Section: Miscellaneous

Original Research Article

TO STUDY THE CORRELATION OF BODY MASS INDEX (BMI) WITH DIABETIC RETINOPATHY IN TYPE 2 DIABETES MELLITUS

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ABSTRACT

Background: Globally, Diabetic retinopathy (DR) is an important cause of loss of vision, contributing significantly to the socioeconomic burden due to its impact on working-age adults. Since obesity is implicated in diabetes mellitus (DM), which is a strong risk factor for DR, it is natural to assume that obesity would be linked to DR. However, this has not been proven. **Aim:** To study the correlation between BMI and the severity of diabetic retinopathy in Type 2 Diabetes and to assess role of weight control in prevention, retardation and management of diabetic retinopathy.

Material and Methods: All patients attending the Departments of General Surgery, General Medicine and Ophthalmology at the Northern Railway Central Hospital, New Delhi, who were found to have a raised blood sugar or a history of DM were enrolled from August 2022 to December 2024. It was an observational, analytical, cross-sectional study. A consecutive sampling method was used, and 200 patients were enrolled during the study period. A total of 200 cases were evaluated. All patients were evaluated to establish the diagnosis, duration, and level of control of DM. They underwent HbA1c examination, and their previous reports were also reviewed. Subsequently, they all underwent retinal examination, and DR grading was done as per the ETDRS classification. All patients underwent anthropometric evaluation, and their height and weight were measured. The BMI was then calculated using the formula BMI = Weight in Kgs/ (Height in metres) ^{2}.

Results: The range of BMI (Kg/m^2) in the study was 22.7 to 41.3, with a mean +/- SD of 29.907 +/- 4.3107. The break-up values were 29.5 +/-3.3, 29.3 +/- 4.7, and 33.4 +/- 5.2, for normal, NPDR, and PDR subjects, respectively, with a p-value of 0.011.

Conclusions: BMI was found to have a statistically significant association with the presence and severity of DR.

Keywords: Type II Diabetes Mellitus, Diabetic retinopathy, Body Mass Index.

INTRODUCTION

Globally, DR is a significant contributor to new blindness cases, particularly in adults aged 20–74 years, ranging from 15.3% to 42.4%, in different epidemiologic studies.[1] In a study from India, DR was present in 16.9%, with sight-threatening diabetic retinopathy (STDR) observed in 3.6% and mild retinopathy in 11.8%.[2]

In South Asia, DR prevalence (19.9%) is relatively lower compared to developed European countries (45.7%).[1] However, urban populations in South Asia are disproportionately affected due to lifestyle and dietary differences when compared to their rural

counterparts. While younger individuals with type 1 diabetes are at greater risk of developing DR, type 2 diabetes contributes significantly to the socioeconomic burden due to its impact on working-age adults.[3]

The tightness of diabetic control and the duration of DM are among the strongest risk factors.[4] This is because the level and duration of exposure to high circulating levels of blood sugar result in microvascular damage to retinal blood vessels, and this leads to DR.[5

DM itself is a multifactorial lifestyle disease, and its management includes not just medications but several other factors like diet control, exercise. Increased BMI and body fat are proven to be linked to DM. The progression of DR is also multi-factorial.[6,7] Therefore, it is a natural progression to think that they would be a factor in the causation of DR.[8] However, whether or not they directly influence DR is not proven.[6]

Aim: To study the correlation between BMI and the severity of diabetic retinopathy in Type 2 Diabetes Mellitus patients.

Objective: To assess role of weight control in prevention, retardation and management of diabetic retinopathy.

MATERIALS AND METHODS

Study Area

The Departments of General Medicine, General Surgery, and Ophthalmology at the Northern Railway Central Hospital, New Delhi.

Study Period

A period of 30 months, from August 2022 to December 2024.

Nature of Study

An observational, analytical, cross-sectional study.

Inclusion Criteria: All patients presenting with

1. Laboratory confirmed cases of both sexes, having Type 2 DM
2. Age more than > 35 years.
3. Patients who have had diabetes for 5 years or more.

Exclusion Criteria

1. Patients with Type 1 DM
2. Congenital ocular disease: Myopic fundus
3. Traumatic posterior chamber abnormality, Retinopathy of prematurity
4. Metabolic disorder other than DM, Cataract eye.
5. Patients not having at least 2 reports of HbA1c/ year for at least the preceding 5 years.

Sampling Method and Size

A consecutive sampling method was used, and 200 patients were enrolled during the study period. A total of 200 cases were evaluated.

Methodology

All patients who attended the Departments of General Surgery, General Medicine and Ophthalmology at the Northern Railway Central Hospital, New Delhi, and were found to have a raised blood sugar or a history of DM were referred to the Medicine department for a detailed work up to establish the diagnosis, duration and level of control of DM. They underwent HbA1c examination, and their previous reports were also reviewed. The average HbA1c was the average of all available HbA1c reports over at least the last three years, with at least 2 HbA1c reports per year.

Subsequently, they all underwent retinal examination by a professional hand-held direct ophthalmoscope. Consultants in the department of ophthalmology did all examinations personally. Diabetic Retinopathy grading was done as per the ETDRS classification.

Diabetic Retinopathy level	Retinal findings
Mild NPDR	Microaneurysm
Moderate NPDR	Haemorrhages (Dot or blot) or MAs in one to three retinal quadrants and/or cotton wool spots, hard exudates, or venous beading
Severe NPDR	Intraretinal haemorrhages (> 20 in each quadrant), venous beading in two or more quadrants, or an IRMA in one or more quadrants
PDR	NPDR that has progressed to PDR, and they exhibit either neovascularization of the disc/elsewhere or vitreous/preretinal haemorrhage

All patients underwent anthropometric evaluation, and their height and weight were measured on the scale available at NRCH. The BMI was then calculated using the formula BMI = Weight in Kgs/ (Height in metres) 2

The results were analysed using the Chi-Square test to find the importance of BMI in the causation and severity of DR.

RESULTS

The study consisted of 200 patients, whose height, weight, and BMI were calculated. The results are tabulated below. [Table 1]

Table 1

Variables	Total patients	Minimum	Maximum	Mean	SD
Height(cms)	200	140.0	178.0	160.330	9.3992

Weight (Kgs)	200	54.0	94.0	76.550	9.2325
BMI(Kg/m^2)	200	22.7	41.3	29.907	4.3107

Table 2

Variables	Normal		NPDR		PDR		ANOVA test P value
	Mean	SD	Mean	SD	Mean	SD	
HEIGHT(cm)	161.9	9.1	160.4	9.2	154.0	9.3	
WEIGHT(Kg)	77.4	9.0	75.4	10.0	77.3	7.8	
BMI(kg/m$^{2)}$	29.5	3.3	29.3	4.7	33.4	5.2	**0.011**

The mean and SD of the height, weight, and BMI (calculated) were separately evaluated for patients with no retinopathy, NPDR, and PDR, respectively. High BMI was found to have a statistically significant association with the presence/ severity of DR.

DISCUSSION

Obesity has become a global pandemic, with its incidence increasing by over 35% from 1980 to 2013. It is implicated in several ocular diseases like cataract, maculopathy and glaucoma.[6]

However, the results from several studies observed a decreased incidence of DR in higher BMI individuals,[9] while other studies detected no significant association between high BMI and the incidence of DR.[10] Obese individuals have increased C-peptide levels, which decrease the risk of DR.[11] Also, obese individuals usually suffer from other comorbid conditions and take more aggressive treatment, thereby decreasing the development of DR.[6]

However, our study found that high BMI was found to have a statistically significant association with the presence and severity of DR. Several other studies have found high BMI to be associated with increased risk of DR. Similar results have been reported by Matuszewski et al. (2020),[12] and Bedi et al. (2021),[13] highlighting obesity as a risk factor for DR, emphasizing the need for lifestyle modifications.

Increased BMI is often associated with hypertension and dyslipidaemia, both of which are risk factors for DR.[14] Obesity is also associated with hyperleptinemia,[15] which is implicated in the development of DR, as it increases blood pressure and oxidative stress levels. Last but not least, obese individuals have higher vascular endothelial growth factor levels, which are associated with PDR.[16]

CONCLUSION

High BMI has a significant association with the presence and severity of DR. However, these results are not universally observed, and bigger studies and meta-analyses will be required to settle the issue.

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