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Research Article

CORRELATION OF INTRAOCULAR PRESSURE WITH BLOOD PRESSURE AND BODY MASS INDEX IN OFFSPRINGS OF DIABETIC PATIENTS: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Raised intraocular pressure (IOP) has been associated with risk factors like hypertension, diabetes mellitus (DM), obesity, body mass index (BMI) and sex, increasing the risk of glaucoma causing visual impairment and blindness. Since familial inheritance is known with glaucoma and DM, the aim was to study the IOP and its correlation with BMI and blood pressure (BP) in offsprings of DM and also to predict the future/early onset of glaucoma in them. **Methods:** This was an observational study done in medical undergraduate students. 25 students were included in the study group (offsprings of diabetic parents-cases) and 23 students in the control group (offsprings without diabetic history in parents). Height, weight, blood pressure and intraocular pressure were recorded in both the groups and these were compared. Statistical analysis was done by student's t test and Pearson's correlation. **Results:** Cases exhibited a lower IOP, BMI, mean arterial pressure (MAP) and diastolic blood pressure (DBP), but not SBP, as compared to controls. These differences, however, were not statistically significant except DBP. There was a negative correlation found between IOP and BMI and also between IOP and MAP in cases, whereas in controls, there was a positive correlation found between BMI and IOP and no correlation between IOP and MAP. **Conclusion:** Offsprings of diabetic patients may be less prone for primary open angle glaucoma. **Limitations:** The limitations of the present study include a smaller sample size, study of the results in relation to paternal or maternal diabetic status and also of grandparents, so that the inheritance of diabetes and also of IOP can be studied.

Keywords: Intraocular pressure; Diabetes mellitus; Body mass index; blood pressure; glaucoma

INTRODUCTION

Glaucoma is one of the leading causes of acquired blindness and is common in females after thirty five years and in those with a family history of glaucoma[1]. Glaucomatous optic nerve damage is more likely to be associated with high intraocular pressure (IOP). Although IOP is not the only risk factor for optic nerve damage, but is one of the main risk factors for emergence of glaucoma and is the only amendable risk factor.

Raised IOP (Normal IOP:10-20mmHg) has been associated with risk factors like hypertension[2], diabetes[3], obesity, body mass index (BMI)[4], sex[5] and

age[6], increasing the risk of glaucoma causing visual impairment and blindness. Among the diabetics, IOP is high as compared to non-diabetics and also an increase in IOP is seen with increasing BMI and there is a positive correlation between this variable and IOP in diabetics. It indicates that the increase in BMI appears to be a positive additive determinant of raising IOP in diabetics[3] and also few studies show minimal or no association between diabetes mellitus (DM) and primary open angle glaucoma (POAG) [5,6].

Familial inheritance is known with glaucoma and DM, and an interesting point about glaucoma is that most of the times it goes unnoticed in the initial stage where progression to blindness can be prevented. There is a paucity of literature involving studies on IOP in offsprings of DM. Hence, the aim was to study the IOP and its correlation with BMI and blood pressure (BP) in offsprings of DM and also to predict the future/early onset of glaucoma in them.

MATERIAL AND METHODS

This was an observational study done in first year medical undergraduates of Bagalkot. Students (Male & Female) whose at least one parent had a diabetic history were included in the study (Cases). Age matched students without parental diabetic history was included in the control group (Controls). Subjects with any systemic illness/endocrine disorders and subjects with a history of ocular injury/ surgery were excluded from the study.

Twenty seven students were found to be having a parental diabetic history, of these two students did not cooperate for data collection. Among the students who consented to the study, twenty five students were included in the study group and twenty three students in the control group.

Ethical clearance was obtained from the institution. Informed consent was taken from all the subjects. Height was recorded by stadiometer, weight by a standard weighing machine, blood pressure by sphygmomanometer and IOP by non-contact tonometer in both cases and controls. BMI and Mean arterial pressure (MAP) were calculated. The recorded parameters were compared in both the groups. Statistical analysis was done by student's (unpaired) t test and Pearson's correlation using SPSS package 11 version.

RESULTS

Forty eight subjects (25 cases and 23 controls) were included, age ranging from 17 to 20 years. Mean age of cases and controls was 18.28years and 18.43years. The mean weight of cases and controls was 59.92 Kg and 58.3 Kg. The mean height of cases and controls was 163.76 cm and 164.86 cm.

Mean IOP of 14.8 mmHg and a mean MAP of 88.2 mmHg was recorded in cases and a mean IOP of 15.15 mmHg and a mean MAP of 91.1 mmHg was recorded in controls. Selected characteristics of the study are shown in Table 1.

It was found that cases (offsprings of diabetic parents) exhibited a lower IOP, BMI, MAP and DBP, but not SBP, as compared to controls (offsprings without diabetic history in parents). These differences, however, were not statistically significant.

Table 1:Comparison of IOP, BMI and BP in cases and controls

		N	Mean± SD	t	p
Intraocular pressure (mm Hg)	**cases**	25	14.80±2.62	-1.001	0.322
	controls	23	15.15±2.94		
Mean Arterial Pressure (mm Hg)	**cases**	25	88.29±7.99	-1.661	0.104
	controls	23	91.71±5.91		
BMI (Kg/m^2)	**cases**	25	22.24±4.04	1.728	0.091
	controls	23	21.29±4.18		
Systolic BP (mm Hg)	**cases**	25	118.48±7.62	0.865	0.392
	controls	23	116.34±9.43		
Diastolic BP (mm Hg)	**cases**	25	73.20±9.03	-2.814	0.007*
	controls	23	79.39±5.67		

*Significant P<0.05

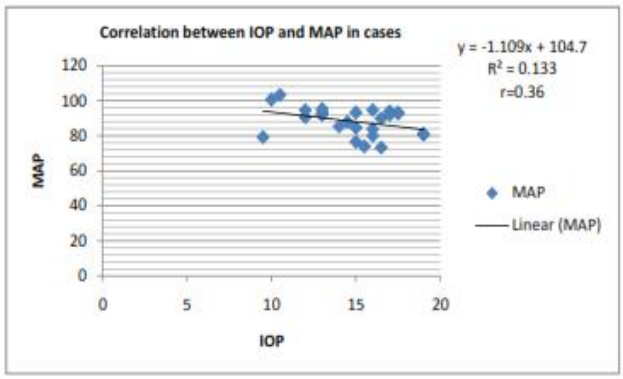

Fig 1: Correlation between IOP and Mean arterial pressure (MAP) in cases

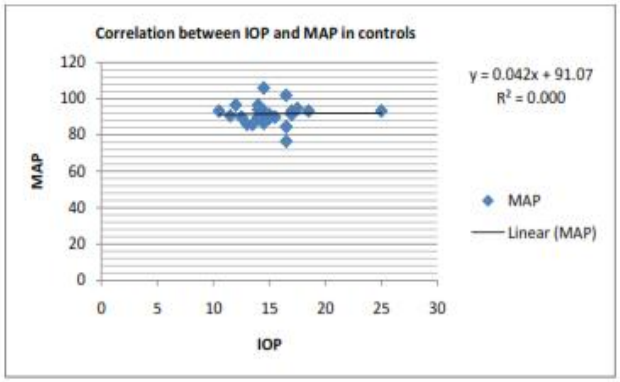

Fig 2: Correlation between IOP and body mass index (BMI) in cases

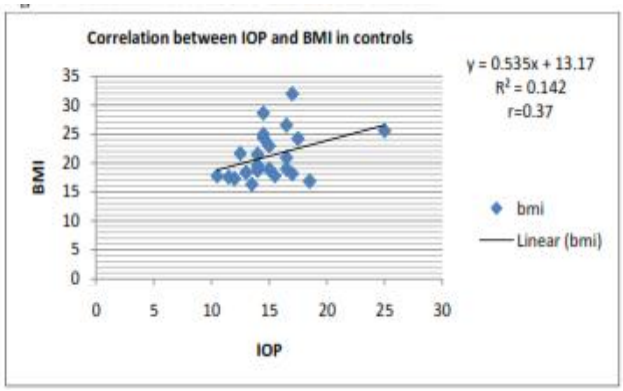

Fig3. Correlation between IOP and MAP in controls

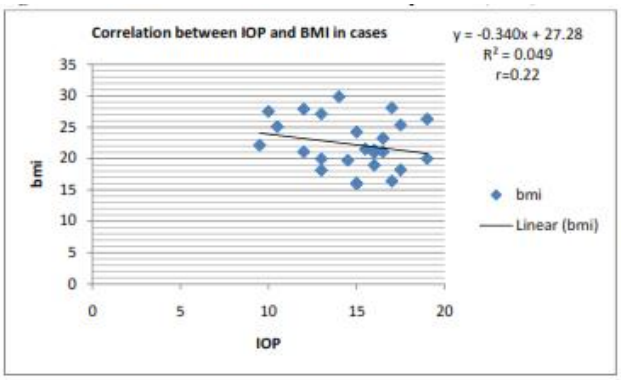

Fig 4: Correlation between IOP and BMI in controls.

There was a negative correlation between IOP and BMI; and also between IOP and MAP in cases (Fig 1& 2).

In controls, there was a positive correlation found between BMI and IOP and no correlation between IOP and MAP (Figure 3 and 4).

DISCUSSION

The results of the present study showed a negative correlation of BMI with IOP which however was not statistically significant.

There are studies which have shown increased IOP and BMI in diabetic patients, but there are no studies done in offsprings of diabetic parents.

Reports of Armaly and Baloglour[7] observed low IOP in diabetics compared to non-diabetics. A few early studies found no evidence of increased intraocular pressure in diabetes[8-10].

In contrast to the above findings, another study revealed that diabetics seem to have higher intraocular pressures and may have a higher rate of glaucoma than those without diabetes[4]. The mean intraocular pressure in maturity onset diabetes was 19.26 mm of Hg which was higher than the normal mean intraocular pressure reported in the general population, which was 16.1 mm of Hg[11,12] and others [5, 7,12,13,14] have observed a slightly higher mean IOP among the diabetic participants than the non-diabetic participants. Etiologic links between IOP and diabetes remain unclear.

When BMI was evaluated, it was found that the mean BMI (in Kg/m^2) in cases was 22.24 and the mean BMI was 21.29 in controls. The BMI was higher in cases than those in controls. A trend of decreasing IOP with increasing BMI was observed in cases whereas, in controls there was an increasing IOP with increasing BMI.

We also compared blood pressure variations both in cases and controls and found less MAP, DBP but high SBP in cases, which was not statistically significant. A similar finding of high SBP was observed in a study done in offsprings of diabetic mothers [15].

The findings of the present study indicate a lower IOP in cases as compared to the controls and persons prone to diabetes may be less prone (?) to develop primary open angle glaucoma in future, but further studies in this regard with large sample size and prospective cohort studies may be helpful.

CONCLUSION

It can be concluded from the above study that offsprings of diabetic patients may be less prone (?) for primary open angle glaucoma in future.

Limitations of the study: The limitations of the present study include a smaller sample size, study of the results in relation to paternal or maternal diabetic status and also of grandparents, so that the inheritance of diabetes and also of IOP can be studied.

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Conflict of interest: Nil

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