

# GLAUCOMA : RISK FACTORS

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## INTRODUCTION :

The term "GLAUCOMA" covers a wide range of diseases. Some authors, define glaucoma as a group of conditions having one thing in common, an elevated intraocular pressure (IOP). Others, mainly from English-speaking world define glaucoma as only those where there is damage to the optic nerve and a loss of visual function.

In the routine practice of ophthalmology , it has proven useful to apply the term "Glaucoma" to all patients having an increased IOP (with or without glaucomatous damage), as well as to patients suffering from glaucomatous damage(with or without a high IOP).

Consequently the term "Ocular hypertension" is used for cases having constantly raised IOP without any associated glaucomatous damage.

Conversely, the term "normal or low tension glaucoma" (NTG or LTG) is suggested for the typical cupping of the disc and /or visual field defects associated with a normal or low IOP.

Glaucoma is one of the main causes of blindness in the world.

Glaucoma is dangerous, as in most of the cases the visual loss is gradual and painless and if not treated is irreversible. In the early stages of the disease , when the first nerve cells and their "extentions" are dying, visual function often remains surprisingly intact. As the condition progresses increasingly severe defects arise in the patient's vision. Though the patient

is often still unaware of these defects, they can be detected by an ophthalmologist. This is what makes glaucoma dangerous.

## HOW COMMON IS GLAUCOMA ?

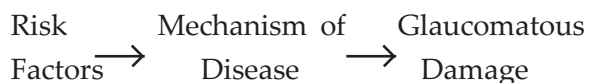
Figures indicate that , on average 3% of the general population is affected with glaucoma. When only older populations are considered , the number are significantly higher.

It is estimated that about 70 million people worldwide have relevant glaucomatous damage , but only half are aware of the diagnosis, and an even smaller percentage receive adequate treatment.

According to WHO, till now 45 lacs have lost their eyesight from Glaucoma and this number is increasing.

## AIM OF THE ARTICLE :

Glaucomatous damage develops when a patient has risk factors.



Therefore if we are aware of the risk factors and accordingly prevent or guard the risk factors, then visual impairment or blindness can usually be prevented.

## RISK FACTORS

It is important to make clear distinction between-

**A. Risk factors that lead to a high IOP and B. Risk factors that contribute to the glaucomatous optic nerve damage.**

A. Risk factors that lead to a high IOP

1. AGE:

- Age plays an important role in glaucoma and particularly in open-angle glaucoma(POAG).
- Although children, even newborns can suffer from congenital glaucoma, it is very rare.
- Most patients having an elevated IOP are over the age of 40 years.
- Throughout one's lifetime , even in healthy eyes, there is a gradual rise in the IOP. This is due to the ageing of the trabecular meshwork and as a result there is reduced facility of aqueous outflow.
- For most glaucoma patients , the IOP starts to rise between the ages of 40 and 50.
- In other patients , the IOP rises at a later age.

2. FAMILY BACKGROUND

- Genetics can certainly play a role , but it is also conceivable that family members are exposed to the same environmental influences.
- Without a doubt, genetics does influence congenital , infantile and juvenile types of glaucoma. This does not mean ,however , that all children of a glaucomatous parent will eventually suffer from the same disease, although children of glaucoma parents have a higher likelihood of developing glaucoma.
- It is certain that there is not one single gene's modification (mutation) is responsible for glaucoma but rather there are several genes which when pathologically altered can lead to the disease.
- Researchers are now of the opinion that there are 6 types of gene responsible for glaucoma. It has been published in "JOURNAL Nature Genetics" that 'ABO' gene is the main cause of glaucoma. This type of gene is mainly found in people having blood group "B". So people having blood group 'B' are more prone to have

glaucoma. Senior and famous professor of London's king college has told if this type of gene defect is detected earlier and treated, then people will be free from blindness caused by glaucoma.

- Regular eye examinations should be recommended for all family members of someone who has glaucoma.
- If the glaucoma developed during childhood, then all relatives both young and old should see an ophthalmologist.
- If the glaucoma occurred at a late stage, then examination of adult relatives is sufficient.

3. RACE

- Patients of African ancestry often have a higher IOP and develop elevated IOP at an earlier age.
- Caucasians on the other hand, suffer more frequently from pseudoexfoliation glaucoma, particularly in northern European countries.
- Interestingly pigment glaucoma is more common among light-skinned than among dark-skinned people.
- Angle closure glaucomas are quite frequent in Asia.
- Studies have shown that the Japanese also frequently suffer from normal tension glaucoma(NTG).

4. GENDER

- Women suffer more frequently from angle-closure glaucoma , because their anterior chambers are usually shallower than those of men.
- Men suffer more frequently from pigment dispersion glaucoma.
- Women are not only more commonly affected with normal-tension glaucoma (NTG), but their optic nerve head is more sensitive to IOP.

5. ARTERIOSCLEROSIS

- Patients with arteriosclerosis also have a slightly increased risk for an elevated IOP.

- Someone having a higher than average blood pressure is just slightly more likely to have an increased IOP.
- Many people with high blood pressure have a normal IOP and vice versa.
- Smokers and patients with high serum lipid levels have only a slightly higher risk of increased IOP.

6. NEAR AND FAR-SIGHTEDNESS

- Far-sighted (hyperopia) eyes have an increased risk of developing angle-closure glaucoma.

Primary pupillary block occurs only in eyes that have a narrow anterior chamber angle which is found in hyperopic individuals because their eyes are shorter. The depth and volume of the anterior chamber and angle decrease steadily throughout life due to the continuous thickening of the lens with age.

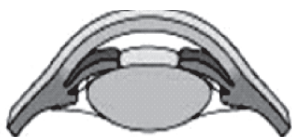


Fig. shows - Extremely shallow chamber angle of an elderly, hyperopic patient.

- Near-sightedness(myopia) eyes are more frequently involved in pigmentary glaucoma.

B. Risk factors that contribute to the glaucomatous optic nerve damage.

1. INTRAOCULAR PRESSURE(IOP)

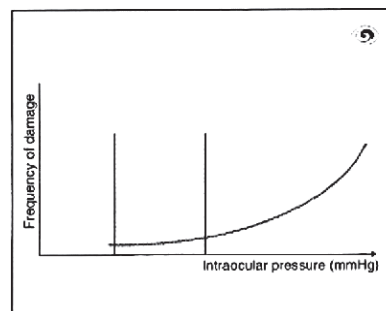
- A high IOP is the most common and most important risk factor for glaucomatous damage.
- A sudden(acute) high increase in IOP ( as in an acute angle-closure glaucoma) can be astonishingly well tolerated and is indeed less damaging than a chronically elevated IOP.
- For glaucomatous damage, chronic rises and falls in the IOP level are more important than the average IOP.

The IOP can induce damage in several ways. It can mechanically effect the weakest

spot inside the eye , the optic disc. Here the sclera is thin and is perforated in an area called the Lamina cribrosa.

High IOP decreases in the ocular blood flow and reduce the ocular perfusion causing the glaucomatous damage.

- 80% of the people with an elevated IOP will never have optic nerve damage.

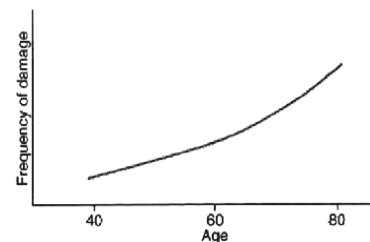


- 30% of glaucomatous patients never experience increased IOP.
- The higher the IOP, the more frequently glaucomatous damage develops. The gray section represents normal pressure.

2. AGE

- The occurrence of glaucomatous damage increases with age.

- This figure shows glaucomatous change is irreversible, it's prevalence increases with age.



- This glaucomatous damage is because of the loss of nerve fibres that adds up throughout life time.

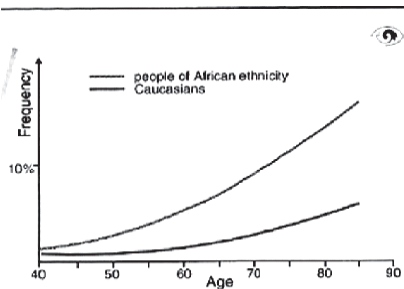
3. FAMILY HISTORY

- When there is a history of family members having glaucomatous damage , then the chances for the onset or progression of already existing optic nerve damage increase.

4. RACE

- Ethnic origin certainly influences both the IOP as well as optic nerve damage.

- Patients of African descent gradually have a higher IOP and a greater likelihood of developing damage at a certain pressure level.
- Glaucomatous damage is more frequent among people of African ethnicity than among Caucasians.

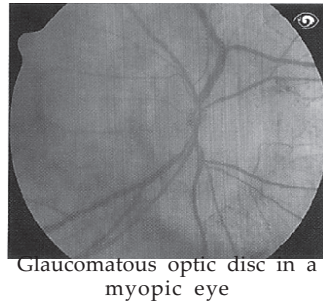


#### 5. GENDER

- Women with primary open-angle glaucoma and a high IOP have a slightly higher risk of developing glaucomatous damage at a certain pressure level than do men.
- This is at least partly related to the fact that the vasospastic syndrome is more common in females.

#### 6. NEAR AND FAR-SIGHTEDNESS

- Myopic eye has an increased sensitivity to pressure. This means that someone near-sighted is more likely to experience optic nerve damage than an emmetropic individual with same IOP.



#### 7. CIRCULATORY PROBLEMS

- It has been statistically proven that patients with glaucomatous changes have circulatory problems more frequently than healthy individual of the same age.
- The reduction in ocular blood flow usually comes first and then glaucomatous defects occur.
- In extreme cases, an inadequate perfusion

(and thus nutrition to optic nerve) can lead to structural damage, even at a very low IOP level.

- Other factors such as acute blood loss and abnormal coagulability profile have also been associated with normotension glaucoma(NTG).

#### I. BLOOD PRESSURE

- Several recent studies have been published which have established a link between development and progression of glaucomatous damage and decreased blood pressure.
- Increased blood pressure is of minimal importance in glaucoma.

#### II. SLEEP APNEA

- Sleep apnea induces transient hypoxia and thereby increases the risk for cardiovascular and neurological damage. To this regard, apnea is also a risk factor for glaucomatous damage.

#### III. VASOSPASMS

- In these cases, the blood vessels of certain organs constrict in a more pronounced fashion and these patients also suffer from ocular vascular dysregulation leading to increased risk of glaucomatous damage.

#### 8. DIABETES MELLITUS

It is previously assumed that diabetes was a major risk factor for glaucomatous damage. However, today diabetes mellitus is regarded as being of lesser significance or as being even protective against glaucomatous damage.

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