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CORRELATION OF SMOKING WITH DIABETIC RETINOPATHY AND DIABETIC MACULOPATHY

Ophthalmology

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ABSTRACT

To determine the effect of smoking on diabetic retinopathy and maculopathy

MATERIALS AND METHODS: This was a bidirectional cohort observational study of 100 cases (199 eyes with one single eyed) of type 2 Diabetes with diabetic retinopathy in atleast one eye conducted in tertiary care hospital. Included patients' demographic details, detailed history regarding the age, duration of diabetes and history of smoking. Stage of diabetic retinopathy according to Early Treatment Diabetic Retinopathy (ETDRS) grading system was done. Type of maculopathy was documented using fundus fluorescein angiography. Correlation of smoking with diabetic retinopathy and maculopathy was tested statistically.

RESULTS: Out of 100 cases, 68 were males and 32 were females. Mean age was 57.21 years and ranged from 41-73 years. Out of 194 eyes with diabetic retinopathy, 31 (15.98%) were in the smoking group. Among 129 eyes with maculopathy, 28 (21.71%) were in smoking group. Smoking had no significant correlation with diabetic retinopathy. There was significant association of smoking with maculopathy. Smoking had no significant association with worsening of vision in the follow-up period.

KEYWORDS

Smoking, diabetic retinopathy, diabetic maculopathy

Introduction:

Cigarettes provide the delivery system for nicotine, an addictive substance related to various pharmacological, biochemical, and psychological processes that interact to support a compulsive pattern of drug use. Other studies found a heightened risk of morbidity and premature death associated with the development of macrovascular complications among smokers with diabetes. Smoking is also related to the premature development of microvascular complications of diabetes and may even have a role in the development of type 2 diabetes[1].

The risk of kidney disease (nephropathy) is increased in Type 1 diabetes patients who smoke[2]. Both active and passive smoking increases the risk of chronic kidney disease in Type 2 diabetes patients[3]. Smoking increases the risk of albuminuria (the presence of protein in the urine, which indicates signs of kidney disease) in both Type 1 and Type 2 diabetes[4,5]. The relationship between cigarette smoking and retinopathy (disorders of the retina) is less well defined than that of other microvascular complications of diabetes[1]. However, some studies have found an association between smoking and diabetic retinopathy[2,6].

Smoking can raise blood sugar by 15% in just 30 minutes. Since the average cigarette contains 1 mg of nicotine, smoking just 2 to 3 cigarettes a day can spike blood sugar by 29%. The increase of glycemia after smoking is assumed to be due to the mobilization of catecholamines and the stimulation of STH and cortisol production. This reaction seems to be more marked in diabetics than in metabolically normal subjects[7].

Wider retinal venular caliber is associated with smoking in Japanese females; however, this impact of smoking on retinal venular dilation is reversible following long-term smoking cessation[8].

MATERIALS AND METHODS:

This was a bidirectional cohort observational study of 100 (199 eyes) cases of Diabetes with diabetic retinopathy in atleast one eye conducted in tertiary care hospital.

Diabetic retinopathy patients who fulfill the inclusion and exclusion criteria attending the outpatient department at tertiary care hospital during the study period. Inclusion criteria: All patients with diabetic retinopathy. Exclusion criteria: i) Narrow angles, ii) Media opacities which preclude fundus examination, iii) Patients already treated for diabetic retinopathy.

Methodology: Informed consent was obtained. Included patient's demographic details, detailed history regarding the age, duration of diabetes and history of smoking. Fundus picture was documented using fundus imaging system after pupillary dilatation. Stage of diabetic retinopathy according to Early Treatment Diabetic Retinopathy (ETDRS) grading system was done. Type of maculopathy documented using fundus fluorescein angiography.

Correlation of smoking with diabetic retinopathy and maculopathy was tested statistically.

STATISTICALANALYSIS:

The study subjects were analysed and correlated smoking and diabetic retinopathy with Kendall's tau test, Smoking and maculopathy was associated by Pearson's chi square test. Smoking and incidence of macular edema was associated by Fisher's Exact test. Smoking and worsening of vision was associated by Pearson's chi square test. The above statistical procedures were performed by IBM SPSS statistics 11. P values less than 0.05 ($p<0.05$) were defined as statistically significant in two-tailed test.

Results:

Out of 100 cases, 68 were males and 32 were females. Mean age was 57.21 years and ranged from 41-73 years.

Chart 1 Sex distribution

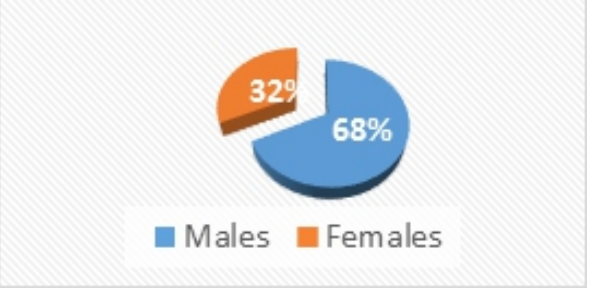
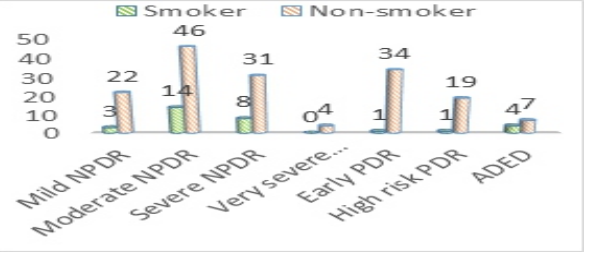


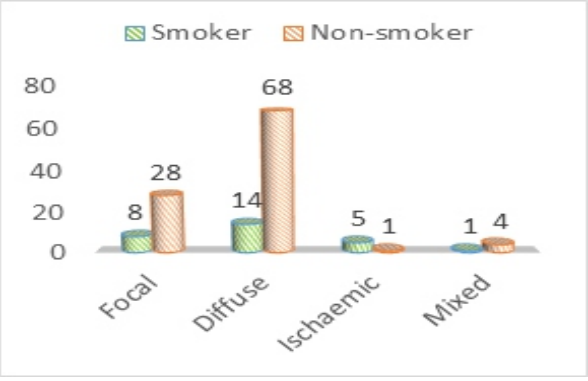
Chart 2 Smoking and stage of DR



* Kendall's tau test, p value 0.287

Out of 194 eyes with diabetic retinopathy, 31 (15.98%) were in smoking group. Among 31 eyes in smoking group, 3 (9.68%) were with mild NPDR, 14 (45.16%) with moderate NPDR, 8 (25.8%) with severe NPDR, none with very severe NPDR, 1 (3.22%) with early PDR, 1 (3.22%) with high risk PDR and 4 (12.9%) with advanced diabetic eye disease. Smoking had no significant correlation with DR and the p value was 0.287.

Chart 3 Smoking and type of maculopathy



*Pearson's Chi square test

Among 129 eyes with maculopathy,28 (21.71%) were in smoking group which accounted for 21.71%. Among 28 eyes with maculopathy, 8(28.57%) were with focal maculopathy, 14 (50%) with diffuse maculopathy, 5 (17.86%) with ischaemic maculopathy and 1(3.57%) eye with mixed maculopathy. Diffuse maculopathy was the commonest type of maculopathy among smokers. There was significant association of smoking with maculopathy and the p value was 0.003%.

TABLE 1 Smoking and worsening of vision

Smoking	Worsening of vision		Total	P value
	Yes	No		
Yes	25	3	28	0.102
No	125	41	166	
Total	6	60	194	

*Pearson's Chi square test

Among 28 eyes with smoking who were followed up for 6 months, 25 had worsening of vision which was 89.28%. Smoking and worsening of vision had no significant association and p value was 0.102.

TABLE 2 Smoking and various parameters

Parameter	Mean	P value
Systolic BP	129	0.007
Diastolic BP	81	0.106
FBS	153.94	0.632
PPBS	256.97	0.254
Urea	28.14	0.006
Creatinine	1.185	0.010

In our study, the mean systolic and diastolic BP were 129 and 81respectively. Smoking and systolic BP had significant negative correlation (-0.162) by Kendall's tau test and the p value was 0.006. Smoking and diastolic BP had no correlation (-0.088) and the p value was not significant (0.141).

The mean fasting blood sugar level was 153.94 and that of postprandial blood sugar was 256.97. Smoking and postprandial blood sugar level had positive correlation and the p value was significant (0.017) Smoking and albuminuria had no significant correlation (0.053) and the p value was 0.451. The mean values of urea and creatinine were 28.14 and 1.185 respectively and there was no significant correlation (p values 0.523 and 0.459 respectively). Smoking and nephropathy had no significant correlation in our study.

TABLE 3 Smoking and A:V Ratio

Smoking	A: V Ratio				Total
	2:3	1:3	1:4	2:4	
Yes	10	0	2	19	31
No	105	11	10	42	168
Total	115	11	12	61	199

- Kendall's tau test, p value 0.000

Smoking and venous dilatation had significant correlation and the p value was very significant (<0.00001).

DISCUSSION:

Smoking is a clear risk factor for cardiovascular disease in both diabetics and nondiabetics. It is also a risk factor for the progression of albuminuria to proteinuria and nephropathy in both type 1 and type 2 diabetic patients. Smoking can increase blood pressure in diabetic patients with nephropathy. However the effects of smoking on DR are unclear. Some studies have suggested an association while others have not. Muhlhauser and Sawicki et al suggested an association of smoking with progression of diabetic retinopathy. Later Muhlhauser concluded that the association between smoking and retinopathy remains less consistent than the association between smoking and nephropathy[2,9,10].
Out of 199 eyes studied, 194 eyes were with diabetic retinopathy. Among the DR eyes, 15.98% were in smoking group. In the smoking group, 9.68% were with mild NPDR, 45.16% with moderate NPDR, 25.8% with severe NPDR, 0% with very severe NPDR, 3.22% with early PDR, 3.22%with high risk PDR and 4 12.9% with advanced diabetic eye disease. Smoking had no significant correlation with DR and the p value was 0.287 which was comparable to Muhlhauser et al study.

Among 129 eyes with maculopathy, 21.71% were in smoking group. In the smoking group, 28.57% were with focal maculopathy, 50% with diffuse maculopathy, 17.86% with ischaemic maculopathy and 3.57% with mixed maculopathy. Though Diffuse maculopathy was the commonest type of maculopathy in our study, ischaemic maculopathy was most common among smokers. There was significant association of smoking with maculopathy and the p value was 0.003%.

Among 28 eyes with smoking who were followed up for 2 years, 25 had worsening of vision which was 89.28%. Smoking and worsening of vision had no significant association and p value was 0.102.

In our study, the mean systolic and diastolic BP were 129.78 and 81.08 respectively. Smoking and systolic BP had significant negative correlation (-0.162) by Kendall's tau test and the p value was 0.006. Smoking and diastolic BP had no correlation (-0.088) and the p value was not significant (0.141).

The mean fasting blood sugar level was 153.94 and that of postprandial blood sugar was 256.97. Smoking and postprandial blood sugar level had positive correlation and the p value was significant (0.017). In our study smoking was found to cause hyperglycaemia by 28.5% on an average.

Smoking and albuminuria had no significant correlation (0.053) and the p value was 0.451. The mean values of urea and creatinine were 28.14 and 1.185 respectively and there was no significant correlation (p values 0.523 and 0.459 respectively). Smoking and nephropathy had no significant correlation in our study.

Smoking and venous dilatation had significant correlation and the p value was very significant (<0.00001). Smoking group eyes had retinal venous dilatation which was an indicator of progression of diabetic retinopathy in our study. This was comparable to Masahide Yanagi study.

CONCLUSION:

Smoking cessation is one of the best interventions and gold standard that can safely and cost-effectively be recommended for all patients to halt progression of maculopathy in diabetics.

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