

# Determining the Association Between Retinopathy and Metabolic Syndrome in Patients with Type 2 Diabetes Mellitus Visiting Mayo Hospital, Lahore

Ghani U.,<sup>1</sup> Niaz Z.,<sup>2</sup> Cheema T.M.,<sup>3</sup> Abaidullah S.,<sup>4</sup> Salman S.,<sup>5</sup> Latif F.<sup>6</sup>

*Address for Correspondence:* Usman Ghani, Department of Diabetic Mellitus, King Edward Medical University / Mayo Hospital, Lahore

---

**Introduction:** The metabolic syndrome is a cluster of metabolic abnormalities including abdominal obesity, glucose intolerance, hypertension and dyslipidemia. Diabetic retinopathy is common sequel of diabetes.

**Objective:** To determine the frequency of retinopathy in patients of type 2 diabetes metabolic syndrome.

**Study Design:** Descriptive study. This study was conducted in diabetic clinic of Mayo Hospital, Lahore, from 17<sup>th</sup> January 2007 to 16<sup>th</sup> July 2007.

**Methods:** Three hundred and sixty patients fulfilling the inclusion criteria were selected for this study and divided into two groups. (Diabetes and with metabolic syndrome) Demographic data of each patient including age, sex, height and weight were collected. Each patient was interviewed about the duration, treatment and complications of diabetes. Data were analyzed by SPSS. P value was calculated by Chi Square test.

**Results:** In group I, the mean height was  $1.60 \pm 0.08$  meters, mean weight was  $68.82 \pm 7.36$  kilograms and mean BMI was  $26.38 \pm 1.10$  kg/m<sup>2</sup> and In group II, the mean height was  $1.56 \pm 0.12$  meters, mean weight was  $81.58 \pm 9.85$  kilograms and mean BMI was  $33.80 \pm 3.61$  kg/m<sup>2</sup>. In group I micro aneurysms, dot hemorrhages, blot hemorrhages and hard exudates were found in 12.22% patients. In group II, microaneurysms, dot hemorrhages, blot hemorrhages and hard exudates were found in 25% patients (p 0.0028). In group I, there were 10.56% patients in which cotton wool spots were found and in group II there were 11.67% patients in which cotton wool spots were found (p 0.0358). In group I, there were 2.78% patients in which new blood vessel formation were found and in group II there were 4.44% patients in which new blood vessel formation was found (p 0.625).

**Conclusion:** It is concluded from this study that frequency of retinopathy is high in patients with metabolic syndrome as compared to patients without metabolic syndrome.

**Key Words:** Type 2 diabetes mellitus, metabolic syndrome, retinopathy.

---

## Introduction

The prevalence of type-2 diabetes mellitus is increasing worldwide. The story is not very different in Pakistan. For the last two decades, diabetes mellitus is spreading like an epidemic in our country. Diabetes mellitus is associated with other risk factors, for example dyslipidaemia, hypertension and obesity.

The metabolic syndrome is a cluster of metabolic abnormalities including abdominal obesity, glucose intolerance, hypertension and dyslipidemia.<sup>1</sup>

Diabetic retinopathy is common sequel of diabetes.<sup>2</sup> Poor glycemic control, disease duration, hypertension and dyslipidemia are considered to be important risk factors for microvascular complications.<sup>3</sup> Persons with metabolic syndrome are more likely to have retinopathy, arteriovenous nicking, focal arteriolar narrowing, generalized retinal arteriolar narrowing and generalized retinal venular dilatation than persons without metabolic syndrome.<sup>4</sup>

In this study it was aimed to find out the frequency of retinopathy in patients with type-2 diabetes mellitus, with and without metabolic syndrome.

## Material and Methods

Descriptive study was conducted in diabetic clinic of Mayo Hospital Lahore. Three hundred and sixty type 2 diabetics: 180 with metabolic syndrome and 180 without metabolic syndrome were included. Duration of study was Six months from 17<sup>th</sup> January 2007 to 16<sup>th</sup> July 2007, through purposive sampling

### Inclusion Criteria:

Patients with diagnosed type 2 diabetes mellitus with and without metabolic syndrome.

### Exclusion Criteria:

Type 2 diabetic subjects with advanced renal disease, cardiac disease or liver disease.

### Data Collection:

Three hundred and sixty patients fulfilling the inclusion criteria were selected from diabetic clinic of Mayo Hospital Lahore and divided into two groups, in group I, 180 patients without metabolic syndrome and in group II, 180 patients with metabolic syndrome. Each patient was explained the

purpose of the study and an informed consent was taken. Demographic data of each patient including age, sex, height and weight was collected. Each patient was interviewed about the duration, treatment and complications of diabetes. Blood pressure was recorded of each patient on three visits. Laboratory tests for fasting blood sugar level and fasting lipid profile were collected. The patients were examined by a trained experienced physician with the help of an ophthalmoscope and findings were recorded. All the above data was entered in the pre-designed proforma attached. The data were analyzed through SPSS. Results were expressed by Chi-Square test and P value.

## Results

The mean age of the patients in group I was  $53.30 \pm 4.57$  years. The mean age of the patients in group II was  $48.79 \pm 2.90$  years. In group I, 114 (63.33%) patients were male and 66 (36.67%) patients were female and in group II 90 (50%) patients were male and 90 (50%) patients were female.

In group I, there were 130 (70.22%) patients of controlled diabetes mellitus and 50 (27.78%) patients of uncontrolled diabetes mellitus. In group II, there were 88 (48.89%) patients of controlled diabetes mellitus and 92 (51.11%) patients of uncontrolled diabetes mellitus. In group I, the mean systolic blood pressure was  $131.44 \pm 6.94$  mmHg on first visit,  $130.28 \pm 6.55$  mmHg on second visit and  $130.17 \pm 6.30$  mmHg on third visit. In group II, the mean systolic blood pressure was  $146.36 \pm 9.72$  mmHg on first visit,  $144.22 \pm 8.11$  mmHg on second visit and  $143.35 \pm 7.92$  mmHg on third visit. In group I, the mean diastolic blood pressure was  $83.33 \pm 7.17$  mmHg on first visit,  $81.50 \pm 7.21$  mmHg on second visit and  $81.50 \pm 7.20$  mmHg on third visit. In group II, the mean diastolic blood pressure was  $96.78 \pm 6.98$  mmHg on first visit,  $95.28 \pm 6.15$  mmHg on second visit and  $94.35 \pm 6.02$  mmHg on third visit.

In group I, the mean serum triglyceride level was  $140.91 \pm 9.23$  mg/dl, mean LDL cholesterol was  $112.49 \pm 13.49$  mg/dl and mean HDL cholesterol was  $47.58 \pm 3.20$  mg/dl. In group II, the mean triglycerides was  $251.21 \pm 24.76$  mg/dl, mean LDL cholesterol was  $192.56 \pm 18.56$  mg/dl and mean HDL cholesterol was  $43.0 \pm 3.06$  mg/dl. In group I, the mean height was  $1.60 \pm 0.08$  meters, mean weight was  $68.82 \pm 7.36$  kilograms and mean BMI was  $26.38 \pm 1.10$ . In group II, the mean height was  $1.56 \pm 0.12$  meters, mean weight was  $81.58 \pm 9.85$  kilograms and mean BMI was  $33.80 \pm 3.61$ .

In group I, there were 22 (12.22%) patients in which microaneurysms, dot hemorrhages, blot hemorrhages and hard exudates were found. In group II, there were 45 (25.0%) patients in which microaneurysms, dot hemorrhages, blot hemorrhages and hard exudates were found (p.0028) (Table 1). In group I, there were 19 (10.56%) patients in which cotton wool spots was found and in group II there were 21 (11.67%) patients in which cotton wool spots was found (p 0.358) (Table 2). In group I, there were 5 (2.78%) patients in which new blood vessel formation was

found and in group II there were 8 (4.44%) patients in which new blood vessel formation was found (p 0.625) (Table 3).

**Table 1:** Distribution of patients by background retinopathy.

Background Retinopathy			
	Yes	No	Total
Group II (Yes)	45	135	180
Group I (No)	22	158	180
	67	293	360
$\chi^2$	8.68		
Df	1		
P	0.0020028		

**Table 2:** Distribution of patients by pre-proliferative retinopathy.

Pre-proliferative			
	Yes	No	Total
Group II (Yes)	21	159	180
Group I (No)	19	161	180
	40	320	360
$\chi^2$	0.845		
Df	1		
P	0.358		

**Table 3:** Distribution of patients by proliferative retinopathy.

Proliferative Retinopathy			
	Yes	No	Total
Group II (Yes)	8	172	180
Group I (No)	5	175	180
	13	347	360
$\chi^2$	0.239		
Df	1		
P	0.625		

## Discussion

In our study the mean duration of diabetes mellitus in group I was  $8.86 \pm 2.80$  years. The mean duration of diabetes mellitus in group II was  $6.91 \pm 1.94$  years. In the study of Rotimi et al<sup>5</sup> the mean duration of diabetes mellitus was 7 years and in the study of Ashraf et al<sup>6</sup> the mean duration of diabetes mellitus was 13 years. So our results are comparable with the results of Rotimi et al.<sup>5</sup>

The associated factors in type-2 diabetes mellitus like, hypertension, dyslipidaemia and obesity are also part of metabolic syndrome. The frequency of metabolic syndrome, defined as association of obesity, NIDDM, hypertension, raised LDL and raised triglyceride, was noted in 2.6% patients above the age of 40 years.<sup>7</sup> The significant frequency of metabolic syndrome is alarming and we need to strengthen our existing clinical strategies for prevention of obesity, better management of hypertension and diabetes and increased physical activity to prevent macrovascular complications in type-2 diabetes mellitus. The frequency of hypertension and diabetes mellitus also increases with age. It is seen that these two are then associated with higher incidence of obesity, hypertriglyceridemia and decreased HDL cholesterol.<sup>8</sup>

In type 2 diabetes mellitus increased triglyceride and reduced HDL-cholesterol levels are the key characteristic of dyslipidemia.<sup>9</sup> A retrospective study was carried out to find out the percentage of dyslipidemia in type-2 diabetes. It was observed that patient with low HDL-cholesterol and predominance of LDL-cholesterol carry an increased risk of developing coronary artery disease.<sup>10</sup>

In this study, group I, the mean triglyceride was  $140.91 \pm 9.23$  mg/dl, LDL cholesterol was  $112.49 \pm 13.49$  mg/dl and HDL cholesterol was  $47.58 \pm 3.20$  mg/dl. In group II, the mean triglycerides was  $251.21 \pm 24.76$  mg/dl, LDL cholesterol was  $192.56 \pm 18.56$  mg/dl and HDL cholesterol was  $43.0 \pm 3.06$  mg/dl.

Current options for the management of cardiovascular risk factors in those with diabetes mellitus include, lowering the LDL-cholesterol levels below 100 mg/dl, lowering blood pressure below 130/85 mm Hg, improving hyperglycemia and the atherogenic lipid profile (i.e. triglyceride and HDL-cholesterol levels).<sup>11</sup>

The associated factors in type-2 diabetes mellitus, hypertension, dyslipidaemia and obesity are also part of metabolic syndrome. The frequency of metabolic syndrome (Obesity, NIDDM, hypertension, raised LDL and raised triglyceride), was noted in 2.6% patients above the age of 40 years.<sup>7</sup> The significant frequency of metabolic syndrome is alarming and we need to strengthen our existing clinical strategies for prevention of obesity, better management of hypertension and diabetes and increased physical activity to prevent macrovascular complication in type-2 diabetes mellitus. The frequency of hypertension and diabetes mellitus also increases with age. It is seen that these two are then associated with higher incidence of obesity, hypertriglyceridemia and decreased HDL cholesterol.<sup>8</sup> The presence of hypertension and diabetes together with other risk factors like obesity, hyperlipidemia, smoking and atherosclerosis make the prognosis worse.<sup>12</sup>

In our study, in group I, the mean systolic blood pressure was  $131.44 \pm 6.94$  mmHg. In group II, the mean systolic blood pressure was  $146.36 \pm 9.72$  mmHg. While comparing with the study of Fawwad et al the mean systolic blood pressure was  $129.7 \pm 19.7$  mmHg.<sup>13</sup>

In group I, the mean diastolic blood pressure was 83.33

$\pm 7.17$  mmHg. In group II, the mean diastolic blood pressure was  $96.78 \pm 6.98$  mmHg. While comparing with the study of Fawwad et al the mean diastolic blood pressure was  $80.9 \pm 10.8$  mmHg.<sup>13</sup>

In our study in group I, the mean height was  $1.60 \pm 0.08$  meters, mean weight was  $68.82 \pm 7.36$  kilograms and mean BMI was  $26.38 \pm 1.10$  kg/m<sup>2</sup>. In group II, the mean height was  $1.56 \pm 0.12$  meters, mean weight was  $81.58 \pm 9.85$  kilograms and mean BMI was  $33.80 \pm 3.61$  kg/m<sup>2</sup>. While comparing with the study of Fawwad et al the mean BMI was  $27.8 \pm 4.9$  kg/m<sup>2</sup>.<sup>13</sup>

In our study in group I, there were 12.22% patients in which background retinopathy was found. In group II, there were 25% patients in which background retinopathy was found. (p 0.0028). In our study in group I, there were 10.56% patients in which pre-proliferative retinopathy were found and in group II there were 11.67% patients in which pre-proliferative retinopathy was found (p 0.358). In our study in group I, there were 2.78% patients in which proliferative retinopathy were found and in group II there were 4.44% patients in which proliferative retinopathy was found (p 0.625). While comparing with the study of Rotimi et al<sup>5</sup> prevalence of diabetic retinopathy was 17.9%.

## Conclusion

It is concluded from this study that frequency of background retinopathy is more in diabetic patients with metabolic syndrome and it is statistically significant (p 0.0028), while the frequency of pre-proliferative and proliferative retinopathy in diabetic patients with metabolic syndrome is more as compared to diabetic patients, but statistically not significant (p 0.358 and p 0.0625).

## References

1. Daskalopoulou SS, Athyros VG, Kolovou GD, Anagnostopoulou KK, Mikhailidis DP. Definitions of metabolic syndrome: where are we now. *Curr Vasc Pharmacol* 2006; 4: 185-97.
2. Naseem A, Jan S, Muhammad S. Presentation of diabetic retinopathy. *J Postgrad Med Inst* 2003; 17: 26-31.
3. Stratton IM, Kohner EM, Aldington SI, Turner RC, Hlman RR, Mnley SC et al. UKPDS 50 risk factors for incidence and progression of retinopathy in type 2 diabetes over 6 years from diagnosis. *Diabetologia* 2001; 44: 156-63.
4. Wong TV, Duncan BB, Golden SH, Klein R, Couper DJ, Klein BE et al. Associations between metabolic syndrome and retinal micro vascular signs: the atherosclerosis risk in communities study. *Invest Ophthalmol Vis Sci* 2004; 45: 2949-54.
5. Rotimi C, Daniel H, Zhou J, Obisesan A, Chen G, Chen Y et al. Prevalence and determinants of diabetic retinopathy and cataracts in West African type 2 diabetes patients. *Ethn Dis* 2003; 13: S1010-7.

6. Ashraf S, Ziauddin F, Jahangeer U. Metabolic syndrome in type-2 diabetes mellitus. *Pak J Med Sci* 2006; 22: 295-9.
7. Dodani S, Qureshi R, Ali BS. Syndrome X and family practitioners. *J Pak Med Assoc* 1999; 49: 177-80.
8. Ghanem WA, Murin J, Sleman O, Jabar J, Bulas J, Mikes P et al. Relation of left ventricular hypertrophy to cardiovascular complications in diabetic hypertensives. *Bratisl lek listy* 2001; 102: 564-9.
9. Niemejer-Kanters SD, Banga JD, Erkelens DW. Lipid lowering therapy in diabetes mellitus. *Neth J Med* 2001; 58: 214-22.
10. Marks JB, Raskin P. Cardiovascular risks in diabetes: a brief review. *J Diabetes Complications* 2000; 14: 108-15.
11. Goldberg RB. Hyperlipidaemia and cardiovascular risk factors in patients with type-2 diabetes. *Am J Manag Care* 2000; 6: 682-91.
12. Rosolova H. Hypertension and diabetes mellitus pathophysiology and risk. *Vnitr Lek* 1999; 45: 655-60.
13. Fawwad A, Qasim R, Hydrie ZI, Basit A, Miyan Z, Gul A. Correlation of fasting insulin resistance indices with clinical parameters of metabolic syndrome in type 2 diabetic subjects. *Pak J Med Sci* 2006; 22: 433-7.