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Research Article

A STUDY OF ASSOCIATION OF POOR GLYCEMIC CONTROL WITH DIABETIC RETINOPATHY

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ABSTRACT

Background: Diabetic retinopathy (DR) is a sight threatening complication of diabetes mellitus and is one of the leading causes of acquired blindness in adults. Various precipitating factors such as duration of disease, glycemic control, dyslipidemia, hypomagnesemia and microalbuminuria have been implicated in the development and progression of diabetic retinopathy. This study is an attempt to evaluate the diagnostic value of HbA1c in the onset & progression of Diabetic Retinopathy.

Aim: The aim of the study was to find the association between HbA1c and diabetic retinopathy.

Settings and Design: In this cross-sectional study, 50 diabetic patients with retinopathy, and fifty controls (age & sex matched).

Methods: Five ml of blood was withdrawn under full aseptic conditions and was evaluated for Fasting blood sugar and HbA1c. Fundoscopic examination was done to assess Diabetic Retinopathy.

Results: Mean age of the cases was 53.73+/-8.10 years and of controls was 53.86+/-9.90 years. P value was 0.947 which is more than 0.005. There was no significant difference between the age of cases and controls. Mean FBS levels in cases was 209.88+/-62.165 mg/dl and in controls was 90.33+/-10.262. Mean HbA1c levels in cases were 11.102+/-2.3156mg/dl and in controls was 6.094+/-0.9571. P value was 0.000 in both the parameters studied which is more than 0.005. A significant difference was seen among cases and controls in both the parameters.

There was a strong association seen between HbA1C and Diabetic retinopathy.

Conclusion: We have observed a significant association between DR and Poor Glycemic control. Progression of DR can be halted in the initial stages by improving diabetes management & regular ophthalmologic follow-up.

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INTRODUCTION

Diabetes mellitus (DM) is a complex metabolic disorder caused by variable interactions between hereditary and metabolic disorder. It is an increasing cause of morbidity and mortality. It is a chronic disease characterised by a disorder of glucose metabolism associated with a reduced ability of tissue to respond to insulin (insulin resistance), resulting chronic hyperglycemia damages the blood vessels and nerves throughout the body producing microvascular disease including retinopathy, neuropathy and nephropathy. Moreover, risk for cardiovascular diseases is considerably elevated in patients with diabetes mellitus as compared to general population. Therefore diabetes mellitus represents a major public health problem causing high economic costs.(1,2) Prevalance of Diabetes for all age groups worldwide was estimated to be 2.8% in year 2000 and would be 4.4% by the year 2030. The

total no of people with Diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. The DM in urban population in developing countries is projected to double between 2000 and 2030. According to latest World Health Organization (WHO) report, India has 31.7 million Diabetic subjects and the number is suspected to increase to a staggering 79.4 million by 2030. (3)

Diabetic retinopathy is one of the leading cause of blindness worldwide. Individuals with this condition run a 25 times higher risk of losing the sight than do normal people. Decrease in visual acuity in Diabetic retinopathy is either associated with maculopathy or its proliferative complications.(4) Diabetic retinopathy develops in majority of the patients with diabetes even when there is no clinically detectable retinopathy, changes at hemodynamic and cellular level take place. The endothelial (inner lining of blood vessel) cell

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supporting cells called pericytes are affected early resulting in endothelial damage. Retinal blood flow is decreased. Clinically evident retinopathy appears as the disease progresses. The various signs that appear are microaneurysm, dot and blot retinal haemorrhages, cotton wool spots, venous calibre changes and retinal capillary non perfusion. Increasing retinal ischemia (reduced blood flow) triggers the production of vasoproliferative diabetic retinopathy. Diabetes also causes retinal blood vessels to be more permeable resulting in transudation of serum components. This results in retinal thickening and causes macular oedema.(5,6)

HbA1c that is glycosylated haemoglobin is widely used and accepted as the most reliable test for assessment of chronic glycosemia.(7)

In the blood stream are red blood cells, which are made up of molecular haemoglobin. Glucose sticks to the haemoglobin to make a glycosylated haemoglobin molecule called haemoglobin A1c or HbA1c. The more glucose in the blood the more HbA1c will be present in the blood.

Red cells live for 8 to 12 weeks before they are replaced. By measuring HbA1c it can tell you how high your blood glucose has been on average over last 8 to 12 weeks. (8)

The goal of glycemic control is HbA1c level is less than 7%. Cut of value of HbA1c for the diagnosis of DM is 6.5%. (9)

HbA1c test is currently one of the best ways to check whether Diabetes is under control or not.

There has been direct relation between glycemic control and progression of diabetic retinopathy.(5)

MATERIAL AND METHODS

This hospital based cross sectional study was carried out in the department of Pathology and department of Biochemistry, AIMS, Bathinda over a period of one year from 1st April 2015 to 31st March 2016 and included all diabetic patients falling into inclusion criteria.

For study to be more significant 50 cases and 50 controls were taken.

Age and sex matched normal healthy volunteers accompanying the patients having no history of any chronic disease coming to hospital were taken as controls. Five ml of blood was withdrawn and analysed for fasting blood sugar level and by the Bioradsheamoglobin testing system for measuring HbA1c level by HPLC method.

After dilating the pupil, the fundus was examined by slit lamp biomicroscopy and indirect ophthalmoscopy to assess retinopathy by two senior ophthalmologists.

Inclusion criteria: All the already diagnosed patients of Diabetes Mellitus having HbA1c level >8% as well as the new diagnosed cases of Diabetes Mellitus who presented with the signs and symptoms of diabetes mellitus, having HbA1c level >8%.

Exclusion criteria: all the Patients on diuretics.

Ethical clearance: ethical clearance was taken from the ethical committee of Adesh Institute of Medical Science and Research, Bathinda.

RESULTS AND OBSERVATIONS

The present study was conducted in Department of Pathology at Adesh Institute of Medical Sciences and Research, Bathinda for a period of 1 year, from 1st April 2015 to 31st March 2016. Fifty cases and 50 controls were included in the study.

In our study we found the mean age of cases and controls to be similar. There is no significant difference between mean age of controls and cases as the p-value is 0.947 which is > 0.05. There is a significant difference in Mean FBS between cases as controls as p-value was 0.000 which is < 0.05.

There is a significant difference in Mean HbA1C between cases as controls as p-value was 0.000 which is < 0.05.

Table 1 Showing sex wise distribution of Mean FBS, HbA1C in cases and controls

Sr No.	Study Parameter	MALE (N=69)	FEMALE (N=31)	t	P value
1	FBS	146.68+/-72.37	158.24+/- 80.58	-0.698	0.487
2	HbA1C	8.47+/-2.9	8.88+/- 3.31	-0.6	0.55

There was no significant change in both the studied parameters as the p-value was more than 0.05 in all the cases.

Our study showed positive correlation of FBS with HbA1C and vice versa.

Table 2 Showing features of Diabetic Retinopathy

S. No	Clinical Features	Histopathological Features
1.	Spots or dark string floating in vision (floaters)	Microaneurysms-earliest sign
2.	Blurred vision	Dot and blot haemorrhages
3.	Fluctuating vision	Flame shaped haemorrhages
4.	Impaired vision	Retinal edema and hard exudates
5.	Dark or empty areas in vision	Venous loops and venous beading
6.	Vision loss	Intraretinal microvascular abnormalities
7.		Macular edema

DISCUSSION

Diabetic retinopathy is a sight threatening complication of DM and is one of the leading cause of acquired blindness. Various precipitating factors such as glycemic control, dyslipidemia, hypomagnesemia and microalbuminuria have been implicated in the development and progression of diabetic retinopathy. In our study, there was a significant increase in the FBS levels and HbA1c levels in diabetic patients with retinopathy when compared to the control group.

Table 3 Comparison of FBS levels and HbA1c levels in other studies and our study.^{1, 10, 11}

S. NO	STUDY	FBS VALUE	HbA1C
1.	Swetha NK et al 2014	194.10+/- 67.79	8.62+/-1.44
2.	Karim I et al 2004	235+/-20.03	10.48+/-1.22
3.	Chauhan K et al 2013	161+/-130	9.2+/-4.22
4.	Present study	209+/-62.165	11.102+/-2.31

Our findings was in concordance with the studies conducted by Swetha NK et al, Karim I et al and Chauhan K et al, who have found that there was a significant association between glycemic control with the severity of diabetic retinopathy.

Hyperglycemia, as indicated by the increase in the FBS and HbA1c levels, is a potent predictor of progression of diabetic retinopathy. The possible mechanism is hyperglycemia leads to glycation of virtually all proteins, resulting in the formation of advanced glycation end products. The interaction of advanced glycation end products and their receptors and increased activity of the polyol pathway have been implicated as mediators of increased microvascular permeability, ischemia and angiogenesis. Elevated HbA1c levels have been found to be a potent predictor of progression of proliferative diabetic retinopathy. The risk of diabetic retinopathy increases stepwise with increasing degrees of hyperglycemia.(ref).

CONCLUSION

We have observed a significant correlation between DR and Poor Glycemic control. Progression of DR can be halted in the initial stages by improving diabetes management, nutritional supplementation & regular ophthalmologic follow-up. Regular monitoring of all diabetic patients with biochemical parameters like HbA1c and microalbuminuria might be helpful to prevent the onset & progression of Diabetic retinopathy.

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