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HbA1C Level in Type 2 Diabetes Mellitus: Clinical Profile

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Abstract
Diabetic retinopathy (DR) is among the most common diabetic complications and is the leading cause of blindness among working-aged individuals worldwide. The prevalence of DR varies from 20-80% in different studies. Recent estimates suggest that the number of people with diabetic retinopathy will increase to 191 million by 2030. Diabetic retinopathy has a complex process. Many risk factors for DR have been established, such as poor glycaemic control, long duration of diabetes, smoking, inflammation, obesity and hypertension. Stratton have given evidence that poor glycaemic control and long duration of diabetes are independent risk factors of DR. Patient consent was taken and patient vitamin D was done and patient underwent fundoscopy after which the vitamin D level was correlated with fundoscopic findings. We found that out of 50 patient using the student t test when compared with HbA1c level found that 21 cases had HbA1c level more than 7 and 29 cases had HbA1c level less than 7. With the use chi square test we found the values that in cases 20 (95.2%) out of 21 had uncontrolled blood glucose level and HbA1c level more than 7 and in control out of 29, 21 (72.4%) had good control of blood glucose level and HbA1c level less than or equal to 7.

INTRODUCTION

India is called the capital of diabetes mellitus and many people are suffering from microvascular and macrovascular complication and vitamin d supplement may prevent the complication and delays it[1].

Diabetes mellitus (DM) is a large public health problem which affects more than 300 million individuals in the world, with significant morbidity and mortality worldwide. In addition to the deleterious effects of the disease itself, its long-term complications can conspicuously decrease the quality of life of diabetes patients. Diabetes patients with uncontrolled or poorly-controlled blood glucose are at high risk of microvascular complications. Diabetic retinopathy (DR) is among the most common diabetic complications, and is the leading cause of blindness among working-aged individuals worldwide[2]. The prevalence of DR varies from 20-80% in different studies. Recent estimates suggest that the number of people with diabetic retinopathy will increase to 191 million by 2030. Diabetic retinopathy has a complex process. Many risk factors for DR have been established, such as poor glycaemic control, long duration of diabetes, smoking, inflammation, obesity and hypertension. Stratton et al. have given evidence that poor glycaemic control and long duration of diabetes are independent risk factors of DR[3].

Praidou *et al.* found that increased physical activity is associated with less severe levels of DR, independent of the effects of HbA1c and body mass index (BMI). However, detailed pathophysiological mechanisms and other DR risk factors are not fully clarified[4].

MATERIALS AND METHODS

Source of Data: 50 subject with diagnosis of type 2 diabetes mellitus attending Hospital.

Sample Size: The Total Sample Size N = 50.

Sampling Method: Purposive sampling.

Type of Study: Cross sectional study.

Inclusion Criteria:

- Patient diagnosed of type 2 diabetes mellitus
- Age more than 18 years

Exclusion Criteria:

- Pregnant and lactating mother
- Patient on vitamin D supplements

Informed consent was taken. Information was collected through structured Performa for each subject. Study will be carried out by making two groups, one group had type 2 diabetes mellitus with retinopathy and HbA1C level >7 and other group had type 2 diabetes mellitus with no retinopathy and HbA1c level <7.

Qualified subjects underwent detailed history, clinical examination including relevant investigation. Statistical test data will be analyzed using appropriate statistical method.

RESULTS AND DISCUSSIONS

A total of 50 patients is included in the present study and in (Table 1) in this it is a comparison of HbA1c level between cases and control group where it is found that cases of (n = 21) had HbA1c level more than 7 and control of (n = 29) had HbA1c level around or equal to 7.

In (Table 2) it is comparison of control and case study with HbA1c level using chi square test for 50 patient and in that it is found to have uncontrolled sugar in cases around 95.2% for 20 cases out of 21 cases and HbA1c level more than 7. In control out of 29 patient it is found to have 72.4% that is 21 patient had good control of HbA1clevel below and equal to 7.

In (Table 3) it is the comparison of mean HbA1c level with different fundus status using one way ANOVA test out of 50 patient, 29 patient who had normal fundus also had mean HbA1c level around 7.03,15 patient with mild NPDR had mean HbA1clevel around 8.84 and 6 patient with moderate NPDR found to have mean HbA1c level >9.

In (Table 4)- It is the comparison of mean difference of HbA1c level and different fundus status using tukeys post hoc analysis and found that patient with HbA1c level around 7 had normal fundus and patient with HbA1c level more than 7 found to have mild NPDR changes and patient with HbA1c level more than 9 found to have moderate to severe NPDR changes.

Vitamin D deficiency (VDD)has been implicated in the development of diabetes complication, specifically diabetic retinopathy (DR).it has a number of metabolites the 2 most important of which are 1,25-dihydroxyvitamin D3 (1,25(OH)2D3) and 25 vitamin hydroxyapatite (25(OH)D). the serum concentration of both have been used to quantify vitamin D deficiency and study its relationship with diabetic retinopathy[5].

In a mouse model of ischemic retinopathy 1,25dihydroxyvitamin D3 (1,25(OH)2D3) has been shown to inhibit retinal neovascularisation and in cell culture. it inhibited endothelial cell proliferation, most likely due to its interaction with vascular endothelial growth factor (VEGF).

In our study, among 50 patients, 21(72.2%) had vitamin d deficiency.

In this cross sectional study it was found that out of 50 patient using the student t test when compared with HbA1c level found that 21 cases had HbA1c level

Table 1: Comparison of mean HbA1c levels between cases and control using independent student t test

Groups	N	Mean	SD	Mean Diff	95% CI for the Diff.		p-value
					Lower	Upper	
Cases	21	8.91	1.41	1.87	1.32	2.42	<0.001*
Control	29	7.03	0.38				

*-Statistically Significant

Note: Cases means subjects with NPDR and Control means normal subjects.

Table 2: Comparison of HbA1c Levels between cases and controls using Chi Square Test

Variable	Category	Cases		Control		c2 Value	p-value
		n	percentage	n	percentage		
HbA1c	Good Control	1	4.8	21	72.4	22.624	<0.001*
	Poor/Uncontrolled	20	95.2	8	27.6		

*-Statistically Significant.

Note: Cases means subjects with NPDR and Control means normal subjects.

HbA1c-Good Control [= 7%] and Poor/Uncontrolled [>7%].

Table 3: Comparison of mean HbA1c levels between different fundus status using One-way ANOVA Test

Fundus	N	Mean	SD	Min	Max	p-value
Normal	29	7.03	0.38	6.4	8.0	<0.001*
Mild NPDR	15	8.84	1.58	6.4	12.2	
Moderate NPDR	6	9.07	0.98	7.8	10.0	

*-Statistically Significant.

Table 4: Multiple comparison of mean difference in HbA1c levels b/w diff. fundus status using Tukey's Post hoc Analysis

(I) Fundus	(J) Fundus	Mean Diff. (I-J)	95% CI for the Diff.		p-value
			Lower	Upper	
Normal	Mild NPDR	-1.81	-2.55	-1.07	<0.001*
	Mod. NPDR	-2.03	-3.08	-0.99	<0.001*
Mild NPDR	Mod. NPDR	-0.23	-1.35	0.90	0.88

*-Statistically Significant.

more than 7 and 29 cases had HbA1c level less than 7.With the use chi square test we found the values that in cases 20 (95.2%) out of 21 had uncontrolled blood glucose level and HbA1c level more than 7 and in control out of 29, 21 (72.4%) had good control of blood glucose level and HbA1c level less than or equal to 7.

When compared with vitamin D level it was found that 29 of control 100% had adequate vitamin D level and in cases 13 (61.9%) had deficiency.

The study was then compared with fundus of each participant with HbA1C level and vitamin D level and found that 29 patient who had normal fundus had HbA1c level below 7 and adequate vitamin D level, some with mild NPDR around 15 had HbA1c level more than 7 and vitamin D level below 20ng/ml. some with moderate NPDR of 6 had HbA1c level around 9 and above it and had deficiency of vitamin D level below 10ng/ml.

Genetic studies have revealed that vitamin D receptor (VDR) is present in the human retina and polymorphisms of VDR are related to Retinopathy risk in type 1 DM. For example, the FOK1 single nucleotide polymorphism of the VDR gene has been associated with the increased transcription activity of the VDR gene and less severe diabetic retinopathy and TAQ1 polymorphism of VDR gene with decreased incidence of retinopathy[6].

A large American study looked at 1790 diabetics in USA and the percentage of individual with the vitamin D deficiency increased with severity of retinopathy.

CONCLUSION

In this cross sectional study it was found that out of 50 patient using the student t test when compared with HbA1c level found that 21 cases had HbA1c level more than 7 and 29 cases had HbA1c level less than 7. With the use chi square test we found the values that in cases 20 (95.2%) out of 21 had uncontrolled blood glucose level and HbA1c level more than 7 and in control out of 29, 21 (72.4%) had goo control of blood glucose level and HbA1c level less than or equal to 7.

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