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A Retrospective Study of Correlation of Risk Factors with Severity of Diabetic Retinopathy

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Abstract
Introduction: *Diabetes mellitus is a complex metabolic disease caused by a variable interaction between hereditary and environmental factors. The clinical syndrome is defined by hyperglycemia, microvascular abnormalities (retinal and renal) and neuropathy. Its main features are abnormal insulin secretion, high levels of blood glucose and a variety of complications such as nephropathy, retinopathy, neuropathy and arteriosclerosis.*
Materials and methods: *Among a total of 335 diabetic retinopathy patients, 33 patients were excluded because of non-cooperation or seriousness of associated illness. 302 patients of Diabetic retinopathy were included in the study.*
Results: *31.81% of the diabetes mellitus patients were found to have Diabetic retinopathy. Average age of DR patients is 54 years. Predominant number of patients of DR is females. Female: Male Ratio is 52.32:47.68, though there is male preponderance among diabetic patients 52.89: 47.11. But the value is not statistically significant. Diabetic retinopathy occurred in predominantly above 40 years' age group.*
Conclusion: *There is a statistically significant correlation between severity of Diabetic retinopathy and systolic blood pressure, albuminuria and smoking. Other factors like female preponderance, higher BMI, diastolic blood pressure and alcohol intake were high among patients of diabetic retinopathy, but the values did not show statistically significant correlation with the severity of diabetic retinopathy.*
Key Words: *Diabetes mellitus, BMI, Diabetic retinopathy, DR*

I. Introduction

Diabetes mellitus is a complex metabolic disease caused by a variable interaction between hereditary and environmental factors. The clinical syndrome is defined by hyperglycemia, microvascular abnormalities (retinal and renal) and neuropathy. Its main features are abnormal insulin secretion, high levels of blood glucose and a variety of complications such as nephropathy, retinopathy, neuropathy and arteriosclerosis.[1]

Diabetic retinopathy is a leading cause of blindness in Americans between 20 and 74 years old, it is responsible for 12% of all new cases of blindness every year (2-3). The prevalence of diabetic retinopathy has been reported from 18 to 40% depending on the population studied.[2] Authors estimate that 1 to 3% of the world's population has diabetes (1-2). Approximately 85% of all cases present in patients 40 years old or older and only 5% in patients younger than 20 years old. Currently there is insufficient data on diabetic epidemiology in Brazil.[3] Papers presented at the 7th Brazilian Congress to Prevent Blindness showed a prevalence of 1.42 to 9.77% of blind eyes due to diabetic retinopathy and its related complications.[4]

Diabetes mellitus is known to produce the microvascular complications and hyperlipidaemia causes endothelial dysfunction due to reduced bioavailability of Nitric Oxide and breakdown of Blood-Retinal Barrier leading to exudation of serum lipid and lipoproteins, which result in Diabetic retinopathy changes and Diabetic macular oedema formation.[5] The established risk factors for development and progression of Diabetic retinopathy include: Type, Duration, Age, Gender, BMI, Glycaemic control, Hypertension, Nephropathy, Smoking, Pregnancy and Serum lipid levels.

II. Materials And Methods

Inclusion Criteria
1. All the patients diagnosed as Diabetic Retinopathy above 20 years of age.
2. Patients of both sexes are taken into the study.

Exclusion Criteria
Non-cooperative patients and patients with Diabetic retinopathy who are seriously ill with other complications.
Methodology
Among a total of 335 diabetic retinopathy patients, 33 patients were excluded because of non-cooperation or seriousness of associated illness. 302 patients of Diabetic retinopathy were included in the study.

All the 302 patients with diabetic retinopathy were subjected to dilated fundoscopy with 90+ D lens direct ophthalmoscopy and were graded as follows-

- Microaneurysm(s) only- Grade I.
- Mild NPDR- Grade II.
- Moderate NPDR- Grade III.
- Severe NPDR- Grade IV.
- Proliferative DR- Grade V.

Prevalence of Diabetic retinopathy, age, sex, occupation, duration of diabetes, BMI, systolic and diastolic blood pressure, smoking history and alcoholic history of these patients were studies. Routine blood and urine examination was done. Presence of albuminuria was noted. All the parameters were correlated with the severity of Diabetic retinopathy.

Statistical Analysis

Descriptive statistics were used to present the findings. Chi-square test of association was used to study the association between severity of retinopathy and different variables under study. Pearson's Chi-square test is used as statistical hypothesis test and Chi-square calculator for a contingency table that has up to five rows and columns is used for calculation. IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp. is used as the statistical tool.

III. Results

Grade of Retinopathy	20-30 Years	30-40 Years	40-50 Years	50-60 Years	> 60 Years	Total
Grade I	02	03	22	39	18	84
Grade II	04	06	26	49	19	104
Grade III	01	12	21	42	06	82
Grade IV	02	03	02	04	05	16
Grade V	01	01	02	09	03	16
Total	**10**	**25**	**73**	**143**	**50**	**302**

Table 1: Age Distribution of Diabetic Retinopathy patients

Grade of Retinopathy	Males	Females	Total	Percentage
Grade I	36	48	84	27.81%
Grade II	49	55	104	34.44%
Grade III	43	39	82	27.15%
Grade IV	08	08	16	5.29%
Grade V	08	08	16	5.29%
Total	**144**	**158**	**302**	**100**

Table 2: Sex distribution of patients of diabetic retinopathy

Profession	No. of Patients	Percentage
Agricultural Workers	181	59.93%
Skilled Labourers	076	25.16%
Others	045	14.90%

Table 3: Professional Occupational Analysis of Diabetic Retinopathy patients

Grade of DR	0-5 Years	5-10 Years	10-15 Years	>15 Years	Total
Grade I	11	13	28	32	84
Grade II	09	21	39	34	104
Grade III	16	16	28	22	82
Grade IV	02	02	09	03	16
Grade V	03	04	07	02	16

Table 4: Duration of DM and Grade of Retinopathy

Grade of DR	SBP 100-130 mmHg	SBP 130-160 mmHg	SBP 160 to 190 mmHg	SBP > 190 mmHg	Total
Grade I	22	16	36	10	84
Grade II	17	29	42	15	104
Grade III	14	32	25	10	82
Grade IV	02	05	04	05	16
Grade V	02	05	03	06	16

Table 5: Systolic Blood Pressure and diabetic retinopathy

Grade of DR	DBP < 90 mmHg	90 to 100 mmHg	100 to 110 mmHg	> 110 mmHg	Total
Grade I	11	27	32	14	84
Grade II	21	21	39	22	104
Grade III	19	21	29	13	82
Grade IV	02	04	04	06	16
Grade V	02	04	04	06	16

Table 6: Diastolic Blood Pressure and diabetic retinopathy

Grade of Retinopathy	BMI < 20	20-25	25-30	> 30	Total
Grade I	06	15	31	32	84
Grade II	18	13	34	38	104
Grade III	22	11	27	22	82
Grade IV	03	02	04	07	16
Grade V	04	02	05	05	16

Table 7: diabetic retinopathy and BMI

Retinopathy	Patients with Albuminuria= 264	Patients with No Albuminuria= 38	Total 302
Grade I	76	08	84
Grade II	93	11	104
Grade III	74	08	82
Grade IV	09	07	16
Grade V	12	04	16

Table 7: Albuminuria and Diabetic Retinopathy

Retinopathy	Non-Smokers 92	Ex-Smokers = 154	Current Smokers = 56	Total 302
Grade I	32	36	16	84
Grade II	18	63	23	104
Grade III	31	42	09	82
Grade IV	05	06	05	16
Grade V	06	07	03	16

Table 8: Smoking and Diabetic Retinopathy

Retinopathy	Alcohol Consumption Not Present = 273	Alcohol Consumption Present = 29	Total =302
Grade I	77	07	84
Grade II	92	12	104
Grade III	77	05	82
Grade IV	13	03	16
Grade V	14	02	16

Table 9: Alcohol consumption and Diabetic Retinopathy

31.81% of the diabetes mellitus patients were found to have Diabetic retinopathy. Average age of DR patients is 54 years.

Predominant number of patients of DR is females. Female: Male Ratio is 52.32:47.68, though there is male preponderance among diabetic patients 52.89: 47.11. But the value is not statistically significant. Diabetic retinopathy occurred in predominantly above 40 years' age group.

There is a statistically significant increase in grades of retinopathy with increased age. 60% of the patients in our study are agriculture workers and 25% skilled labourers.

In our study, prevalence of DR increased with increase in duration of Diabetes mellitus. But the value is not statistically significant.

There is a statistically significant increase in prevalence of DR with increase in systolic blood pressure. There is an increase in prevalence of DR with increase in Diastolic blood pressure, but the value is not statistically significant.

195 cases out of a total of 302 cases belong to group of 25 and above BMI. But the value in our study is not statistically significant. Albuminuria in our study statistically correlated with the severity of Diabetic

retinopathy. Smoking correlated with severity of Diabetic retinopathy. History of alcoholism did not correlate with severity of Diabetic Retinopathy.

IV. Discussion

Though the number of diabetics were more among the men, retinopathy is predominant among women in our study. A Pakistani study also showed female preponderance.[6] The study showed a prevalence of 23.9% of DR, which is similar to our study. Female predominance in our study is not statistically significant.[7] A large Japanese study also showed female predominance. 29.6% of their diabetic patients had retinopathy. Another Indian study showed that duration of Diabetes and Diastolic Blood pressure showed a positive association with diabetic retinopathy with male predominance.[8]

The prevalence of DR in the Chennai Urban Rural Epidemiology (CURES) Eye Study in south India was 17.6 percent. CURES Eye study showed that the major systemic risk factors for onset and progression of DR are duration of diabetes, degree of glycaemic control and hyperlipidaemia. Hypertension did not play a major role in this cross-sectional analysis. In our study, smoking but not alcoholism correlated with severity of DR.[9]

Hammes et al study revealed significant correlation of glycaemic control, HDL-cholesterol and diastolic blood pressure on the occurrence of retinopathy.20 An Italian study showed Systolic BP was significantly related to Diabetic retinopathy, but Diastolic BP was not significantly related, and our study showed similar results.[10]

V. Conclusion

Diabetic retinopathy is a significant complication of diabetes mellitus, which is a cause of preventable blindness or Sight Threatening Retinopathy (STDR). Prevalence of diabetic retinopathy among diabetic patients in our study is 31.81%. Average age of Diabetic retinopathy patients is around 54 years. Several studies correlated development of DR and severity with duration of DM, systolic and diastolic hypertension, BMI, albuminuria, smoking, alcoholism and decreased vitamin D levels. Our study correlated with statistically significant figures with regards to Systolic blood pressure, albuminuria and smoking. Other factors like female preponderance, higher BMI, diastolic blood pressure and alcohol intake were high among patients of diabetic retinopathy, but the values did not show statistically significant correlation with the severity of diabetic retinopathy

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