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The prevalence and pattern of retinal diseases in a sample population of older adults in the city of Lodz, Poland

Częstotliwość występowania chorób siatkówki i ich struktura – w badaniu wybranej populacji osób dorosłych z miasta Łodzi (Polska)

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Abstract: **Background:** To assess the prevalence and pattern of retinal diseases in a sample population of older adults in the city of Lodz, Poland.

Material and methods: An observational cross-sectional study was designed. 1107 enrolled subjects of European Caucasian descent, most of whom live, or have lived, in the city of Lodz in central Poland, were interviewed and underwent detailed ophthalmic examinations including optical coherence tomography and fluorescein angiography.

Results: The mean age of study participants was 60.4 $\pm$ 12.8 years. Overall, retinal diseases were detected in 9.12% (95% CI 7.43 – 10.82) of all study subjects. Age-related macular degeneration was the most common retinal disease, which accounted for 47.5% of all detected retinal diseases. Age-related macular degeneration was followed by diabetic retinopathy, retinal vein occlusion and epi-retinal membrane, which accounted for 18.8%, 5.9% and 5.9% respectively. The prevalence rates of these retinal diseases were age-related macular degeneration 4.33%, diabetic retinopathy 1.72%, retinal vein occlusion 0.54% and epi-retinal membrane 0.54%. Other common retinal diseases were degenerative myopia, retinal detachment, post-traumatic macular scar, central retinitis and macular hole. Multiple logistic regression modelling including age, gender and socio-economic status as predictor variables only demonstrated significant correlation between retinal diseases and older age (OR 1.43, 95% CI 0.92–1.95).

Conclusions: The total prevalence of retinal diseases in our study population was similar to the findings from other parts of the world and was only significantly associated with older age.

Key words: Age-related macular degeneration (AMD), diabetic retinopathy (DR), epi-retinal membrane (ERM), retinal vein occlusion (RVO).

Abstrakt: **Cel:** zbadanie częstotliwości występowania chorób siatkówki i ich struktury w wybranej populacji osób dorosłych z miasta Łodzi (Polska).

Materiał i metody: w badaniu uczestniczyło 1107 osób rasy kaukaskiej, w większości mieszkańców miasta Łodzi, których dokładnie przebadano okulistycznie w kierunku występowania chorób siatkówki. W analizie okulistycznej brano pod uwagę wyniki badań optycznej koherentnej tomografii siatkówki i angiografii fluoresceinowej. Do analizy wyników zastosowano analizę statystyczną.

Wyniki: częstotliwość występowania chorób siatkówki była stosunkowo wysoka – rozpoznano je u 9,12% (95% CI 7,43–10,82) badanych. Najczęściej występującą chorobą siatkówki było zwyrodnienie plamki związane z wiekiem, które stanowiło 47,5%. Drugą w odniesieniu do częstości występowania była retinopatia cukrzycowa (18,8%). Kolejne najczęściej występujące choroby siatkówki to zakrzep żyły siatkówki (5,9%) i błona nasiatkówkowa (5,9%). Częstotliwość występowania tych chorób siatkówki w badanej przez nas populacji wynosiła odpowiednio: 4,33%, 1,72%, 0,54% i 0,54%. W wieloczynnikowym modelu regresji logistycznej choroby siatkówki były statystycznie istotnie powiązane tylko z wiekiem badanych (OR 1,43, 95% CI 0,92–1,95).

Wnioski: częstotliwość występowania chorób siatkówki w badanej populacji mieszkańców Łodzi jest zbliżona do częstotliwości występowania tych chorób w populacjach z innych części świata. Nasza analiza częstotliwości występowania chorób oczu, w tym struktury chorób siatkówki, jest pierwszą okulistyczną analizą epidemiologiczną z Europy Wschodniej.

Słowa kluczowe: zwyrodnienie plamki związane z wiekiem (AMD), retinopatia cukrzycowa (DR), błona nasiatkówkowa (ERM), zakrzep żyły siatkówki (RVO).

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Introduction

Retinal diseases are a main cause of visual impairment and blindness in industrialized countries and among leading causes of severe vision loss worldwide. In Europe, diabetic retinopathy is a main cause of blindness in people of working age and age-related macular degeneration (AMD) is the most

common cause in the elderly (1–3). Poland is the biggest eastern European country with a population of 38 million people according to the 2011 national census (4). Due to a lack of data from Poland and other post-soviet nations, we conducted an epidemiological survey in a sample population of older adults in the city of Lodz, the results of which have recently been published (5, 6). In the previous reports, we found that retinal diseases represented a main cause of both unilateral and bilateral non-correctable visual impairment and were a main cause of bilateral blindness (5). Considering this, we decided to perform a separate, comprehensive study on retinal diseases. The aim of this study was to assess the prevalence and pattern of retinal diseases in the same population.

Material and methods

Observational cross-sectional study was designed. The city of Lodz has a population of seven hundred and forty thousand inhabitants and is the second largest city in Poland (4). The recruitment and sampling method has been described earlier (5, 6). The sample size for the study was calculated with 99% confidence, within an error bound of 5%. The sample size requirement was 661, as calculated by

$$N = Z^2 / 4d^2,$$

where Z = 2.57 for 99% confidence interval and d = 0.05 for 5% error bound. After allowing for an arbitrary 50% increase in sample size to accommodate possible inefficiencies associated with the sample design, the sample size requirement increased to 991 subjects (5, 6). Due to physiological changes in the vision organ occurring around the age of 40, our previous reports conducted on young males in the military population categorized young adults as aged 18–34 years old (7, 8). For the present study we defined an older adult as a person at the age of 35 years or older. We used simple systematic sampling to select our study population. In 2012, a total 14110 outpatients were examined in the Department of Ophthalmology and Visual Rehabilitation of the Medical University of Lodz and every tenth subject aged 35 years and older was enrolled in this study (6). All selected subjects were interviewed and underwent detailed ophthalmic examinations including optical coherence tomography (OCT) with Topcon 3D OCT-1000 (supplied by Topcon, Tokyo, Japan) and fluorescein angiography (FA) with Topcon TRC-50 EX fundus camera using Imagenet 2000 software (supplied by Topcon, Tokyo, Japan). For this report, age-related macular degeneration was defined according to the international classification and grading system for age-related maculopathy and age-related macular degeneration developed by the International ARM Epidemiological Study Group (9). Diabetic retinopathy (DR) was defined according to Early Treatment Diabetic Retinopathy Study Research Group (10). For other retinal diseases we used the definitions from 10th revision of International Statistical Classification of diseases, injuries and causes of death (ICD-10).

All statistical analyses were performed using STATISTICA v. 10.1 PL (StatSoft Polska, Krakow, Poland) software. Prevalence rates of age related macular degeneration, diabetic retinopathy and other retinal diseases were calculated. Multiple logistic regression was used to investigate the association of retinal diseases with age, gender and socio-economic status

of participants. Odds ratios (ORs) were computed. All presented confidence intervals (CIs) were 95% CI; differences were significant at $p < .05$. The study fulfilled the provisions of Declaration of Helsinki for research involving human subjects and was approved by the ethic committee of the Medical University of Lodz.

Results

A total of 1107 subjects (642/58.0% women, 465/42.0% men) aged 35 years and older (mean age 60.4 ± 12.8 years; age range of 35 to 97 years) were enrolled in the study. In this group, 520 subjects were aged 35–59 years (47%), and 587 subjects were 60 years of age and older (53%). All study participants were white Caucasians, most of whom live or have lived in the city of Lodz. As reported earlier, they were a fair representation of the population of the city of Lodz in terms of sex distribution (statistical analysis – Chi square test: $\chi 2 = 3.64$, p> 0.05) and socioeconomic status according to 2011 national census (4). Socio-demographic analysis showed that 31 subjects (2.8%) declared to have no source of income in this population and its number was significantly higher in the age group of 35–59 years.

In total, retinal diseases were found in 9.12% [95% confidence interval (CI) 7.43–10.82] of all study subjects. The pattern of retinal diseases seen in our researched population is presented in Table I. Figure 1 shows the prevalence of retinal diseases in the study population. Overall, AMD was the most common retinal disease and comprised of 47.5% of all subjects with retinal diseases. The prevalence of AMD in our population was 4.33% (95% CI 3.14–5.54). Diabetic retinopathy was the second most common retinal problem. The overall prevalence of DR was 1.72% (95% CI 0.95–2.48) which accounted for 18.8% of the retinal cases. The third most common retinal diseases in our population were retinal vein occlusion (RVO) and epi-reti-

Disease pattern/ Struktura chorób siatkówki	Subjects number (%)/ Liczba osobników (%)
Age related macular degeneration/ Zwyrodnienie plamki związane z wiekiem	48 (47.52%)
Diabetic retinopathy/ Retinopatia cukrzycowa	19 (18.82%)
Retinal vein occlusion/ Zakrzep żyły siatkówki	6 (5.94%)
Epiretinal membrane/ Błona nasiatkówkowa	6 (5.94%)
Degenerative myopia/ Wysoka krótkowzroczność	5 (4.95%)
Retinal detachment/ Odwarstwienie siatkówki	5 (4.95%)
Retinal scars (post traumatic)/ Blizny siatkówki (pourazowe)	3 (2.97%)
Central retinitis/ Zapalenie centralnej siatkówki	2 (1.98%)
Macular hole/ Otwór w plamce	2 (1.98%)
Malignant melanoma/ Czerniak złośliwy	1 (0.99%)
Retinitis pigmentosa/ Zwyrodnienie barwnikowe	1 (0.99%)
Ocular albinizm/ Albinizm oczny	1 (0.99%)
Chronic central serous retinopathy/ Przewlekła centralna chorioretinopatia surowicza	1 (0.99%)
Ocular toxoplasmosis/ Toksoplazmoza oczna	1 (0.99%)
All/ Wszyscy	101 (100%)

Tab. I.   Pattern of retinal disorders in the researched population.
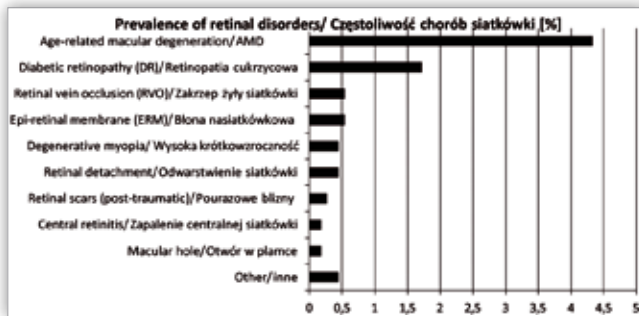Tab. I.   Struktura chorób siatkówki w badanej populacji.

Fig. 1. Prevalence of retinal diseases in the researched population.
Ryc. 1. Częstotliwość występowania chorób siatkówki w badanej populacji.

nal membrane (ERM) which accounted for 5.9% of retinal cases each, with the total prevalence of 0.54% (95% CI 0.11–0.97) each. The other common retinal diseases were degenerative myopia (4.9%), retinal detachment (4.9%), post-traumatic macular scar (2.9%), central retinitis (1.9%) and macular hole (1.9%). Other diseases including malignant melanoma, retinitis pigmentosa, ocular albinism, chronic central serous retinopathy (CSR) and ocular toxoplasmosis accounted for less than 1% of all retinal diseases in our study. Since the number of subjects with individual retinal diseases was low, we did not assess the prevalence of retinal diseases in sex- and age-based subgroups. A multivariate logistic regression model was constructed to analyze risk factors for retinal diseases in this population. Multiple logistic regression modelling including age, gender and socio-economic status as predictor variables only demonstrated significant correlation between retinal diseases and older age (OR 1.43, 95% CI 0.92–1.95). However, no association was found with gender and socio-economic status of subjects.

Discussion

This study is the first to provide reliable data concerning the prevalence and pattern of all retinal diseases in a sample population of older adults in the city of Lodz, in central Poland. We have already reported the prevalence of AMD, DR and degenerative myopia (6) but this study showed comprehensive data on retinal diseases in this group. The overall prevalence of retinal diseases in the study group was 9.12% (95% CI 7.43–10.82). Although the number of studies to demonstrate the total prevalence of retinal diseases is low, direct comparison of our results to the results obtained in other studies is limited due to differences in study design and population sampling. The major limitation of the current study is the fact that we enrolled patients solely from our Outpatients Department, thus the prevalence of retinal diseases might be overestimated. However, our total prevalence of retinal diseases was similar to the rates found by Nirmalan et al. in individuals aged 40 years and older in Tamil Nadu in southern India (The Aravind Comprehensive Eye Study) and by Hatef et al. in the city of Teheran in The Teheran Eye Study (11, 12). Furthermore, the prevalence rates of major retinal disorders found in our study were also in agreement with the results from previously published studies performed in Western Europe, America and Asia. Our prevalence rate of AMD was similar to that found in population aged ≥ 30 years in Finland and in the Coimbra Eye Study in Portugal (13, 14). Interestingly, the prevalence rate of DR in our population was higher than found

in adults in Finland and in subjects of predominantly Caucasian origin in the National Health Interview Survey (NHIS) in the United States, but this study comprised significantly younger age group (13, 15). According to the latest findings from the United Kingdom, the prevalence of DR in diabetic patients in Europe could be as high as 48.4% in the population with type 1 diabetes mellitus and 28.3% in the population with type 2 diabetes mellitus (16). The prevalence rate of RVO in our study group was similar to the one reported by the Beaver Dam Eye Study in the United States but higher than reported by the Gutenberg Health Study in Germany (17, 18). Finally, our prevalence rate of ERM was similar to that found in the study performed in predominantly Caucasian population of Australia and in the Funagata Study in Japan, where individuals of similar age were enrolled (19, 20). Similarly, the prevalence rate of retinal detachment found in our study population was close to that recently found in Germany (21).

In summary, although there are many studies concerning the prevalence of particular retinal diseases worldwide, comprehensive studies on retinal diseases are generally not undertaken. There is also a lack of accurate data from Eastern Europe and our study fills this gap. The total prevalence of retinal diseases in our study population was rather high but was similar to the findings from Western Europe and other parts of the world. To the best of our knowledge, the prevalence and pattern of retinal diseases amongst European Caucasian adults in Eastern Europe have not been previously reported.

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