

# Characteristics of Diabetic Patients and Pattern of Diabetic Complications

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The objective of our study was to elucidate and establish the basic characteristics of diabetic patients in Pakistani population and to determine the prevalence of micro and macrovascular complications in them. This was an observational study conducted in the diabetic clinic of Mayo Hospital, affiliated with King Edward Medical College Lahore. Six hundred and seventy patients attending diabetic clinic in the year 1996-97 were studied. We determined the basic characteristics of patients and diabetic complication on history, physical examination and investigations. A total of 670 patients (174 males and 496 females) were studied. Most of the patient's ages at the onset of diabetes ranged from 36-55 years, with the mean value of  $41.1 \pm 13.5$  years. Female to male ratio was 2.5:1. Fifty-four percent of patients were overweight (BMI >25 kg/m<sup>2</sup>) and history of diabetes in first degree relatives was obtained in 46.7% of patients. Ninety one percent had NIDDM and 9% IDDM. Out of the total, 22.3% had retinopathy, 14.6% had nephropathy while sensory and motor neuropathy was present in 40.6% and 29.1% respectively. History of angina pectoris was present in 16.4%, myocardial infarction in 5.5%, cerebrovascular accident in 5.8%, and 3.7% had peripheral vascular disease. Approximately 53% of the patients were hypertensive (systolic >140 or diastolic >90). Out of 112 patients with an early onset of disease (<40 years) 8 had experienced ketoacidosis compared to 9 out of 503 (1.8%) who had late onset diabetes. Two hundred eighty nine (42.9%) patients required hospitalization, either for the control of diabetes or for the management of its complications. Seventy five percent of the patients had at least one complication attributable to diabetes mellitus. We conclude that NIDDM is highly prevalent in our society with seventy five percent of patients presenting with one or more complications. Needless to say that more attention given to good metabolic control can reduce the prevalence of diabetic complications.<sup>1</sup>

**Key Words:** Diabetes mellitus, diabetic complications.

Diabetes is extremely prevalent in all countries of the world including Pakistan.<sup>2</sup> It is characterized by microvascular complications such as retinopathy, nephropathy and neuropathy.<sup>3</sup> Macrovascular complications like ischaemic heart disease, cerebrovascular accidents and peripheral vascular disease are also commonly seen in diabetic patients.<sup>4</sup> Their exact relationship with diabetes is however difficult to ascertain, because other risk factors like obesity, hyperlipidaemia and sedentary life style often co-exist which may contribute in the pathogenesis of such complications.<sup>5</sup> In several previous studies it has been demonstrated that the incidence of microvascular complications is roughly proportional to the duration of diabetes mellitus and the degree of glycaemic control.<sup>6</sup> In Pakistan due to limited financial resources, poor motivation and lack of patient education the long term glycaemic control is particularly poor. The objective of this study was to determine the characteristics of diabetic patients in our population and prevalence of complications in these patients.

## Patients and Methods:

All the patients attending diabetic clinic, Mayo Hospital, Lahore from 1996-97 were included in the study. A detailed history was taken and their previous medical record reviewed. Their height, weight, and blood pressure was recorded. A thorough physical examination especially directed to pick up diabetic complications was performed.

This included deep tendon reflexes, position sense, vibration sense and fundoscopy. On subsequent visits their urine was collected and tested for proteins and sugar. A fasting and 2-hours postprandial blood sugar, blood urea and creatinine, was determined. Any adult having fasting sugar of more than 140 mg/dl or postprandial blood sugar of more than 200 mg/dl was considered diabetic. Glycated haemoglobin, fructosamine and lipid profile was not done due to financial constraints. ECG was recorded to screen ischaemic heart disease. Criteria used for the diagnosis of different complications are described in Table 1.

**Exclusion criteria:** Diabetic patients whose complications could be attributed to other existing diseases were excluded. Gestational diabetes, secondary diabetes, impaired glucose tolerance (IGT) or patients with transient hyperglycemia due to stress or medication, were also excluded.

## Results

Out of 670 patients 174 (26%) were males and 496 (74%) were females. Their mean age was  $48.8 \pm 13.2$  years. The duration of diabetes ranged from 0 (newly diagnosed) to 40 years with a mean value of  $7.5 \pm 5.3$  years. Values for mean weight, height, and body mass index were  $63.8 \pm 15.1$ kg,  $156 \pm 10.5$  cm and  $25.9 \pm 5.6$  kg/m<sup>2</sup> respectively. Female patients had body mass index significantly greater than that of males ( $26.74 \pm 5.7$  vs.  $23.5 \pm 4.8$ ). Approximately fifty four percent were overweight (BMI >

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25 kg/m<sup>2</sup>). Ninety percent fulfilled the criteria of NIDDM and the remaining 10% were placed in the IDDM group. The mean systolic blood pressure was 137 ± 20 and diastolic pressure 86.7 ± 12.2 mmHg. Approximately 53% of the patients had blood pressure values exceeding the normal i.e. systolic 140 and diastolic 90 mmHg. Complications of diabetes in our study were as follows: retinopathy (23.9%), nephropathy (15.3%), sensory neuropathy (42.1%) motor neuropathy (27.1%), coronary heart disease (18.5%), cerebrovascular disease (5.9%) and peripheral vascular disease (2.7%) (Fig 1). The mean duration of diabetes was significantly longer in patients with retinopathy than those without it (9.42 ± 5.2 vs. 6.94 ± 5.1 years *p* < .01). The same ratio for other complications was as follows: nephropathy 9.67 ± 5.7 vs. 7.08 ± 5.6, myocardial infarction 9.7 ± 4.2 vs. 7.4 ± 5.3, motor neuropathy 8.33 ± 5.7 vs. 7.14 ± 5.13 and sensory neuropathy 8.2 ± 5.5 vs. 7.4 ± 5.1. In all these complications, the mean duration of diabetes in complicated cases was greater than that in uncomplicated ones, but the difference failed to reach the level of statistical significance. There was however, no relationship between the duration of diabetes mellitus and prevalence of cerebrovascular accidents, peripheral vascular disease and hypertension. 81.2% patients gave history of taking prescribed treatment regularly, (71% oral hypoglycaemic agents and 24% insulin) where as 16.2% controlled their diabetes on diet alone, and 2.6% had not taken any treatment.

Table 1: Criteria for the diagnosis of various diabetic complications.

Condition	Diagnostic criteria used
Retinopathy	Presence of exudates, aneurysms and neovascularisation.
Nephropathy	Presence of albumin in the urine in the absence of any other known cause.
Myocardial infarction	A typical history, elevated cardiac enzymes, diagnostic ECG changes or previous documentation of myocardial infarction.
Angina pectoris	A typical history with or without ECG changes.
Motor neuropathy	Absence of ankle jerk, muscle wasting and weakness.
Sensory neuropathy	Complaints of paresthesia and numbness in the feet with or without loss of vibration and position sense.
Carbuncle	A typical lesion.
Ketoacidosis	A typical syndrome with altered sensorium, dehydration high sugar and ketones in the urine.
Overweight	A calculated BMI of more than 25 kg/m <sup>2</sup> .
Hypertension	Systolic pressure more than 140 mmHg and/or diastolic more than 90 mmHg.
Cerebrovascular accident	A thrombotic or haemorrhagic stroke as documented in previous medical record.
Hospitalization	Hospital admission for the control of diabetes or its complication but not unrelated cause e.g. delivery.
Peripheral vascular disease	Cyanosis, cold extremities, intermittent claudication, and weak or absent pulses.

## Discussion

Our results (Table 2 & 3) are in keeping with many known facts about diabetes mellitus. It is more common in women than men<sup>7</sup> and in our study female to male ratio was much more than previously reported. This could be the result of a selection bias since the number of female patients, mostly housewives, attending the diabetic clinic in the office hours was significantly more than men. Ninety percent of the patients had non-insulin dependent diabetes (NIDDM) as against ten percent who were insulin dependent (IDDM). The second group may be slightly under represented because of the exclusion of some paediatric patients who attend a separate out-patients. As a well-known fact, our study also confirmed that most of the patients with NIDDM were overweight.<sup>8</sup> Only 31% of the patients had their body mass index within normal range. A small proportion was underweight, where as more than 54% were overweight. However it is possible that obesity in all these patients may not be diabetes related since obesity is otherwise very common in our society.

An overwhelming majority (75%) had at least one complication directly attributable to diabetes. This probably reflects poor long-term metabolic control. Although 80% patients claimed that they were taking medicines regularly, we could not ascertain the compliance and the adequacy of glycaemic control. Patients with long standing diabetes irrespective of the type are vulnerable to micro and macrovascular complications such as retinopathy, nephropathy, neuropathy and atherosclerotic disease of large vessels, including cardiac, cerebral, and peripheral vascular disease.<sup>9</sup> Although the mean duration of diabetes mellitus in those who developed complications was longer as opposed to those who did not, the difference was not statistically significant (except for retinopathy). Only a follow-up of a cohort of diabetic population recording the exact time of the onset of complication under study can detect any difference in duration of the two groups.

Retinopathy is the most well studied and characteristic complication of diabetes directly related to the duration and the degree of hyperglycaemia.<sup>10</sup> According to different population based studies of NIDDM patients, prevalence of retinopathy varies from 3 to 54%<sup>11</sup>. In our study 23.9% patients had retinopathy and there was a direct relationship between the duration of diabetes and the presence of retinopathy (9.42 ± 5.2 vs. 6.94 ± 5.1) (*p* < .01).

Nephropathy is another diabetes-specific complication associated with the greatest mortality.<sup>12</sup> Thirty five to forty five percent of patients with IDDM and less than 20 percent of those with NIDDM develop nephropathy.<sup>13</sup> Unlike retinopathy, the prevalence of nephropathy does not rise continuously with the increasing duration of diabetes.<sup>14</sup> The mean duration of IDDM before the development of overt proteinuria and end-stage renal disease are 17 years and 23 years, respectively<sup>15</sup>. In our study the prevalence of nephropathy

as defined by the presence of overt proteinuria was 15.3% at a mean duration of 7.5 years.

Peripheral symmetric sensorimotor neuropathy is the commonest form of neuropathy which is time related and bothersome for the patient albeit benign.<sup>16</sup> According to different studies the prevalence of neuropathy in diabetes varies from 35% to 62% based on subjective complaints.<sup>17</sup> We found that 42.1% patients had symptoms of sensory neuropathy and 27.1% had evidence of motor neuropathy.

Pattern of macrovascular complications such as ischaemic heart disease, stroke and peripheral vascular disease is generally similar for diabetics as well as non diabetic patients. The chief difference here lies in the increased frequency and earlier onset particularly in women.<sup>18</sup> This increased prevalence of coronary artery disease in diabetes is associated with a constellation of other risk factors like obesity, sedentary life style, aging

and hyperlipidaemia. However, independently of these variables, diabetes remains a major risk factor for coronary artery disease.<sup>19</sup> Data are more scarce regarding peripheral and cerebrovascular disease in diabetes, but roughly two to fivefold increase in the risk of these complications accompanies diabetes,<sup>20</sup> as also noted by us. History of angina pectoris was present in 18.5%, myocardial infarction in 4.1%, cerebrovascular accident in 5.9%, and 2.7% had peripheral vascular disease.

In conclusion, diabetes is a very common healthcare problem in Pakistan and will remain so in foreseeable future. Complications are mainly responsible for morbidity and mortality. Until we find a cure, only meticulous control of blood sugar gives us a hope of preventing complications and improving the quality of life of diabetic patients.

Table 2: Characteristics of study population.

No	Age (yrs)	Height (cm)	Weight (kg)	BMI kg/m <sup>2</sup>	Blood pressure (mmHg)	Type of Diabetes	Duration (yrs)	Family history
670	49±13	157±9	64±14	25±5	135±21 (Sys) 84±12 (Dia)	NIDDM 603 (91%) IDDM 67(9%)	8±5	Yes 320 (46.7%) No 350 (52.3%)

Table 3: Complication of diabetes seen in study patients.

Sensory neuropathy	Motor neuropathy	Nephropathy	Retinopathy	Angina pectoris	Myocardial infarction	Cerebrovascular accident	Peripheral vascular disease	Hospital admission	Keto-acidosis
273 (40.7%)	196 (29.5%)	98 (15.3%)	150 (22.3%)	110 (16.4%)	37 (5.5%)	39 (5.8%)	25 (3.7%)	289 (42.9%)	23 (3.4%)

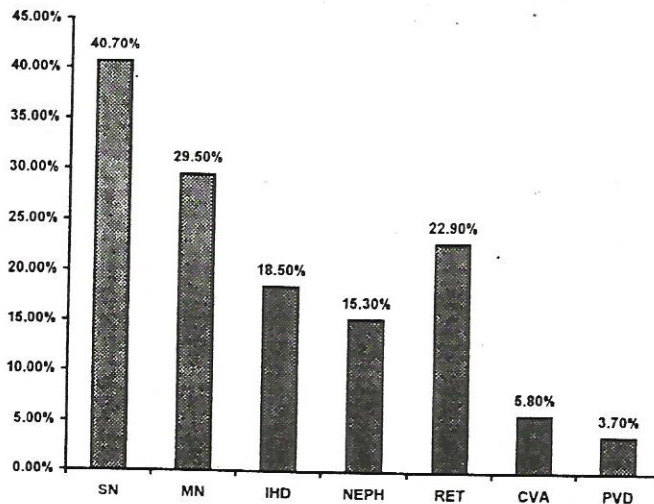


Fig. 1: A bar diagram showing relative incidence of various complications in diabetic patients.

Key: SN, Sensory neuropathy; MN, Motor neuropathy; IHD, Ischaemic heart disease; NEPH, Nephropathy; RET, Retinopathy; CVA Cerebrovascular accident & PVD Peripheral vascular disease.

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