

# A Clinical Study in Diabetics and its Effects on IOP in Relation to Blood Sugar Levels

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**Abstract:** Diabetes Mellitus, a major cause of visual disability and blindness in developing and developed countries. DM Cause many ocular manifestations. One is blood sugar levels and IOP. By testing blood sugar level in DM patients with orthotoludine method and relation with IOP levels recorded by Goldman applanation method by a number of experimental studies. Aim of the study: Diabetes Mellitus is one of the major tragedies of Ophthalmology in our present generations affecting all the age groups. DM is one of the major causes of blindness and visual disabilities throughout the world. Diabetes Mellitus, a disorder of the carbohydrate metabolism characterized by hyperglycemia and glycosuria due to deficiency or diminished effectiveness of Insulin. In the present study was under taken to review the possible relationship between IOP in relation to blood sugar levels. The main objective of this study to know the possible relationship between various levels of blood sugar in diabetic patients and effect of IOP. In this study 100 cases of known target population of diabetic patients were taken in randomized manner. Material and Methods: The study of IOP in relation to fasting and random blood sugar levels in Diabetes Mellitus has been carried out in REH, Kurnool and Outside Hospital patients admitted in endocrinology unit of GGH, Kurnool for various medical complaints.

**Keywords:** Diabetes Mellitus<sup>1</sup>- blood sugar<sup>2</sup>-Orthotoludine<sup>3</sup>-Iop<sup>4</sup>-applanation<sup>5</sup>-gonioscopy<sup>6</sup>-ophthalmoscopy<sup>7</sup>-mean intraocular pressure<sup>8</sup>-primary open angle glaucoma<sup>9</sup>

## 1. Clinical Study Carried Out as Follows

In present study 100 diabetic cases has been evaluated for IOP. Hypertensive and Arterio Sclerotic patients are excluded in this study.

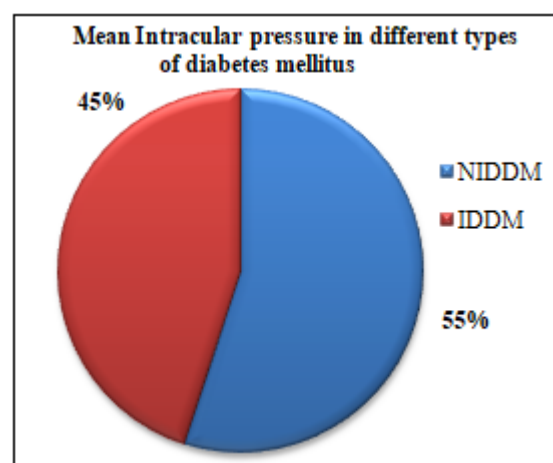
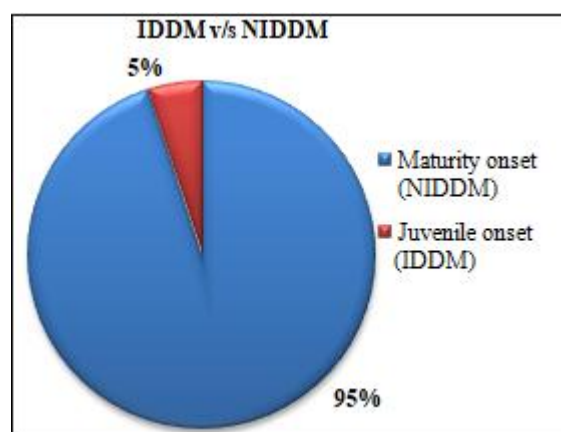
Clinical study carried out as follows:

- 1) Intraocular pressure recording done with Goldman applanation tonometer. The same tonometer was used through out the study for 100 patients.
- 2) Through clinical examination
- 3) Gonioscopy
- 4) Fundoscopy by direct and indirect ophthalmoscopy
- 5) Blood sugar level estimation by Orthotoludine method
  - a) FBS
  - b) RBS
  - c) With corresponding urine sugar from 0 to ++++

## 2. Observations

Out of 100 diabetics – mean intraocular pressure in different types of Diabetes Mellitus

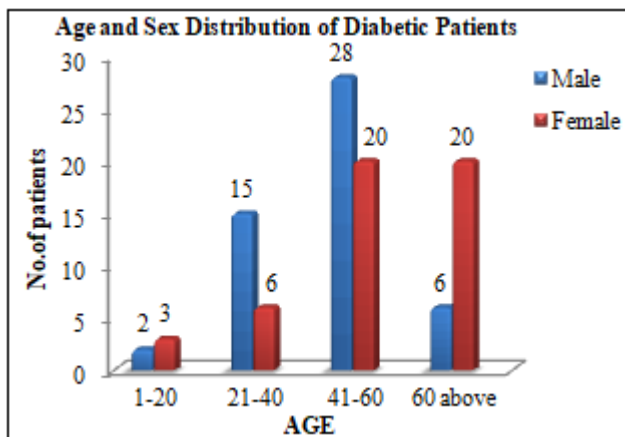
	Maturity onset	Juvenile onset (IDDM)	Normal I.O.P. (in mmHg)
No.of Patients	95	5	
Mean intraocular Pressure(mm.Hg)	21mmHg	18mm.Hg	16mm.Hg



In the present study, the mean intraocular pressure recorded by applanation tonometer being 21mm.Hg. in maturity onset diabetes and 18mmHg in juvenile diabetes; while the normal intraocular pressure by applanation tonometry had been taken as 16mm.Hg.

**Table 1:** Out of 100 Diabetics – Age & Sex Distribution of Diabetic Patients found WAS

Group	Age in years	Male	Female	Total
I	1-20	2	3	5
II	21-40	15	6	21
III	41-60	28	20	48
IV	60 above	6	20	26



In the present study 5<sup>th</sup> and 6<sup>th</sup> decade patients are maximum in number and female are predominated.

**Table 2:** Relationship of Intraocular Pressure and Retinal Status

Types of diabetes	No.of eyes	Percentage	Mean I.O.P (in mm.of Hg)
Diabetics without retinopathy	25	25	18
Diabetics with retinopathy	75	75	21
I) Non-proliferative			
a) Mild	15	15	22
b) Moderate	25	25	23
c) Severe	29	29	24
II) Proliferative	6	6	14
Total	100	100	-

Out of 100 diabetic patients surveyed 75 cases were found to possess diabetic retinopathy. The relationship between intraocular pressure and diabetic retinopathy was correlated.

Most of cases with mild, moderate, severe diabetic retinopathy showed higher intraocular pressure. The maximum intraocular pressure recorded in severe diabetic retinopathy being 24 mm.Hg. as diabetic retinopathy proceeds to the proliferate stage the pressure reduced to 14mm.Hg.

**Intraocular Pressure in Relation to Blood Sugar Level**

Total number of Diabetics	Percentage of Patients	Blood sugar level (fasting)	I.O.P in mm of Hg	Mean + SD
	25	80-120 mg%	16-18mm.Hg	16±0.3 mm.Hg
	45	120-150 mg%	18-20mm.Hg	18±0.3 mm.Hg
	30	150-180 mg%	20-24mm.Hg	20±0.3 mm.Hg

Standard deviation

$$\frac{4pq}{L^2}$$

P = Prevalance

Q = 100-P

L = 10% P

In the study standard deviation is 0.3 mm of Hg

Out of 100 diabetics, 25% of the cases showed normal fasting blood sugar level with intraocular pressure between 16-18mm.Hg. in 45% of the cases, the fasting blood sugar level was between 120-150mg% with intraocular pressure between 80-20mm Hg and in another 30% of the cases the fasting blood sugar level was between 150-180 mg% with intraocular pressure between 20-24mm.Hg. Hence it has been observed that with the increased of blood sugar level, there has been an increase in the intraocular pressure.

### 3. Discussion

Diabetes mellitus is very common disease. The present clinical study has been carried out to know the relationship between blood sugar levels and IOP.

In the study the mean IOP in NIDDM is 20MM.Hg which is higher than normal mean IOP reported in the general population is 16.1mm.Hg. in Juvenile(IDDM) the mean IOP is lower (18mm.Hg) than the mean IOP in maturity onset diabetes than normal average mean IOP.

Thus the finding, clearly indicates the higher mean IOP in diabetic as compared to the non diabetic population.

Emotional stress and obesity are aggravating factors in each condition resulting in diurnal variation of the blood sugar in diabetes and increased IOP.

The study of blood sugar level relationship with IOP in 100 cases showed only 25% of then showed normal blood sugar level correlated with maintenance of normal IOP. In 75% of then showed increase of blood sugar level is associated with increase of IOP. The exact relationship between blood sugar level and the IOP could not be made out which requires still a detailed study in future probably. It is the blood sugar level that determine the level of IOP which has to be evaluated in this regard by a number of experimental studies.

In the present clinical study the mean IOP of diabetic eyes without retinopathy was 18mm.Hg and with NPDR was 21 mm.Hg. the significant finding was the lower IOP of 14mm.Hg in PDR.

### 4. Conclusions

The present clinical study has been carried out in 100 diabetic patients with regard to the intraocular pressure. The final conclusions drawn from such a study are as follows.

- 1) Over the age of 40 years, both diabetes and glaucoma were found to be common disorders. The age incidence is same almost in both the sexes. Both sexes are equally affected but a slight female preponderance was observed.
- 2) Primary open angle glaucoma is observed to be more common in diabetics over 40 years of age as compared to the same age group of normal population
- 3) The mean intraocular pressure in maturity onset diabetes (NIDDM) is 21mm. of Hg.
- 4) The mean intraocular pressure in juvenile onset diabetes is 18mm. of Hg.

- 5) In the 100 diabetic patients surveyed gonioscopically showed wide open angle of the anterior chamber in 85% of cases and 15% of cases were with angle closure.
- 6) An exact correlation cannot be made out in all cases of diabetics between the variations in tension and blood sugar level maintenance marked disparity is observed in 2/3<sup>rd</sup> of cases, but in states of hyperglycemia due to release of adrenaline will produce low intraocular pressure. In well controlled diabetic patients there is less fluctuations in intraocular pressure.
- 7) Secondary glaucoma due to lens induced cases was also observed to be high in incidence, as the age group after 50 years the lenticular complications like diabetic cataract and early senile cataract producing complications should be born in mind.

## 5. Summary

In the present clinical study in 100 diabetics were examined for blood sugar levels and IOP. The study has been summarized as follows.

- 1) The IOP was found to be higher in diabetics than in the general population except in patients with PDR.
- 2) C value low in Diabetics
- 3) Gonioscopy revealed wide open in 85% cases.
- 4) The average duration between onset of Diabetes and onset of POAG is about 10-12 years.
- 5) Primary open angle glaucoma is usually missed in a diabetic over 50yrs of age due to visual impairment and disturbances are usually attribute to lens osmotic changes and cataract formation, unless careful tonography and visual field survey has been carried out.
- 6) High IOP in diabetics is slightly more predominant in females.
- 7) High blood sugar level influences the rise of IOP due to osmotic effect to a certain extent.
- 8) In well controlled diabetics it is less likely to have marked fluctuations in the IOP.

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