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PREVALENCE OF AGE-RELATED MACULAR DEGENERATION AMONG ELDERLY BULGARIAN POPULATION

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Abstract

Age-related macular degeneration (AMD) is the leading cause of blindness worldwide in an older patient population with the highest risk of disease development in individuals older than 65 years. This study aims to estimate the prevalence of AMD and its stages among the elderly population of Sofia city. An observational study among elderly Sofia citizens, held as prophylactic ophthalmological examinations was performed. The participants underwent full ophthalmic examination including autorefractometry, noncontact tonometry, best-corrected visual acuity measurement, biomicroscopy, and indirect ophthalmoscopy through a dilated pupil. Optical coherent tomography was performed in cases with difficulties to determine the stage of AMD or when the visual acuity did not correspond to the ophthalmoscopy findings. All participants were asked to fill in informed consent and a specifically structured questionnaire based on the modified Wolffson LVQOL questionnaire that was previously used in the study in Eastern Bulgaria (in 2014 by Nencheva). Overall 700 patients, with a median age of 74 years (69 to 96 years) met the inclusion criteria and were enrolled in the study. The prevalence of AMD, early, intermediate and late AMD was estimated as 26.1%, 14%, 6.6%, and 5.6%, respectively. Age was strongly associated with the prevalence of AMD and its stages. The ageing of the population in Bulgaria and worldwide and the large proportion of elderly persons, affected by AMD, emphasize the necessity of regular ophthalmological examinations of that part of the population. The timely diagnosis and treatment are very important for diminishing of blindness and visual impairment.

Key words: age-related macular degeneration, AMD, prevalence, elderly

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Introduction. The improvement of living conditions and quality of healthcare in the last decades leads to an increased quality and expectancy of life and enlargement of the elderly population worldwide. According to most demographic analyses and prognoses, the number of persons aged 65 years and above would overdraw one billion by the year 2030 (16.7% of the world's population) and 1.6 billion by 2050 [1]. The demographic situation is even worse in Bulgaria, where the population is expected to diminish by 200 000 every 5 years with an increase in the absolute and relative number of elderly persons, 26.6% of whom are expected to live in Sofia by the year 2050. Ageing is the major risk factor for many diseases that expend economic, healthcare, and social resources. Blindness and visual impairment are among the major health problems in seniors that reduce their quality of life and have a very high financial, social and personal impact.

Age-related macular degeneration (AMD) particularly the neovascular form, is the most common cause of blindness in individuals older than 60 years of age and accounts for 8.7% of all blindness worldwide [2]. It is the main cause of visual impairment in Europe [3].

AMD is a disorder that affects the macula within two disk diameters of the fovea, predominantly in individuals older than 55 years. It is characterized by atrophy of photoreceptors and retinal pigment epithelium with or without choroidal neovascularization [4]. The disease is generally painless with an asymmetric affection and in the early stages, patients often do not realize that they have a problem, which increases the risks of late treatment and complications. There are many classifications of AMD. The most popular defines two forms of the disease: dry, which accounts for 85% of cases and includes drusen and geographic atrophy (GA), and exudative (wet). The clinical classification scale categorizes the stages of the disease – early, intermediate, and late, and is valuable for predicting the risk of late AMD. Ageing is the major risk factor for AMD even though other risk factors were reported in different studies [5].

This study aimed to evaluate the prevalence of AMD and its stages among the elderly population of Sofia city, the capital of Bulgaria.

An observational study among Sofia citizens aged 65 years and above was conducted in "Alexsandrovska" University Hospital in Sofia. The participants were enrolled in the study after subscription for free prophylactic ophthalmic examinations. In our country, many people who are not aware of health problems prefer to go to organized campaigns at teaching institutions rather than visiting an ophthalmologist.

This study was performed in accordance with the Helsinki Declaration. Informed consent was obtained from each person.

Patients were asked to fill in a structured questionnaire, specifically generated for that study based on the modified LVQOL questionnaire that was used in the study held in Eastern Bulgaria in 2014 by Nencheva [6]. It consisted of four sections: demography (name, age, sex), medical history, ophthalmolog-

ical complaints, and coexisting ophthalmic and systemic diseases. All patients underwent a general ophthalmological examination according to a standardized protocol that included autorefractometry, noncontact tonometry, best-corrected visual acuity measurement (standard Snellen chart), biomicroscopy, and indirect ophthalmoscopy through a dilated pupil. Optical coherent tomography (OCT) was performed in cases with difficulties to determine the stage of AMD or when the visual acuity did not correspond to the ophthalmoscopy findings.

The clinical classification system (Beckman classification) based on fundus lesions assessed within 2 disc diameters of the fovea was used [5]. Large drusen were defined as those over 125 µm in the smallest diameter, which is a distance approximating the width of the central retinal veins in the area of crossing the optic disc margin. Small drusen were defined as those with a diameter smaller than one-half that of large drusen (< 63 µm). Persons with drusen smaller than 63 µm and no pigmentary abnormalities (hyperpigmentation, hypopigmentation) were considered to have normal ageing changes. Early AMD was defined by the presence of medium drusen (>63 µm but ≤ 125 µm) and no AMD pigmentary abnormalities. Intermediate AMD was defined as either any soft drusen and pigmentary abnormalities or large drusen (> 125 µm) with a large drusen area and/or any pigmentary abnormalities. Late age-related macular degeneration was defined as the presence of signs of geographic atrophy of exudative AMD (any of the following: pigment epithelial detachment, subretinal haemorrhage, visible subretinal new vessels, or subretinal fibrous scar) [5].

To analyze the age-specific prevalence of AMD the participants were divided into four groups according to their age (in 5 years intervals): group 1 – 65 to 69 years, group 2 – 70 to 74, group 3 – 75 to 79, and group 4 – aged 80 years and above. The age-specific prevalence was calculated as a proportion of persons with AMD and its forms in each age category.

Results. Overall 700 persons met the inclusion criteria (age 65 years and above and residence in Sofia city). Exclusion criteria: Unclear ocular media. All subjects were aged between 65 and 96 years with a median age of 74 years, an interquartile range (IR) of 69 to 80 years. Women were the prevalent group – 64.1% and had lower median age compared to men. Patient demographic data are summarized in Table 1. According to the self reported data, 58% of the

Table 1

Demographic data

		Age groups (years)			
		65–69	70–74	75–79	80 and above
Sex distribution (in numbers)	Male	47	62	59	84
	Female	151	109	93	95
The relative ratio of each age group (in %)		28.3%	24.4%	21.7%	25.6%

participants had arterial hypertension, 18% had ischemic heart disease, 13.4% had diabetes mellitus 18.6% of whom had diabetic retinopathy (16.7% nonproliferative and 3.6% proliferative).

Small druses (druplets) that are accepted as normal age-related changes were not a subject of our discussion.

AMD was diagnosed in 26.1% of the subjects. The prevalence of early, intermediate, and late AMD in the studied cohort was estimated as 14%, 6.6%, and 5.6%, respectively. The prevalence of all stages of the disease increased with the increase of age and the maximum values were recorded among the oldest individuals (aged 80 years and above) (Table 2). According to the univariate binary logistic regression analysis, age was strongly associated with the prevalence of AMD and its types. The people without AMD were over three years younger than those with AMD, 73.8 and 77.1 years, respectively. The average prevalence of early AMD was estimated as equal for both eyes (13%) but in either of the eyes, it was 14%. It was also found that the average age of persons with AMD tended to increase with the severity of the stage and was the highest among patients with late AMD. That finding also demonstrated the correlation between the disease and age.

The persons with AMD in at least one of the eyes were estimated as 183, 69% women, and 31% men, with the sex-specific prevalence of 26.3% and 25.8%, respectively. In the studied population, males were more often affected by the intermediate and late stages of the disease whereas females were by the early stages (Table 2). However, sex was documented to be a factor with borderline significance for the prevalence of AMD, $p \approx 0.01$.

Table 2

The absolute and relative ratio of persons with AMD by age and sex and the average age of persons with AMD and its stages in at least one of the eyes

	Early AMD		Intermediate AMD		Late AMD		AMD	
Age (in years)	In %	Number	In %	Number	In %	Number	In %	Number
65–69	7.6%	15	2.0%	4	0.5%	1	10.1%	20
70–74	14.6%	25	7.6%	13	4.1%	8	26.1%	46
75–79	17.1%	26	8.6%	13	5.9%	9	31.6%	48
over 80	17.7%	32	8.8%	16	11.6%	21	38.1%	69
Total	14.0%	98	6.6%	46	5.6%	39	26.1%	183
Male	12.3%	31	6.75%	17	6.7%	17	25.8%	65
Female	15.0%	67	6.47%	29	4.9%	22	26.3%	118
Mean age (in years)								
Mean age		76.3	77.5		79.8		77.1	

The proportion of persons with AMD in at least one of the eyes was the smallest among the youngest participants (65 to 69 years) (10.1%) and increased with age reaching its maximum of 38.1% among individuals over the age of 80 years. The correlation between the age and the prevalence of AMD was proved as statistically significant for any of the eyes as well as in either eye, $p < 0.001$. Dry AMD represented 88.5% of all cases with AMD.

The prevalence of geographic atrophy (GA) was 4.9% and increased with age from 0.5% in persons from 65 to 69 years to 10.5% among those aged 80 years and above. The estimated prevalence of wet AMD was calculated at 3% and demonstrated a sevenfold increase with age from 1 to 7.2%. In the studied population, females who were affected by dry AMD and GA were much more than males but a statistically significant correlation with sex was not proved.

Discussion. The prevalence of AMD worldwide varies in wide ranges from 14 to 36%, with a mean of 27%. It has to be emphasized that our study included only self-selected persons and that fact may point to difficulties in comparing with other reported data. The estimated prevalence of AMD in the studied population of Sofia was 26.1%. It was higher than the reported in India (18.7% and 22.3%) [7], and Alabama (24.8%) [8], and lower than estimated in Norway [9], and Nepal (35.4%) [10]. The prevalence of AMD in Sofia city demonstrated a fourfold increase with age from 10.1 to 38.1% and corresponded to the data for the same age categories in other reports [11].

In our study in synchrony with other reports in Europe, the prevalence of AMD was found to have an insignificant association with the sex [9, 12]. Males were more affected by intermediate and late AMD, which was also observed by other authors, but it should be emphasized that the studied population included only self-selected persons. In addition, the median age of males in the studied cohort was significantly higher compared to females which could contribute to the mentioned findings [8].

The prevalence of early AMD among the studied population was lower than reported in the Beaver Dam Eye Study (20.3%), Los Angeles Latino Study (15.8%), and Rotterdam Study (17.1%) [13]. Recently, the prevalence of early AMD in Europe was found to increase from 3.5% in subjects aged 55 to 59 years to 17.6% in those aged 85 years and older which is very similar to our data [12].

For late AMD the prevalence increased with age from 0.5 to 11.6% and followed the trend estimated in other studies in Europe [14, 15] and the UK (from 4.8 to 12.2% among persons aged 80 years and above) [16].

Drusen were less often found in the Bulgarian population than in the Tromso Study – 34.9% [9], EUREYE – 36.5%, and other studies among the Caucasian race of the same age [15]. Our findings that the proportion of druses was the lowest among the participants before 70 years of age and progressively increased with ageing proved the correlation of drusen with the age and corresponded to the data in other reports [17].

The prevalence of wet AMD in our study (3%) was equal to the reported in France, higher than the mean calculated in Europe (2.3%), Netherlands (2.5%), and Spain (1.3%), and lower than the data from Norway (3.5%), Italy (3.7%), Ireland and Estonia (3.8%), and Greece (4.7%) [15]. The tendency of increasing the age-specific prevalence with ageing corresponded to the estimated in the UK [16].

Geographic atrophy in either of the eyes was found in 4.9% of the studied cohort with a significant increase in the prevalence with increasing age from 0.5 to 10.5%. The progressive increase of the prevalence with age corresponded to the trend reported in other studies but the average and the age-specific prevalence especially in the last age strata was estimated to be higher [15, 16].

The statistical analysis of the prevalence of AMD among the studied cohort demonstrated a correlation with age, cataracts, and cataract surgery as reported by other authors [10, 18]. Several studies confirmed the correlation of AMD with some coexisting diseases, personal habits, and genetic and environmental factors. Based on those findings we could speculate that the high levels of arterial hypertension, diabetes mellitus, smoking, and unprotected exposure to sunlight in Bulgaria could contribute to the higher level of AMD, as well as it was reported for the cataract development [19].

The assessment of the prevalence of AMD and its impact on the population is essential for adequate health care planning and provision. It has to be noted that the presented study was observational and included only self-selected persons. Therefore, the results, recorded in the study of the elderly population in Sofia require validation through a longitudinal population-based study like "The Sofia Eye Survey" made by the team of professor Vassileva in 1995, which to the best of our knowledge is the only population-based study in Bulgaria [20].

Conclusions. The high prevalence of AMD estimated in our study, and the great proportion of persons who were unaware that they were affected by the disease require further public health campaigns. Regular ophthalmic examinations of the elderly population and the diminishing of the modifiable coexisting risk factors for AMD development will lead to timely diagnosis and treatment of AMD, which will minimize blindness and visual impairment in Bulgaria.

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