 5.38$  kg/m<sup>2</sup>.

As many as 338 (54%) of respondents reported a history of hypertension, mostly reported by urban women ( $p=0.016$ ).

In 138 (22%) respondents, ischemic heart disease was recorded (time from diagnosis: 1 month – 50 yrs,  $x = 2.3 \pm 5.9$ ). 109 (17%) of the respondents had been diagnosed with diabetes mellitus in history, with the mean time of diagnosed DM  $1.5$  year  $\pm 4.4$  (1 month – 30 yrs); 36 of them were being treated with insulin therapy. Reported ischemic heart disease and diabetes mellitus was almost equally recorded in the urban and rural subgroups ( $p=0.341$  and  $p=0.813$ , respectively). The mean time of diagnosed glaucoma showed no significant differences between examined subgroups ( $8.7$  years  $\pm 7.1$  in urban and  $8.57$  years  $\pm 7.0$  in rural;  $p=0.924$ ).

Regular use of neurotropic agents (soporific, anxiolytics, anti-depressive, analgesics) was reported by 99, 97, 27 and 271 subjects, retrospectively. No significant differences in the use of neurotropic agents between urban and rural respondents were observed ( $p=0.228$ ;  $p=0.080$ ,  $p=0.960$  and  $p=0.300$ ).

Dexterity, measured with the 'Up&Go' test: urban respondents –  $11.45$  s  $\pm 3.45$ , rural respondents –  $11.35$  s  $\pm 5.33$  ( $p=0.774$ ).

### Ophthalmological care

The mean regularity of ophthalmic examination was every  $2.87 \pm 4.29$  years (range: 40 years to 1 month). As expected, the respondents from urban areas were significantly more frequently checked by an ophthalmologist than those from rural areas – every 2.3–3.6 years ( $p=0.000$ ). The most irregular ophthalmologist visits were recorded in the poorly educated respondents, particularly when compared with respondents who had completed secondary education ( $p=0.000$ ). Neither age nor physical condition affected the regularity of professional eye care. However, the regularity of ophthalmologist visits correlated with visual acuity ( $R=-0.13$ ;  $p=0.011$ ).

**Ophthalmic agents.** Regular use of ophthalmic medications (see Tab. 1).

**Table 1.** The most frequent use of ophthalmic drugs

Drugs/Drops	Use	Drugs/Drops	Use
Anti-cataract	13.48% (84)	B-blockers	3.85% (24)
Artificial tears	5.1% (32)	Prostaglandins	2.57% (16)
CAI*	2.4% (15)	$\alpha$ 2agonists	0.64% (4)

\* carbonic anhydrase inhibitors

### Vision status

According to the WHO criteria [13], blindness ( $< 0.05$ ) was identified in 0 subjects. Visual impairments: severe ( $0.05 \geq 0.1$ ) in 4 (0.6%), moderate ( $0.1 \geq 0.33$ ) in 17 (2.7%) and mild ( $0.33 \geq 0.5$ ) in 57 (9.1%). Visual acuity normal or near normal ( $\geq 0.5$ ) was found in 545 (87.5%). The best visual acuity (measured in better eye) presented almost the same level in respondents from urban:  $0.81 \pm 0.24$  and from rural regions:  $0.81 \pm 0.25$  ( $p=0.922$ ).

The lowest visual impairment ( $R=-0.31$ ,  $p=0.001$ ) was recorded among respondents with normal physical condition, which, in turn, was not dependent on either age or BMI.

The other ocular pathologies (Tab. 2) were not of great importance with regards to the general visual condition of the examined group.

Examined respondents in the analysed subgroups presented comparable the best near vision level ( $p=0.564$ ). In 47.99% (urban) and in 44.53% (rural) the best near vision (corrected if necessary) revealed no impairment.

**Pathologies.** Ocular pathologies on anterior and posterior segments are summarized in Table 2.

**Table 2.** The most common ocular pathologies in examined sample

PATHOLOGY	PREVALENCE (%)	PATHOLOGY	PREVALENCE (%)
Dry Eye Disturbances	48.96% (305)	Diabetic retinopathy	2.1% (13)
lens spectacles (+)	31.94% (199)	Amblyopia	2.09% (13)
AMD	11.6% (72)	Degenerative myopia	1.93% (12)
Glaucoma (treated)	8.34% (52)	ERM	1.44% (9)
Lens spectacles (-)	6.9% (43)	CSME diabetic	1.3% (8)
After cataract surgery	5.30% (33)	Benson/ Scintillatio albescens	1.12% (7)
Glaucoma neuropathy (evident)	4.82% (30)	Fuchs dystrophy	1.12% (7)
Pseudoexfoliation	4.17% (26)	After trabeculectomy	0.48% (3)

### Dry eye diseases

Dry Eye Syndrome, a common problem of women at menopausal age, was diagnosed in 305 (48.96%) respondents. The peak incidence of tear deficiency was recorded at the age over  $67.59 \pm 8.01$  years. Younger women have statistically less problems with the ocular surface ( $p=0.000$ ). Dry eye did not seem to be dependent on BMI, originating regions ( $p=0.259$ ) or on the menopausal age. The problems with tear film were significantly frequently noted in the subgroup of postmenopausal women, not using HRT – 51.71% to 36.89% ( $p=0.000$ ).

### Cataract

Prevalence of cataract: 71.93% in mild, 82.35% in moderate and 100% in severe visual impairment. Interestingly enough, cataract was recorded nearly equally frequently in urban and rural districts. Significantly, HRT had been used by 54.92% patients with and in 42.89% patients without cataract ( $p=0.010$ ). No relationship was found between cataract prevalence and reproductive history.

### Age-related macular degeneration (AMD)

AMD was significantly frequently recorded in respondents with a better physical condition level – 11.49 s versus 10.49 s of respondents without AMD ( $p=0.003$ ). The proportion of respondents with AMD who had been using HRT (36.67%) to respondents without HRT (47.15%), was statistically significant ( $p=0.032$ ). Neither BMI nor reproductive history correlated with AMD in the examined sample. No significant differences were found between the urban and rural subgroups ( $p=0.09$ ) in AMD prevalence.

### Glaucoma history/glaucomatous neuropathy

The prevalence of first time recorded advanced glaucoma neuropathy differed from the number of respondents diagnosed and treated for glaucoma: 3.33% in 21.15% (19 of 571 without glaucoma diagnosis in 11 of 52 respondents with diagnosed glaucoma). Although the morphology of the optic disc head prompted glaucomatous damage, 19 (3.33%) of the affected respondents had not been previously diagnosed.

The respondents screened as having severe glaucoma neuropathy, and those with diagnosed glaucoma at a low-statistically frequent level, used anxiolytics agents ( $p=0.061$ ) and reported a history of ischemic heart disease ( $p=0.052$ ). The distribution of respondents treated for suspected of glaucoma between the urban and rural subgroups was comparable (10.92% and 12.00%, respectively;  $p=0.673$ ).

## DISCUSSION

### Respondents

The statistical woman in the presented sample was about 67 years of age, with primary or secondary education, came from equally populated urban and rural areas, was obese, and with visual acuity either normal or near normal. The first surprising data included BMI higher than that reported in Poland [14], Sweden [15] and Greece [16]. These differences could also have resulted from the age of examined respondents: in the study population the mean age was the highest, which could be associated with even more intensified lipid metabolism disturbances and their impact on eye disorders in the examined respondents.

### Ophthalmological care

The best visual acuity and most regular ophthalmologic attention were noted among the respondents with secondary education who came from urban areas. Although eye care regularity assessment was based on one ophthalmological visit – the last one, it is an important part of ophthalmic healthcare. As shown, the better the ophthalmologist availability, the better the visual condition.

### State of vision

In the presented study, only the best (with spectacles, if used) visual acuity was measured with the intention of estimating the real vision condition of the study group. Miscorrection of refractive errors was not estimated. Hyperopic correction was almost five times more frequently recorded than myopic correction. Vision acuity in the presented group depended mostly on lens opacification.

### Physical condition level

As mentioned above, physical condition level significantly correlated with visual outcome. On the other hand, no relations were recorded among BMI, age and physical condition, while the visual status seemed to be a highly important factor, affecting the mobility and manoeuvrability of the studied respondents.

### Dry Eye Disease (DED)

The incidence of DED in the examined sample of postmenopausal women was significantly higher than that previously reported [17], a difference that may have resulted from diagnostic methods, surveyed population and BMI.

The impact of HRT on tear film condition still remains a controversial issue and seems to depend mostly on HRT type. [18, 19, 20] According to the presented results, HRT exerted a protective effect against DED.

### Cataract

Cataract was the major, visual condition modulating factor in the studied sample.

The prevalence of lens opacities among the urban and rural populations suggested ageing as the leading cataract inducing factor in areas of low insolation. As previously reported [21, 22], HRT seemed to be a protective factor for age-related cataract.

The association between reproductive exposures and age-related cataract, as previously analyzed, is still a controversial issue [21, 23].

### AMD

The previously reported prevalence of AMD varied between West European countries, from 14% – 40%, and was markedly higher in women than in men. In the studied group, AMD was noted in 11.6% of participants. These conflicting results were previously observed and could be explained by the longer life-expectancy of the Western European population in comparison with the population in Eastern Europe [24]. Additionally, regional dietary habits and social-economic status may influence susceptibility to AMD. The results of the presented study confirm that exposure to estrogens, resulting from hormone replacement therapy (HRT), could be a protective factor against AMD [25, 26, 27].

Analysis revealed no connection between BMI and AMD. As mentioned before, BMI was comparatively higher in the study group; therefore, it may be that the duration of obesity is a more important risk factor than BMI for ocular diseases related to lipid metabolism.

The results of the presented study consolidate the thesis that good physical condition is a protective factor in the development of AMD [28].

### Glaucoma

The screening test for glaucoma (optic disk morphology) offers imprecise results and may be used only for tentative estimation. In the presented study, the focus was only on glaucomatous disc damage, ignoring the types of glaucoma

The number of recorded cases with advanced glaucomatous neuropathy, previously not diagnosed and untreated, proves the observations in the general population that glaucoma is one of the most frequently misdiagnosed ocular diseases in Poland [29].

An association of angle-closure glaucoma with anti-anxiety agents were previously reported [30]. In the subgroup of respondents with advanced glaucomatous neuropathy and/or previously diagnosed and treated glaucoma, more frequent usage of sedative agents was reported. Even if the significance of such an association was borderline, the entire role of sedative agents in glaucomatous neuropathy development should be investigated.

As presented above, the differences between urban and rural populations seemed to have no serious impact on eye and vision condition. The presented study sampled a relatively small population (110,231 people) living in an area of 543,76 km<sup>2</sup>, with a female to male ratio of 1:5 (*Central Statistic Office, Poland; www.stat.gov.pl*).

It should be expected that such a small population presents genetic and environmental homogeneity, and that the urban-rural division had only an administrative character. Better urban health care availability and the education of urban women were not enough to be protective factors of eye diseases in the examined sample when compared with rural participants.

## CONCLUSIONS

Older adult women living in neighboring urban and rural areas present no differences in ophthalmic health problems.

## Conflict of interest and financial disclosure

No conflicting relationship exists for any of the authors who have no proprietary or commercial interest in any of materials discussed in this study.

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## REFERENCES

- Foster A, Resnikoff S. The impact of Vision 2020 on global blindness. *Eye* 2005; 19: 1133–1135.
- Congdon NG, Friedman DS et al. Important causes of visual impairment in the world today. *JAMA* 2003; 290: 2057–2060.
- Sharts-Hopko NC. Lifestyle strategies for the prevention of vision loss. *Holist Nurs Pract*. 2010; 5: 284–291.
- Paunksnis A, Kusleika S et al. The relationship of the intensity of lens opacity with physical activity. *Medicina*. 2006; 42: 738–743.
- Mares JA, Voland RP et al. Healthy lifestyles related to subsequent prevalence of age-related macular degeneration. *Arch Ophthalmol*. 2010; 13.
- Schaumberg DA, Sullivan DA et al. Prevalence of dry eye syndrome among US women. *Am J Ophthalmol*. 2003; 136: 318–326.
- Snow KK, Seddon JM. Age-related eye diseases: impact of hormone replacement therapy, and reproductive and other risk factors. *Int J Fertil Womens Med*. 2000; 45: 301–313.
- Klein R, Klein BEK et al. Prevalence of age-related maculopathy: the Beaver Dam Eye Study. *Ophthalmology*. 1992; 99: 933–943.
- Pasquale LR, Rosner BA et al. Attributes of female reproductive aging and their relation to primary open-angle glaucoma: a prospective study. *J Glaucoma*. 2007; 16: 598–605.
- Battaglia C, Mancini F et al. Hormone therapy and ophthalmic artery blood flow changes in women with primary open-angle glaucoma. *Menopause* 2004; 11: 69–77.
- Podsiadlo D, Richardson S. The Timed “Up & Go”: A Test of Basic Functional Mobility for Frail Elderly Persons *J Am Geriatr Soc*. 1991; 39: 142–148.
- Thylefors B, Chylack LT Jr et al. A simplified cataract grading system. *Ophthalmic Epidemiol*. 2002; 9: 83–95.
- World Health Organisation. International statistical classification of diseases and related health problems. Geneva: WHO1992.
- Olszanecka A, Posnik-Urbańska A et al. Adipocytokines and blood pressure, lipids and glucose metabolism in hypertensive perimenopausal women. *Kardiol Pol*. 2010; 68: 753–760.
- Rosenberg L, Czene K et al. Obesity and poor breast cancer prognosis: an illusion because of hormone replacement therapy? *Br J Cancer* 2009; 100: 1486–1491.
- Dionysiotis Y, Galanos A et al. Assessment of musculoskeletal system in women with jumping mechanography. *Int J Women Health* 2010; 1: 113–118.
- Gayton JL. Etiology, prevalence, and treatment of dry eye disease. *Clin Ophthalmol* 2009; 3: 405–412.
- Taner P, Akarsu C et al. The effects of hormone replacement therapy on ocular surface and tear function tests in postmenopausal women. *Ophthalmologica* 2004; 218: 257–259.
- Altıntaş O, Çağlar Y, Yüksel N et al. The effects of menopause and hormone replacement therapy on quality and quantity of tear, intraocular pressure and ocular blood flow. *Ophthalmologica* 2004; 218: 120–129.
- Erdem U, Özdegirmenci O et al. Dry eye in post-menopausal women using hormone replacement therapy. *Maturitas* 2007; 56: 257–262.
- Noran NH, Salleh N et al. Relationship between reproductive exposures and age-related cataract in women. *Asia Pac J Public Health* 2007; 19: 23–28.
- Aina FO, Smeeth L et al. Hormone replacement therapy and cataract: a population-based case-control study. *Eye* 2006; 20: 417–422.
- Klein BE, Klein R et al. Reproductive exposures, incident age-related cataracts, and age-related maculopathy in women: the beaver dam eye study. *Am J Ophthalmol*. 2000; 130: 322–326.
- Prokofyeva E, Zrenner E. Epidemiology of major eye diseases leading to blindness in Europe: a literature review. *Ophthalmic Res*. 2012; 47: 171–188.
- Edwards DR, Gallins P et al. Inverse association of female hormone replacement therapy with age-related macular degeneration and interactions with ARMS2 polymorphisms. *Invest Ophthalmol Vis Sci*. 2010; 51: 1873–1879.
- The Eye Disease Case-Control Study Group. Risk factors for neovascular age-related macular degeneration. *Arch Ophthalmol*. 1992; 110: 1701–1708.
- Snow KK, Cote J et al. Association between reproductive and hormonal factors and age-related maculopathy in postmenopausal women. *Am J Ophthalmol*. 2002; 134: 842–848.
- Williams PT. Prospective study of incident age-related macular degeneration in relation to vigorous physical activity during a 7-year follow-up. *Invest Ophthalmol Vis Sci*. 2009; 50: 101–106.
- Nizankowska MH, Kaczmarek R. Prevalence of glaucoma in the Wrocław population. The Wrocław epidemiological study. *Ophthalmic Epidemiol*. 2005; 12: 363–371.
- Richa S, Yazbek JC. Ocular adverse effects of common psychotropic agents: a review. *CNS Drugs* 2010; 24: 501–526.