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Risk factors for glaucoma progression and their impact on late stage development of the disease

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Abstract

As part of a special program running at three in-patient ophthalmology departments at district hospitals in Ivano-Frankivsk region during 2002-2011 a representative group of 515 people with primary glaucoma, including 347 respondents from I-II (initial) stage of primary glaucoma and 168 patients of III-IV (later) stages of the disease have been surveyed. It was proved that the chances of complicated course of glaucoma increase with age, in males, in patients with burdened heredity and concomitant cardiovascular diseases. Poor education, unemployment, loneliness, poor physical and social activity, harmful habits facilitate vision deterioration in glaucoma patients. It was reported that the development of late-stage glaucoma significantly decreases quality of life by deteriorating health, decreased daily activity, increased anxiety and depression, elevated sense of social insecurity. The chances of late-stage glaucoma development increase with insufficient coverage by ophthalmological screening and low compliance to treatment. This indicates the potential to prevent complications of glaucoma at the level of primary health care.

Keywords: glaucoma, risk factors

1. Introduction

Primary glaucoma is one of the major problems of the modern health care system due to the rapidly increasing levels of morbidity of this pathology and a higher percentage of disability as a result of the development of incurable blindness [2, 3, 5-9]. It is predicted that by 2020 the number of people in the world suffering from glaucoma will be 78 million. Persons with the largest number of patients will be observed in the European Region (21.1% -23.9% of global data) [5].

The sixty-sixth World Health Assembly adopted an action plan entitled "Universal eye health: a global action plan 2014-2019", which is primarily designed to slow down global trend of prevalence of chronic eye diseases caused by aging [10].

According to many studies risk factors of primary glaucoma, including: advanced age, black race, burdened heredity, concomitant chronic diseases, frequent migraine, have been established [1-4, 6-8]. However, given that the most dangerous consequence of glaucoma is blurred vision all the way to complete vision loss, it is equally important to identify possible factors for glaucoma's progression, which will increase the effectiveness of blindness prevention, decrease indicators of disability and socio-economic losses. All abovementioned determined the relevance of this research.

Objective: To identify factors of glaucoma progression and their impact on the development of late-stage glaucoma.

2. Materials and methods

As part of a special program running at three in-patient ophthalmology departments at district hospitals in Ivano-Frankivsk region during 2010-2011 a representative group of 515 people with primary glaucoma, including 347 respondents from I-II (initial) stage of primary glaucoma and 168 patients of III-IV (later) stages of the disease have been surveyed. Besides this patients were divided by sex, age (under 55, 55-59, 60-64, 65-69, 70-74, 75-79, 80 and over) and the place of residence (urban or rural residents). The study examined the biological, socio-economic, socio-psychological, behavioral, medical and organizational factors. Testing hypotheses about the impact of risk factors on the progression of glaucoma was performed using the calculation of the odds ratio (OR) and its 95% confidence interval (95% CI), and the null hypothesis by eligibility criteria χ^2 .

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3. Results and Discussion

As a result of calculating the odds ratio 21 significant risk factors for progression of glaucoma were selected (see Table). The study shows that the most important biological factors for complicated course of glaucoma (see Table) are the same risk factors that contribute to the disease (aging processes, burdened heredity and concomitant chronic diseases) and male gender.

Thus, it has been proven that the chances of not only beginning, but also development of later stages of the disease increase with age (OR = 2.32; 95% CI: 1.56-3.46 after 70 years), in patients with burdened heredity (1.78; 1.15-2.75) and concomitant chronic disease (1.92; 1.05-3.51), including coronary heart disease (1.75; 1.20-2.56) and hypertension (1.75; 1.11-2.76).

Table: The main risk factors of glaucoma progression

Risk factors	Odds ration index (OR)	95% Confidence interval (95% CI)
Biological:		
senior age	2.32	1.56 - 3.46
male gender	1.48	1.02 - 2.15
burdened heredity	1.78	1.15 - 2.75
concomitant diseases	1.92	1.05 - 3.51
coronary (ischemic) heart disease	1.75	1.20 - 2.56
arterial hypertension	1.75	1.11 - 2.76
Socioeconomic:		
unemployment	2.34	1.22 - 4.52
elementary and unfinished middle school	1.60	1.09 - 2.36
social insecurity	2.28	1.38 - 3.76
Socio-psychological and behavioral:		
low health self-esteem	4.54	2.74 - 7.53
loneliness	2.64	1.92 - 3.62
low public activity	1.79	1.21 - 2.65
anxiety and depression	2.34	1.45 - 3.78
smoking, incl. history of smoking	1.57	1.08 - 2.30
alcohol abuse	5.28	1.01 - 27.48
physical passivity	1.75	1.15 - 2.66
independent everyday activity	7.33	3.90 - 13.79
Medical and organizational:		
irregular medical examinations	2.56	1.55 - 4.23
failure to follow ophthalmologist's prescriptions	3.73	1.08 - 12.92
irregular mode of antihypertensive drops instillation	2.42	1.45 - 4.01
distrust to family doctor	2.79	1.57 - 4.97

Although abovementioned diseases also accompany the aging processes and it is difficult to unequivocally affirm their close relationship with glaucoma. However, the presence of higher chances of negative progression of glaucoma in males (1.48; 1.02-2.15), in our view, is associated with well-known worse discipline of the males to seek medical attention on time and lower compliance to doctors' prescriptions.

Among the socio-economic determinants studied in the research (income, education, employment) two of them demonstrated to be significant for complicated course of glaucoma (see Table): low levels of education among both genders (1.60; 1.09-2.36) and unemployment in its various forms - retirement, unemployment and disability (2.34; 1.22-4.52). However, given that 82.7 ± 1.7% of the patients with glaucoma were retired people, we believe that this factor (unemployment) is also largely collinear with age, so it is difficult to unambiguously interpret it as an independent risk factor for complicated course of glaucoma.

The share of single persons increases with age, mainly due to widowers/widows (from zero among people younger than 55 years to 77.5 ± 4.4% aged 80 and over) and opposite decrease in the number of married persons (from 84.0 ± 7.3 % under the age of 55 years to 20.2 ± 4.3% in those older than 80 years). Therefore, the statistical significance of loneliness as a risk factor for a complicated course of glaucoma (2.64; 1.92-3.62) can also largely be related to the age factor. Although we should not deny the fact that loneliness may contribute to

negative progression of the disease as a result of lack of control by family members on the timeliness and completeness of treatment and appropriate compliance provision, particularly in the elderly.

Collinearity with aging processes and interdependence of glaucoma complications can be explained by reducing social (visiting friends, friends and people that share common interests, groups, societies, church, etc.) and physical activity (sports, exercises) that naturally deteriorate with age. Thus, the results showed a significant spread of physical inactivity among surveyed - 69.1 ± 2.0%. Before mentioning index increased to 95.5 ± 2.2% in people aged 80 and older (p<0.01), and the odds of inactivity among patients with advanced glaucoma were significantly higher than the initial (1.75; 1.15-2.66) data. Similarly, the index of social activity decreased with age to 73.0 ± 4.7% in people aged 80 and older (p<0.001), and the ratio of chances confirmed the high probability of social isolation among patients with complications of glaucoma (1.79; 1.21-2.65).

These findings emphasize another aspect of the issue - the need to take decisions related to the care of the elderly, lonely patients with glaucoma who are without the support of their family and friends, amid significant reduction in quality of life (see Figure). Thus, the study demonstrated that the presence of late-stage glaucoma increases negative emotions, the chances of low self-esteem of health (4.54; 2.74-7.53), constant anxiety and depression (2.34; 1.45-3.78), a sense of social insecurity

(2.28; 1.38- 3.76), reduces the possibility of full independent activities of daily living (7.33; 3.90-13.79).

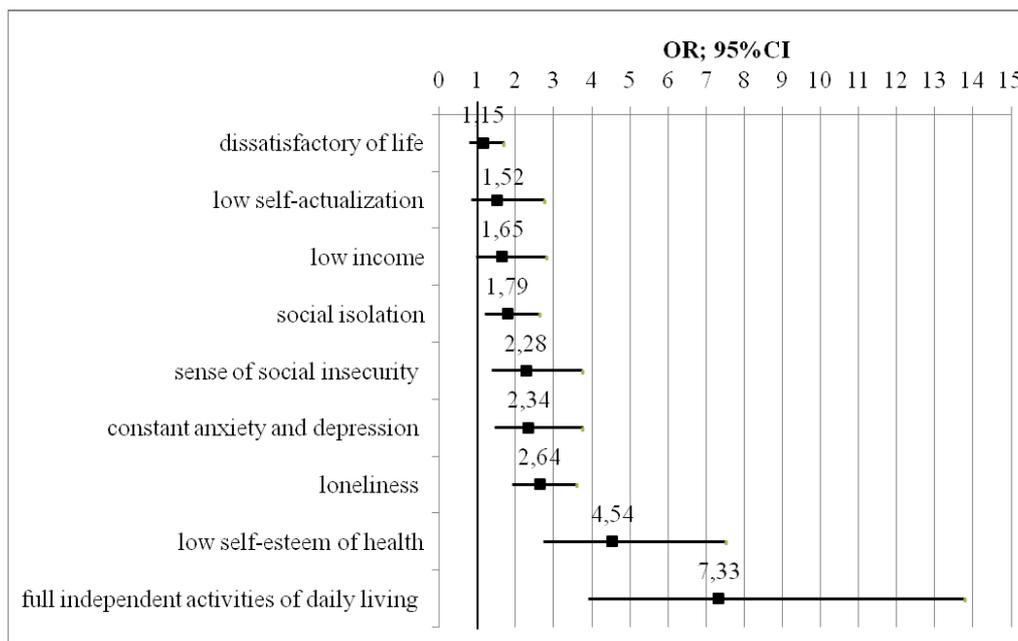


Figure. The chances of decrease in key quality of life components in patients with advanced glaucoma

Low socio-economic conditions, high levels of loneliness, stressfulness of pathology, psycho-emotional experiences can be accompanied by unhealthy lifestyles, as it is well known that the most common justification for harmful habits is the need for "stress relief." On the other hand, unhealthy lifestyle is a collection of risk factors for chronic diseases that includes glaucoma.

It was reported that the odds of late-stage glaucoma, increased in cases of smoking history (1.57; 1.08-2.30) and alcohol abuse (5.28; 1.01-27.48). However, harmful habits are several times more common among men: 17.3 ± 2.4% of them are smokers and 52.8 ± 3.1% smoked in history (against rare cases among women, p <0.001); 27.7 ± 2.8% consume alcohol once a week or every day (versus 7.7 ± 1.7% of women, p<0.001). These facts may serve as another explanation why complicated course of glaucoma is more common in men.

However, the study clearly showed that medical and organizational factors have important influence on the progression of glaucoma.

It was established that respondents with glaucoma stage III-IV were significantly more likely to be diagnosed during self-reported visit than patients with stage I-II, (77,2 ± 3,2% vs 69,7 ± 2,5%, respectively, p <0.05), and more than half rarer - during prophylactic medical examination (6,6 ± 1,9% vs 16,5 ± 2,0%). It was proved that missing periodic medical examinations considerably increased the chances of delayed diagnosis of glaucoma (2.56; 1.55-4.23).

Such low incidence of disease at screening visits notes the lack of primary care services, possibly due to low confidence in the institution of family medicine among Ukrainian society. The survey results of patients with glaucoma show that almost 40% (36.5 ± 2.1%) of them do not have full confidence in their family doctor, one tenth of respondents (10.3 ± 1.3%) did not know their family doctor. Furthermore, among patients aged 80 and over one in five didn't know their family doctor (20.2 ± 4.3%, p<0.05). This proved that ignorance and distrust to their primary care doctor significantly increases the chances of

neglecting glaucoma (2.79; 1.57-4.97).

It is known that an important condition for the stabilization and prevention of further progression of vision loss is permanent medical treatment, even if it does not lead to subjective improvement of visual function. However, the results surveyed patients with glaucoma have shown that, despite a 100% awareness of the need for continuous medication, only 60.8 ± 2.2% of respondents were following it. The rest of patients with glaucoma that is about 40% (37.1 ± 2.1%) admitted to follow the prescriptions partially and 2.1 ± 0.6% - completely ignored the prescriptions. Calculating the odds ratio proved the danger of this situation. The risk of late-stage glaucoma was significantly higher in patients with low compliance (3.73; 1.08-12.92) and who followed irregular mode of antihypertensive drop instillation (2.42; 1.45-4.01).

In our view, the data indicate significant reserves in the prevention of glaucoma complicated course due to improvement of general practitioners' / family medicine in the areas of:

- coverage of the population, especially risk groups, with ophthalmological screening (tonometry, visometry, perimetry, ophthalmoscopy);
- formation of alertness, increase of public awareness about glaucoma and its negative consequences;
- monitoring compliance with recommendations of the ophthalmologist and maintaining motivation for continuous medical treatment, control of intraocular pressure, lifestyle modifications, especially among single elderly and senile aged persons.

4. Conclusions

It was proved that the chances of complicated course of glaucoma increase with age, in males, in patients with burdened heredity and concomitant cardiovascular diseases.

Poor education, unemployment, loneliness, poor physical and social activity, harmful habits facilitate vision deterioration in glaucoma patients.

It was reported that the development of late-stage glaucoma significantly decreases quality of life by deteriorating health,

decreased daily activity, increased anxiety and depression, elevated sense of social insecurity.

The chances of late-stage glaucoma development increase with insufficient coverage by ophthalmological screening and low compliance to treatment. This indicates the potential to prevent complications of glaucoma at the level of primary health care.

5. Avenues for further research

Development and assessment of the program to prevent complicated course of glaucoma at primary health care level.

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