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Glaucoma Risk Factors

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ABSTRACT

Background: Glaucoma is the second leading cause of blindness for over 70 million people worldwide. Bilateral blindness occurs with an estimated 10%. In Indonesia, the prevalence of glaucoma is 0,46%. That means, that 4 to 5 out of 1.000 people suffer from glaucoma.
Content: The aim of this study was to analyze four risk factors that can affect the occurrence of glaucoma, namely age factor with diabetes and hypertension history, gender, family medical history, and race. This research used a literature review from 20 journals containing four risk factors for glaucoma. The results showed that diabetes and hypertension are often found in the elderly and that glaucoma symptoms can be exacerbated by increased intraocular pressure. Moreover, glaucoma patient with a positive family medical history of glaucoma has a higher value of intraocular pressure than glaucoma patients without the positive family medical history of glaucoma. Other results showed that men are more at risk because they have a different axial length than women, and Asians are considered riskier than Europeans because Asians' awareness of eye health is very low.
Conclusion: Based on the review, four risk factors could greatly affect the occurrence of glaucoma.

Keywords: Blindness; glaucoma; intraocular pressure; open-angle; risk factors

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Introduction

Glaucoma is a progressive degeneration of eye nerve damage caused by blockage of the eye's fluid flow system (aqueous humor). Aqueous humor is a natural fluid that plays a role in protecting the shape of the eye, supplying nutrients, and sterilizing dirt in the eye. The pressure inside the eyeball will remain normal if the fluid in the eyeball is absorbed periodically to avoid accumulation. However, if there is a build-up of fluid, the pressure on the eyeball will increase and cause damage to the optic nerve fibers. The symptoms can include visual disturbances with reduced visual fields, pain in the eyes, to headaches. These symptoms are often not noticed by patients in the early stages because has no significant effect. However, the patient will realize it after experiencing severe visual disturbances or even blindness. Each glaucoma patient has a different disorder in pathoglaucos, risk factors, treatment, manifestations, non-specificity, and prognosis.[1;2;3] In general, glaucoma is classified into two types, namely primary and secondary glaucoma. The most common primary glaucoma in the world is primary open-angle and angle-closure glaucoma.[4]

The prevalence of glaucoma worldwide is estimated at 10% who are bilaterally blind. In Indonesia, the prevalence of glaucoma was 0,46%, which means that 4 to 5 people out of 1.000 Indonesians had glaucoma. Based on online hospital application information (SIRS online), the number of glaucoma visits has increased the incidence of glaucoma during the period 2015-2017.[2] The prevalence of glaucoma will increase if it is influenced by several factors, such as age, gender, race, family history, and history of comorbidities (diabetes mellitus and hypertension) and a history of the eye examination.[1]

Subheading 1

The method used a literature review, where the literature search was carried out on several databases using an electronic-based that is accredited/indexed by Sinta/Scopus, such as Science Direct, Pubmed, Ministry of Health Data Center, and other database sources. The inclusion criteria in the study include a minimum of 20 reference articles or journals with the last 10 years published, internationally and nationally accredited and relevant to the topic of this research, while the exclusion criteria include articles or journals that do not have an ISSN.

Research or case studies that relate to glaucoma risk factors were obtained as a result of data analysis in this study. There are 20 studies from international journals. Based on the 20 studies, consist of nine journals discussed the age factor with diabetes and hypertension so that it can affect the development glaucoma. The nine journals used several methods, such as systematic review and meta-analysis, cross-sectional, imaging and clinical, retrospective case-control and longitudinal. The results from the nine journals showed that the elderly group is riskier of developing glaucoma because there are supporting risk

factors, such as comorbidities due to increasing age and the more susceptible to diabetes and hypertension to develop glaucoma. In addition, there were five journals that discussed the effect of gender factors on the developing glaucoma. The methods in that five journals were case-control, longitudinal cohort, cross-sectional, clinical and observational and retrospective. The results from five journals showed that men are riskier of developing glaucoma than women, although there was one journal that says that women are riskier of developing glaucoma. However, biologically, men are riskier.

Six other journals discussed family history and race, two journals discussed the effect of family history on glaucoma and four discussed the effect of race on glaucoma. Two journals discuss the effect of family history factors using cross-sectional methods and case reports of comparative studies. The results from these two journals showed that positive family history is strongly associated with the incidence of primary open-angle glaucoma and primary angle-closure, especially among first-degree relatives. Then, four journals that discussed the effect of race factors used prospective, cohort, cross-sectional observational and systematic review methods. The results from four journals showed that the incidence of glaucoma in Asia is higher than in Europe.

Subheading 2

Research related to glaucoma risk factors was obtained as a result of data analysis in this study. There were 20 related journals. The explanation for each journal can be seen in Table 1.

Table 1. Glaucoma Risk Factors Data Analysis

Factor	Method	Result
Age factor with diabetes and hypertension history	Imaging and clinical	The mean age of patients with primary open angle glaucoma and open glaucoma was 73.2 ± 11.16 and 67.8 ± 9.9, respectively. The relationship between the two was very statistically significant. In their study, researchers compared age groups, where the age group of 50-59, 60-69, 70-79 and ≥ 80 respectively had about 2,051 times, 3,283 times, 5,474 times, and 6,972 times more exposure to primary open-angle glaucoma.[5]
	Systematic review and meta-analysis	Diabetes mellitus is another risk factor associated with primary open angle closure and is often found in the elderly. Researchers said that the results of case-control studies or cohort studies had about

Factor	Method	Result
		1.4 times greater risk of developing

			primary open-angle glaucoma.[6]
		Cross-sectional	The prevalence rates in diabetic, pre-diabetic, and non-diabetic patients with glaucoma at ≥ 40 years of 9.5%, 3.5% and 2.6% respectively.[7]
		Cross-sectional and case control	Diabetics were more often found to have glaucoma with an average age of 59.6 ± 8.11.[13]
		Prospective study	Hypertension is a comorbid condition that generally affects the elderly, especially people with glaucoma. Researchers found that 56% of hypertensive patients with an average age of 58.7 had glaucoma. The investigators said that the association between hypertension and primary open angle glaucoma was 13.95%.[8]
		Retrospective case control	Hypertension increased the risk of glaucoma severity by 31%.[9]
		Cross-sectional observational	There was a difference between the value of intraocular pressure in hypertensive patients and controls. The value showed 15.37 ± 2.01 mmHg and 13.41 ± 2.82 mmHg.[10]
		Longitudinal study	The value of intraocular pressure in hypertensive patients of 15.4 ± 3.0 mmHg was strongly associated with the formation of glaucoma, cribrosa and axoplasmic flow disturbance.[11]
Gender		Case-control	Men had about 1.64 times riskier of developing primary open angle glaucoma.[12]
		Cross-sectional	Men are riskier due to hormonal factors (not having estrogen) and health factors, as well as environmental conditions that allow them to experience an increase in intraocular pressure.[13]
		Retrospective	Women can be riskier of developing glaucoma, with a percentage of 54.5% of 1,000 participants.[14]
		Retrospective longitudinal cohort	Estrogen treatment was able to reduce the risk of developing primary open angle glaucoma in the long term until the woman experienced menopause.[15]
		Clinical study and observation	Estrogen treatment was able to reduce intraocular pressure by 0.5 mmHg in elderly women, while pregnant women in the third trimester were able to reduce intraocular pressure by 10% due to an increase in estrogen and progesterone.[16]
Family Medical		Cohort	The relationship between glaucoma and a positive family history of glaucoma is

History		very strong in the relationship between siblings, mothers, fathers or children who have glaucoma.

Factor	Method	Result
		Researchers found that participants who had a positive family history of glaucoma had intraocular pressure values > 30 mmHg and retinal nerve fiber layer thickness > 80 µm. Another result found that 35% of the subjects in the study had a positive family history of glaucoma from a first-degree relative.[17]
	Cross-sectional	A positive family medical history of glaucoma can be derived from a first-degree relative. Researchers showed that there were 55.5% of men had primary open angle glaucoma from first-degree relatives. Moreover, someone with a positive family history of glaucoma has about 7-15 times more risk of developing glaucoma.[18]
	Comparative case report	25% of primary angle closure patients and 21.5% of primary open angle glaucoma patients got the disease from one family member. In other words, primary angle closure was found in the relationship with parents and primary open angle glaucoma was found in the relationship between siblings and offspring.[19]
Race	Prospective	The incidence of glaucoma in Europe, especially acute angle closure occurred in Scotland with a percentage increase of 29% and 31% in 2012 and 2013. However, when compared with the prevalence in Asia (Singapore), Scotland has decreased prevalence of 46% (1998-2012). In other words, the Chinese race had a higher prevalence of primary angle closure glaucoma.[20]
	Cohort	The prevalence of glaucoma in Northern Ireland is similar to that of the rest of the European population, with an estimated prevalence of 2.83%.[21]
	Cross-sectional	The prevalence of glaucoma in Asia was higher than in Europe. It was found that nearly 10,000 Asian populations were affected by glaucoma.[22]
	Systematic review and meta-analysis	The highest prevalence of glaucoma was found in East Asia and Central South Asia, which was 65.2%. This is caused by the increasing population and lack of awareness of eye health. In contrast to

	Europe, where in Europe has communities that are concerned with their own health so that they can influence other individuals to be aware of a disease.[23]

Conclusion

Based on the results of the literature review, it can be concluded that the prevalence of glaucoma is different in each region in the world. This is influenced by factors of age, gender, family medical history and race. From these four factors, it was found that age of > 40 with a history of diabetes mellitus and hypertension as well as a family medical history can increase the risk of developing glaucoma. Likewise, with gender, where men are more at risk of developing glaucoma, and based on race, Asians are considered more at risk of developing glaucoma.

Conflicts of Interest

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