

## Intraocular Pressure Changes in Smokers

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### Abstract

*Background:* Tobacco is one of the most abused drugs of all ages. It is said to alter the Intraocular Pressure and hence vulnerable to cause ocular disease. *Aim:* To study the Intraocular Pressure changes in smokers. *Materials and Methods:* A cross sectional study was conducted at Dept. of ophthalmology, Navodaya medical college on 20 healthy male smokers and 20 controls in age group of 20-50 years. Smokers included with history of smoking 10-20 cigarettes per day for duration of >5 years. Exclusion criteria involved any ocular pathology, hypertension, diabetes. Intraocular pressure (IOP) was measured using schiottz tonometer. Statistical analysis done by student t test. *Results:* The mean difference in right eye smokers is  $17.08 \pm 3.06$ , right eye non-smokers is  $13.70 \pm 2.66$ . The mean difference in left eye smokers is  $17.25 \pm 2.75$ , left eye non-smokers is  $14.29 \pm 3.03$ . Thus it was observed that the mean difference in IOP changes amongst smokers was significantly increased in both right and left eye ( $p < 0.05$ ) when compared to non-smokers. *Conclusion:* It was observed that tobacco in the form of smoking increases intraocular pressure. Measuring intraocular pressure by schiottz tonometer is simple technique which can be done at periphery centers to detect high risk group for glaucoma.

**Keywords:** Intra Ocular Pressure; Smokers.

### Introduction

Tobacco consumption is increasing in today's modern world by both sexes in all socioeconomic classes among developed and developing countries [1]. Recent statistics from India have shown that while smoking is very common in men, the rates in women have doubled. Usually its consumption starts in teen age and continues throughout the life as tobacco causes dependence. Cigarette smoking has both ocular and systemic changes. Cigarette smoke contains toxic chemicals such as polycyclic aromatic hydrocarbons, tar, carbon monoxide and heavy metals [2]. Nicotine is a primary active ingredient of tobacco. Nicotine stimulates the release of nor epinephrine and partially accounts for the stimulatory effect of the drug. At a dose absorbed by a typical cigarette smoker, the effect seemed to be on the central nervous system activity while at higher doses, there is direct effect on the nervous system. Normal intra ocular pressures (IOPs) have been reported to vary in both eyes even in the same individual [3]. Nicotine is a

psychoactive component of tobacco that can affect eye causing cataracts and macular degeneration leading to loss of vision [4]. Smoking is an important preventable health risk. The incidence of smoking-related illness, including atherosclerotic changes in the coronary, aortic and cerebral circulations, chronic obstructive pulmonary disease, and death from cancer is reduced by cessation of smoking. Widespread circulatory changes in several organs, as a result of local metabolic and vascular effects of nicotine exposure, have been documented, including vasospastic effects on peripheral small vessels such as the ophthalmic artery [5]. Tobacco alters the Intraocular Pressure [IOP] and hence vulnerable to cause ocular diseases leading to total blindness. IOP is determined by the balance between the rate of aqueous humor production of the ciliary body, resistance to the aqueous flow at the angle of anterior chamber and the level of episcleral venous pressure. Cigarette smoking has been associated with transient rise in intraocular pressure. It has been hypothesized that nicotine in tobacco induces vasoconstriction which leads to raised episcleral venous pressure thereby

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reducing aqueous outflow and hence rise in IOP [1]. Current consensus among ophthalmologists define normal intraocular pressure as that between 10-20 mmHg. Ocular hypertension is defined as IOP above 21mm Hg and is risk factor for open angle glaucoma [6,7]. Glaucoma, a resultant effect of increased IOP irrespective of its prevalence, remains a multifactorial optic neuropathy of unknown aetiology. There is conflicting epidemiological data on whether tobacco smoking affects IOP. Whereas some studies have found no association between smoking and IOP, others reported a relationship. Thus, this study was taken up to determine the effects of cigarette smoking on intra ocular pressure.

#### Aim and Objectives

To know the effect of smoking on Intraocular Pressure and compare it among smokers and non smokers.

#### Materials and Methods

A cross sectional study was conducted at Dept. of ophthalmology, Navodaya medical college, Raichur. Ethical clearance was obtained from the institution ethical committee.

Inclusion criteria involved 20 healthy male smokers and 20 non-smokers in age group of 20-50

years. Smokers included with history of smoking 10-20 cigarettes per day for duration of >5 years. Questionnaire was given and subjects were selected accordingly. Exclusion criteria involved any ocular pathology, hypertension, diabetes. IOP was measured using schiotz tonometer.

#### Methodology

With the subject in supine position the cornea of both the eyes were anaesthetized with 4% topical Xylocaine. Then the lids were separated with the left hand and by keeping the foot plates of the Schiotz tonometer vertically on the centre of the cornea, the reading on the scale was recorded. A conversion table was used to derive the IOP in mm Hg from scale reading and the plunger weight. IOP was measured in both the eyes. IOP recorded first in the right eye and than in the left eye. 3 consecutive readings were taken in both right and left eye. The mean of 3 readings was computed separately for each eye.

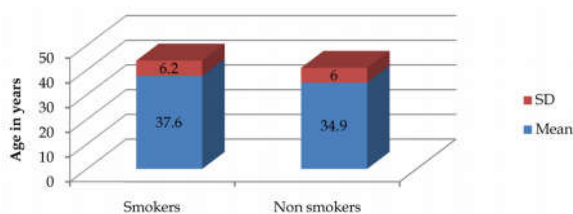
Statistical analysis was done by using, unpaired "t" test.

#### Results

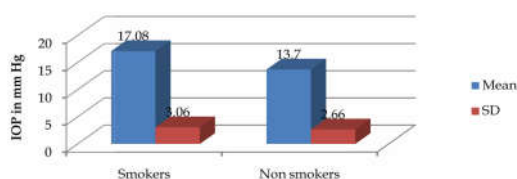
Mean age group of smokers is 37.6yrs and Non-smokers is 34.9 yrs.

**Table 1:** Comparison of IOP in both control and smoker group results are presented in Mean  $\pm$  SD, P value obtained by student t test.

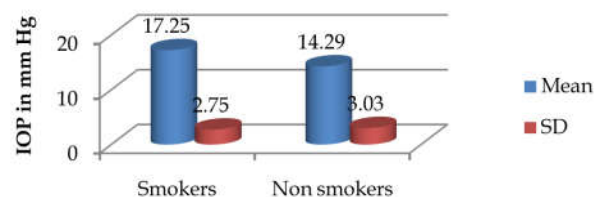
	Variable	Mean	SD	T	p	DF	Inference
RE	Smokers	17.08	3.06	3.72	0.001	38	significant
	Non-smokers	13.70	2.66				
LE	Smokers	17.25	2.75	3.23	0.003	38	Significant
	Non-smokers	14.29	3.03				



**Fig. 1:** Distribution of study population according to mean age



**Fig. 2:** IOP comparison of right eye between smokers and non smokers



**Fig. 3:** IOP comparison of left eye between smokers and non smokers

Table 1 depicts the comparison of IOP in both smokers and control group. The mean difference in right eye smokers is  $17.08 \pm 3.06$ , right eye non-smokers is  $13.70 \pm 2.66$ . The mean difference in left eye smokers is  $17.25 \pm 2.75$ , left eye non-smokers is  $14.29 \pm 3.03$ . Thus it was observed that the mean difference in IOP

changes amongst smokers was significantly increased in both right and left eye ( $p < 0.05$ ) when compared to non-smokers.

### Discussion

Previous studies show conflicting effects of cigarette smoking on IOP so we have taken up this study. In our study we found IOP of smokers to be significantly elevated ( $p < 0.001$ ) compared with nonsmokers. Our studies were in accordance with findings of Afroz Afshan, C. [1] O. Timothy [2], Dhubghaill. S.S [8].

Okaro observed an increase in intra ocular pressure due to cigarette smoking, was consistent with the report among smokers and non-smokers [9]. In a study by M. Roy. Wilson regarding the relationship between primary open angle Glaucoma and potential toxic exposures in people found that cigarette smoking was associated with Glaucoma [10].

On the other hand, Sami. L [11], Shephard [12], Klein et.al [13], reported no relationship between cigarette smoking, elevated intraocular pressure and Glaucoma. Sami conducted a study in which it was found that the 3 groups composed of smokers, exsmokers and non smokers had the same distribution of IOP, and had no relationship to the smoking habit [11]. Shephard. R.J et al, reported no relationship between cigarette smoking, elevated intraocular pressure and Glaucoma [12].

Nicotine is vasoconstrictor. This potentially slows down aqueous outflow from ant. Chamber drainage angle which leads to raised intra ocular pressure. and restricts blood flow to optic nerve.

It has been suggested that increased IOP was observed for the change in the mean values monocularly (that is, it was different for each of the two eyes, and binocularly for the two eyes) for the subjects.

This, therefore suggests a relationship between cigarette smoking and intra ocular pressure. The sudden increase in IOP of normotensive subjects after smoking cigarette showed that it could be an important risk factor in the occurrence of glaucoma and ocular hypertension including other chronic ocular diseases such as cataract, macular degeneration (leading to severe visual impairment and blindness), retina ischaemia, anterior ischaemic optic neuropathy, gravis ophthalmopathy, and amblyopic strabismus [14].

### Conclusion

We observed a significantly higher effect of cigarette smoking on intra-ocular pressure of left eye. This increase intra-ocular pressure of normotensive subjects after getting habituated to cigarette smoking showed that it could be an important risk factor in occurrence of glaucoma and ocular hypertension including other chronic ocular diseases such as cataract, macular degeneration, amblyopia.

It is concluded that acute and chronic cigarette smoking leads to systemic ailments and ocular diseases. Among many drugs, tobacco is also an agent causing increased ocular pressure. We conclude our study with observation that tobacco in the form of cigarette smoking affects the intra-ocular pressure. Further studies on larger samples with longer followup are needed to substantiate our findings before firm conclusion can be drawn that there is an increase in intra-ocular pressure

Measuring intraocular pressure by schiotz tonometer is simple technique which can be done at peripheral centres to detect high risk group for glaucoma.

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