

**STUDY OF PREVALENCE OF DIABETIC RETINOPATHY AND CORRELATION WITH RISK FACTORS**D. V. C. Nagasree<sup>1</sup>, Ramakrishna Rachakonda<sup>2</sup><sup>1</sup>Associate Professor, Department of Ophthalmology, NRI Medical College, Chinakakani, Guntur, Andhra Pradesh, India.<sup>2</sup>Professor and HOD, Department of Pulmonary Medicine, NRI Medical College, Chinakakani, Guntur, Andhra Pradesh, India.**ABSTRACT****BACKGROUND**

Diabetes mellitus is increasing in our society, so are the complications of diabetes mellitus. Diabetic retinopathy is a common cause of preventable blindness. We have taken a total of 1053 diabetic patients in our tertiary centre and studied 302 patients of Diabetic retinopathy diagnosed in the Department of Ophthalmology as a cross-sectional institution-based descriptive study from April 2016 to October 2017 in our tertiary care centre.

**MATERIALS AND METHODS**

We studied 302 patients of diabetic retinopathy and graded them into five grades of retinopathy. The severity of retinopathy is correlated with age, sex, duration of diabetes mellitus, systolic and diastolic blood pressure, BMI, albuminuria, smoking status and alcohol consumption.

**RESULTS**

Among the 302 diabetic retinopathy patients, there is a male predominance among diabetics. Females outnumbered males in the diabetic retinopathy group. Female preponderance in DR is not significant. There is an age-related increase in diabetic retinopathy, but the values are not statistically significant. 60% of our patients of DR are agricultural labourers in our study. Average age of diabetic retinopathy patients in our study is around 54. Duration of diabetes increased the prevalence of DR, but the values are not significant in our study. Systolic blood pressure, albuminuria and smoking history correlated with severity of DR (p-value < 0.05). BMI, alcoholism and diastolic blood pressure did not correlate with severity of diabetic retinopathy.

**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**

Diabetic Retinopathy, Albuminuria, Systolic Blood Pressure, Diastolic Blood Pressure, Albuminuria, Smoking, Alcoholism.

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**BACKGROUND**

Diabetes mellitus is a chronic disease arising from absolute or relative deficiency of insulin. Globally, an estimated 422 million adults were living with diabetes in 2014 compared to 108 million in 1980. Globally, 8.5% adult population are suffering from Diabetes mellitus.<sup>1</sup> Both Type I and Type II forms of diabetes can lead to multisystem complications of microvascular disease including retinopathy, nephropathy and neuropathy, ischaemic heart disease, stroke and peripheral vascular disease. The premature morbidity, mortality, reduced life expectancy and financial and other costs of diabetes make it an important public health condition.<sup>2</sup>

Diabetic retinopathy is a chronic progressive, potentially sight-threatening disease of the retinal microvasculature associated with the prolonged hyperglycaemia and other conditions linked to diabetes mellitus such as hypertension.

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Diabetic retinopathy is a potentially blinding disease in which the threat to sight comes through two main routes: growth of new vessels leading to intraocular haemorrhage and possible retinal detachment with profound global sight loss and localised damage to the macula/fovea of the eye with loss of central visual acuity.<sup>3</sup>

Environmental and lifestyle changes resulting from industrialisation and migration to urban environment from rural settings may be responsible to a large extent for this epidemic of Type 2 diabetes in Indians. Obesity, especially central obesity and increased visceral fat due to physical inactivity and consumption of a high-calorie/ high-fat and high sugar diets are major contributing factors. There is also strong evidence that Indians have a greater degree of insulin resistance and a stronger genetic predisposition to diabetes. One-third of the world's burden of Diabetes is borne by India and China.<sup>4</sup> The overall prevalence of pre-diabetes in 15 states in India was 10.3%.<sup>5</sup> The prevalence of diabetes among adults has reached approximately 20% in urban populations and approximately 10% in rural populations.<sup>6</sup>

Relevance of Diabetic retinopathy in India: India has more than 62 million Diabetic individuals and many more undiagnosed and as a result Diabetic retinopathy is emerging as an important cause of visual disability, reported by World Health Organisation.<sup>7,8,9,10</sup> It was estimated that about 5.5 million adult patients with Diabetes have Diabetic

retinopathy. About 50,000 new cases of blindness occur per year, out of which 50% are caused by Diabetes, that too mostly by Diabetic retinopathy.<sup>11</sup>

Diabetes mellitus is known to produce the microvascular complications<sup>12</sup> 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.<sup>13,14</sup> 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.<sup>15,16</sup>

**Aims and Objectives**

1. To study the prevalence of Diabetic retinopathy among diabetic patients.
2. To study the demographic data and co-factors in diabetic retinopathy patients.
3. To study the influence of Duration of Diabetes, BMI, Systolic and Diastolic blood pressures, Smoking, Alcoholism and Albuminuria among Diabetic Retinopathy patients.
4. To correlate the various parameters with the severity of Diabetic retinopathy for the purpose of preventing visual loss.

**Study Design**

It is a cross-sectional institution-based descriptive study from April 2016 to October 2017 in a tertiary care centre.

**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 funduscopy 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 studied. 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.

Sl. No.	Total No. Studied	Cofactor	No. of Patients	%
1.	302	Female sex	158	52.32%
2.	302	Age above 40 years	266	88%
3.	302	Duration of DM > 10 years	204	67.54%
4.	302	SBP > 130 mmHg	243	80.46
5.	302	DBP> 90 mmHg	247	81.79%
6.	302	BMI > 25 kg/meter square	205	67.88%
7.	302	Albuminuria	264	87.41%
8.	302	Current or Ex-Smokers	210	69.5%
9.	302	Alcohol Consumption	29	9.60%

**Table 1**

Total No. of Diabetic Patients	No. of Patients with Retinopathy	Percentage
1053	335	31.81%

**Table 2**

Male Diabetics 557 and Female Diabetics 496. Ratio is 52.89%: 47.11%. Average age of diabetic retinopathy patients is 54.44

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
<b>Total</b>	<b>10</b>	<b>25</b>	<b>73</b>	<b>143</b>	<b>50</b>	<b>302</b>

**Table 3. Age Distribution of Diabetic Retinopathy Patients**

The Chi-square statistic for age is 26.9195. The p-value is 0.042386. The result is significant at p < 0.05.

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%
<b>Total</b>	<b>144</b>	<b>158</b>	<b>302</b>	<b>100</b>
<b>Percentage</b>	<b>47.68%</b>	<b>52.32%</b>	<b>302</b>	<b>100</b>

**Table 4. Sex Distribution of patients of Diabetic Retinopathy**

The Chi-square statistic for female preponderance is 1.61. The p-value is 0.806991. The result is not significant at  $p < 0.05$ .

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

**Table 5. 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 6. Duration of DM and Grade of Retinopathy**

The Chi-square statistic is 12.3856 and the p-value is 0.415232 and the value are not significant for  $p < 0.05$ .

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 7. Systolic Blood Pressure and Diabetic Retinopathy**

The Chi-square statistic for SBP is 22.5108 and p-value is 0.032179. The result is significant at  $p < 0.05$ .

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 8. Diastolic Blood Pressure and Diabetic Retinopathy**

The Chi-square statistic for DBP is 13.0136. The p-value is 0.368055. The result is not significant at  $p < 0.05$ .

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 9. Diabetic Retinopathy and BMI**

The Chi-square statistic for BMI is 13.759. The p-value is 0.316362. The value is not statistically significant at  $p < 0.05$ .

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 10. Albuminuria and Diabetic Retinopathy**

The Chi-square statistic is 18.0635. The p-value is 0.001199. The result is statistically significant at  $p < 0.05$ .

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 11. Smoking and Diabetic Retinopathy**

The Chi-square statistic is 17.5823. The p-value is 0.024586. The result is statistically significant at  $p < 0.05$ .

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 12. Alcohol Consumption and Diabetic Retinopathy**

The Chi-square statistic is 3.4624. The p-value is .483612. The result is not significant at  $p < 0.05$ .

Sl. No.	Variable	Chi-square	P-value	Significance $p < .05$
1.	Age Distribution	26.9195	0.042386	Significant
2.	Duration of DM	12.3856	0.415232	Not Significant
3.	Systolic Blood Pressure	22.5108	0.032179	Significant
4.	Diastolic BP	13.0136	0.368055	Not Significant
5.	BMI	13.759	0.316362	Not Significant
6.	Albuminuria	18.0635	0.001199	Significant
7.	Smoking	17.5823	0.024586	Significant
8.	Alcohol consumption	3.4624	0.483612	Not Significant

**Table 13. Summarised Statistical Analysis**

**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 are 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.

## 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. The study showed a prevalence of 23.9% of DR, which is similar to our study.<sup>17</sup> Female predominance in our study is not statistically significant. A large Japanese study also showed female predominance. 29.6% of their diabetic patients had retinopathy.<sup>18</sup> Another Indian study showed that duration of Diabetes and Diastolic Blood pressure showed a positive association with diabetic retinopathy with male predominance.<sup>19</sup> 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.<sup>9</sup> In our study, smoking but not alcoholism correlated with severity of DR. Hammes et al study revealed significant correlation of glycaemic control, HDL-cholesterol and diastolic blood pressure on the occurrence of retinopathy.<sup>20</sup> 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.<sup>21</sup>

## 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.

## Abbreviations

DR: Diabetic Retinopathy; NPDR: Non-Proliferative Diabetic Retinopathy; BMI: Body Mass Index; NPDR: Non-Proliferative Diabetic Retinopathy; STDR: Sight Threatening Diabetic Retinopathy.

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