

---

## **Effects of alcohol consumption on visual performance**

---

**K. Ganesh<sup>\*1</sup>, D. Joya Rani<sup>1</sup>, Madhuri Taranikanti<sup>2</sup> and Ratna Jyothi Meka<sup>3</sup>**

<sup>1</sup>Department of Physiology, Gandhi Medical College, Secunderabad, India

<sup>2</sup>Department of Physiology, Shadan Institute of Medical Sciences, India

<sup>3</sup>Department of Physiology, The Oxford Medical College, India

### **\*Correspondence Info:**

Dr. Ganesh Kamble

Assistant Professor,

Department of Physiology,

Gandhi Medical College, Hyderabad

E-mail: [prodraganesh@gmail.com](mailto:prodraganesh@gmail.com)

### **Abstract**

Alcohol consumption is on the rise in developing countries like India. Alcohol enters the blood stream and gets distributed throughout the body and exerts its effects on several organ systems of the body. 100 male subjects were included in the study out of which 50 were grouped as controls who did not consume alcohol and 50 were cases who ingested alcohol. Examination was done to measure blood pressure, pulse rate, respiratory rate, visual acuity and intraocular pressure. Alcohol has a negative impact on the eye leading to a decrease in the visual performance and interference in daily tasks by decreasing the visual acuity and decreasing the intraocular pressure. It also exerts general effects on the body causing hypertension and dyspnea.

**Keywords:** Alcohol, visual acuity, intraocular pressure.

### **1. Introduction**

IOP ranges between 10-21 mm of Hg with a mean of 15 or 16 mm of Hg. It exhibits a diurnal variation between 3-6 mm of Hg [1,2]. Factors like exercise [3], musical instruments [4], heart rate, respiration, fluid intake, systemic medication and topical drugs also change the IOP. Alcohol, marijuana may transiently decrease IOP and caffeine increases IOP [5]. Alcohol is considered a CNS depressant by depressing the midbrain reticular activating system [6]. The effects of alcohol on brain seem to be biphasic with lower concentrations stimulating and higher concentrations progressively depressing the functions. The effects of alcohol on eye have been studied in the past

The amount of alcohol consumption has risen in India between 2008 and 2013 as per WHO reports. Over 11% of population in India indulged in heavy alcohol consumption, which is more in South India. When ingested, alcohol enters the blood stream and is distributed throughout the body. It exerts its effects on every organ of the body especially the brain, heart, liver and kidneys. Consumption of alcohol can have a negative impact on visual functions [1-4]. Alcohol consumption may interfere with daily tasks that require full visual performance like driving [5]. Some authors have found

physiological changes in the eye following alcohol consumption [6,7]. Alcohol consumption is a modifiable lifestyle factor. Not many studies have shown the effect of alcohol consumption on the functions of eye especially in India. Few studies have shown a weak relation between heavy alcohol consumption and macular degeneration.

Alcohol consumption is associated with decreased visual performance by weakening the eye muscles leading to blur and double vision, causes delayed pupil reaction to light which is important for drivers especially during night. This may be due to decreased rate at which the iris constricts and dilates. It also leads to dryness of eye and also affects contrast sensitivity and may cause optic neuropathy with loss of vision and decreased peripheral vision or reduced colour vision. Alcohol is also found to decrease the intraocular pressure due to its dehydrating effects on the body and eye.

The aim of the present study was to see the changes in visual performance as measured by visual acuity and intraocular pressure changes.

### **2. Material and Methods**

A total of 100 male participants between 40-60 years were included in the study out of which 50

were controls who did not indulge in any alcohol consumption and 50 participants grouped as cases had variable alcohol consumption history. Subjects with HTN, Diabetes and obesity were excluded from the study. As the effect of alcohol on gender is variable, female participants were not included in the study. A questionnaire was given to all participants to obtain information about alcohol consumption in terms of duration and amount consumed. Anthropometric measurements were taken to determine their weight in Kg and height in cm. Blood pressure was measured using a sphygmomanometer to obtain both systolic and diastolic pressures. Normal blood pressure was considered as systolic blood pressure between 100-140 mm of Hg and diastolic blood pressure between 60-90 mm of Hg. Pulse rate and respiratory rate were also recorded. Examination of the eye was done to measure their visual acuity using a Snellen's chart and intraocular

pressure was measured using Schiotz tonometer. Normal intraocular pressure ranges between 10-20 mm of Hg. The study was conducted in a medical college in Hyderabad. An informed consent was taken from all the study participants and the Institutes' Ethics committee permission was obtained.

### 2.1 Statistical analysis

Data was tabulated and analysed using percentages.

## 3. Results

The mean age of group I subjects (controls) was 47.76 years and that of group II (cases) was 55.72 years.

The average amount of alcohol consumed per day by group II participants (cases) was 98.4 ml which amounts to 1.51 ml / kg body weight / day.

**Table 1: Anthropometric data of controls and cases**

Anthropometric Parameters	Group I (Controls)	± SD	Group II (Cases)	± SD
Mean Weight (Kg)	66.56	± 5.39	65.24	± 7.47
Mean Height (cm)	162.72	± 6.5	164.18	± 5.72

The mean weight of controls (66.56 Kg) was slightly more than cases (65.24 Kg). Mean height of controls was more than cases as given in table 1.

**Table 2: Blood pressure of controls and cases**

Parameters	Group I (Controls)	± SD	Group II (Cases)	± SD
Pulse rate /min	88.04	± 8.21	90.4	± 6.26
Respiratory Rate (breaths /min)	16.04	± 2.32	15.32	± 1.92
Mean SBP (mm of Hg)	126.4	± 6.31	132.8	± 14.17
Mean DBP (mm of Hg)	83.6	± 5.9	84.6	± 7.6

Pulse rate, systolic and diastolic blood pressure were more in cases than controls. However, respiratory rate was slightly lower in controls than cases as seen in table 2.

**Table 3: Visual functions in groups I and II**

Eye parameters	Group I (Controls)	± SD	Group II (Cases)	± SD
Visual Acuity (Right Eye)	7.14	± 1.47	10.02	± 2.23
Visual Acuity (Left Eye)	7.92	± 1.98	9.9	± 2.2
Intraocular pressure: Right Eye (mm of Hg)	19.38	± 1.5	16.8	± 2.5
Intraocular pressure: Left Eye (mm of Hg)	19.39	± 1.53	16.81	± 2.59

Visual acuity was found to be lowered in cases when compared to controls who did not consume alcohol.

The intraocular pressure measurements were found to be low in participants who consumed alcohol (cases) as given in table 3.

## 4. Discussion

Consumption of alcohol for long periods is found to be hazardous to health. The effects of long term alcohol consumption are well documented. Several studies have shown that drinking excess alcohol can raise the blood pressure to unhealthy levels. It temporarily increases blood pressure when

consumed in one sitting but repeated drinking for several days causes a more sustained and long - term increase in blood pressure [8,9].

Alcohol relates close to obesity as it contains calories that may contribute to unwanted weight gain which is a risk factor for high blood pressure. BP increases progressively with increasing alcohol consumption showing a linear relationship [10]. The present study shows an increase in both systolic and diastolic blood pressures in subjects consuming alcohol when compared to those who do not consume it. This is in accordance with previous studies.

Alcohol consumption is a potentially preventable cause of hypertension in the community [10].

Literature suggests variable effect of alcohol on intraocular pressure. Few studies have shown that there is a fall in intraocular pressure with alcohol consumption [11] as alcohol induces tear hyperosmolarity and a significant shortened tear break up time leading to dry eyes and its complications [11-13]. This study also shows a fall in intraocular pressures in subjects consuming alcohol which correlates with earlier studies.

Long-term alcohol consumption can possibly depress the respiratory center in the brainstem and lead to decrease in respiratory rate. The present study also shows a decrease in the respiratory rate of individuals consuming alcohol.

In the present study there is an increase in the pulse rate of subjects consuming alcohol. Previous studies have established a similar relation between alcohol intake and increase in heart rate. This may be due to reduced vagal activity that is possibly caused by increase in sympathetic discharge secondary to vasodilatation brought about by consuming alcohol [14].

In conclusion, the results of the present study suggest that consuming alcohol can lead to serious eye damage, which may be irreversible. Measuring the intraocular pressure from time to time in individuals consuming alcohol may be helpful in determining the extent of damage done to the eye so that any intervention may be instituted early so as to prevent further severe damage and complications. Also, creating awareness among public about the ill-effects of alcohol to decrease or even stop its consumption maybe helpful in the long run.

## References

- [1] Brown B., Adams A. J., Haegerstrom-Portnoy G., Jones R. T., and Flom M. C., "Effects of alcohol and marijuana on dynamic visual acuity: I. Threshold measurements," *Perception & Psychophysics*, 1975; 18 (6): 441-446.
- [2] Watten R. G. and Lie I., "Visual functions and acute ingestion of alcohol," *Ophthalmic and Physiological Optics*, 1996; 16 (6): 460-466,
- [3] Adams A. J., Brown B., and Flom M. C., "Alcohol induced changes in contrast sensitivity following high intensity light exposure," *Perception & Psychophysics*, 1976; 19 (3): 219-225,
- [4] Miller R. J., Pigion R. G., and Takahama M., "The effects of ingested alcohol on accommodative, fusional, and dark vergence," *Perception & Psychophysics*, 1986; 39 (1): 25-31.
- [5] Allen A. J., Meda S. A., Skudlarski P. et al., "Effects of alcohol on performance on a distraction task during simulated driving," *Alcoholism: Clinical and Experimental Research*, 2009; 33 (4): 617-625.
- [6] Kim J. H., Kim J. H., Nam W. H. et al., "Oral alcohol administration disturbs tear film and ocular surface," *Ophthalmology*, 2012; 119 (5): 965-971.
- [7] Arora S. S., Vatsa M., Singh R., and Jain A., "Iris recognition under alcohol Influence: a preliminary study," in Proceedings of the 5<sup>th</sup> IAPR International Conference on Biometrics (ICB '12), pp. 336-341, New Delhi, India, March 2012.
- [8] Potter JF, Beevers DG: Pressor effect of alcohol in hypertension. *Lancet* 1984; 1:119-122 8.
- [9] Howes LG, Reid JL: Decreased vascular responsiveness to noradrenaline following regular alcohol consumption. *Br J Clin Pharmacol* 1985;20:669-674 )
- [10] Arkwright PD, Beilin LJ, Rouse I, Armstrong BK, Vandongen R Effects of alcohol use and other aspects of lifestyle on blood pressure levels and prevalence of hypertension in a working population. *Circulation*. 1982 Jul; 66(1):60-6.
- [11] Buckingham T, Young R. The rise and fall of intraocular pressure: The influence of physiological factors. *Ophthalmic Physiol*. 1986; 6:95-9.
- [12] Houle RE, Grant WM. Alcohol, vasopressin, and intraocular pressure. *Invest Ophthalmol*.1967; 6:145-54.
- [13] Harris A, Swartz D, Engen D, Beck D, Evans D, Caldemeyer K, et al. Ocular hemodynamic effects of acute ethanol ingestion. *Ophthalmic Res*. 1996; 28:193-200.
- [14] Howes LG, Reid JL. The effects of alcohol on local, neural and humoral cardiovascular regulations. *Clin Sci* 1985; 71:9-15.