

Diabetes Mellitus: The Association of Clinical Pattern and Complications with Type of Glycaemic Control

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Diabetic mellitus (DM) is a major metabolic disorder. The duration of disease is the main risk factor for the development of complications. The present study was aimed to provide an insight into the spectrum of complications. The study was conducted on ninety-one subjects comprising of sixty-five diabetic patients and twenty-six control subjects. The proportion of non-insulin dependent diabetes mellitus (NIDDM) was 75% whereas insulin dependent diabetes mellitus (IDDM) was 25% in the patients studied. A poor glycaemic control was observed in the diabetic patients. The hemoglobin and packed cell volume (PCV) were significantly lower ($p < 0.05$) in NIDDM patients. The diastolic blood pressure was higher in NIDDM subjects on diet control. The highest percentage of associated complications was observed in NIDDM subjects on oral hypoglycemics. It is emphasized that diabetic clinics should be established at community level for screening, diagnosis and early treatment of diabetes and associated complications.

Key Words: Non-insulin dependent diabetes mellitus (NIDDM), Insulin dependent diabetes mellitus (IDDM), diabetic complications, hypertension.

Diabetes mellitus (DM) is the most common of serious metabolic disorders. It is characterized by chronic hyperglycemia and hyperlipidemia¹. Diabetes is an important cause of morbidity and mortality. In Pakistan the overall prevalence of DM is relatively high (3.9%) in whole population and is on the increase. Non-insulin dependent diabetes mellitus (NIDDM) is the most common form of diabetes prevalent in Pakistan². Genetic factors have a major role in pathogenesis of obesity and NIDDM. Epidemiological evidence suggests that environmental factors are active in the etiology of insulin dependent diabetes mellitus (IDDM)³.

The management of DM with insulin and oral hypoglycemics has prolonged life and at the same time has led to an increase in the prevalence of different complications. The main risk factor for the development of complications is reported to be the duration of disease⁴. The relatives of patients with IDDM are at a 10 to 15 times increased risk of developing diabetes⁵. In NIDDM patients on oral hypoglycemics, more often the blood glucose is hardly elevated and classical diabetic symptoms are also absent that may render these patients susceptible to the development of microvascular complications⁶.

Insulin therapy aims at maintaining long term near-normoglycaemic control in-patients with IDDM and strict glycaemic control delays the onset and slows the progression of diabetic neuropathy, retinopathy and nephropathy^{7,8}. The treatment of hyperglycemia in NIDDM whether with diet control or oral hypoglycemic agents is aimed to improve the glycaemic control and prevent complications⁹.

The relationship between diabetes and certain cardiovascular risk factors such as blood pressure has been reported. Obesity, hypertension and glucose intolerance often coexists in the same individual^{10,11}.

Aims and Objectives

To clarify the clinical pattern and provide insight into the spectrum of the complications.

To highlight the importance of complete physical examination in detecting such complications by symptomatology.

To signify the early institution of therapeutic interventions to prevent complications.

Materials and Methods

A total of ninety one subjects were included in the study. The diabetic sample consisted of 65 patients including NIDDM as well as IDDM cases. They were selected by simple random technique from Diabetic Clinic, Mayo Hospital Lahore out patient department. Both males and females aged 20-60 years were included in the study. Age matched controls (Group A, n=26) were picked from the staff of Physiology Department, King Edward Medical College, Lahore and non diabetic relatives of the patients. The diabetics were divided into three groups; NIDDM on diet control (Group B, n=13), NIDDM on oral hypoglycemics (Group C, n=36) and IDDM patients (Group D, n=16).

All findings for each subject were recorded on a history and examination Performa. Body mass index (BMI) was calculated from height measured to the nearest 'cm' and body weight recorded to the nearest '0.5 kg'. The supine blood pressure (BP) was measured using a mercury sphygmomanometer. The mean BP was calculated from three readings taken at five minute intervals after subject had rested for thirty minutes.

Random blood sugar level was determined by enzymatic color test on spectrophotometer. The hemoglobin (Hb) was estimated by Cyanmet Hb method and packed cell volume (PCV) by Microhaematocrit

method. Student's 't' test was used for data analysis. A p-value less than 0.05 (p < 0.05) was considered statistically significant.

Results

A total number of 91 subjects, twenty six controls and sixty five diabetics were studied. It was observed that among diabetics, patients with NIDDM (75%) were more prevalent as compared to patients with IDDM (25%).

A comparison of characteristic parameters of diabetic patients with control subjects is given in table-1 and shown in fig-1. The mean ± SD value of blood glucose level is highest in group D i.e. 305.69 ± 129.3 mg/dl while it is 257.53 ± 114.15 in group C and 202.46 ± 91.01 in group B. These values of blood glucose level show a statistically significant difference (p < 0.05) when compared with the blood glucose level in control group.

In groups A, B, C & D, mean ± SD values of hemoglobin level are 14.08 ± 1.18 gm/dl, 12.78 ± 1.97 gm/dl, 12.55 ± 1.86 gm/dl & 14.26 ± 2.69 gm/dl respectively. The mean ± SD value of PCV percentage is 43.96 ± 4.18 in group A while it is 40.00 ± 4.26 in group B, 39.14 ± 5.13 in group C and 41.50 ± 4.97 in group D. It shows statistically significant difference (p < 0.05) for both the parameters when group A is compared with groups B and C while non-significant difference (p > 0.05) between groups A and D. The mean ± SD values of diastolic BP are 74.8 ± 9.54 mmHg, 85.00 ± 15.08 mmHg, 80.00 ± 11.83 mmHg and 77.50 ± 6.32 mmHg in groups A, B, C & D respectively. The difference is

statistically significant (p < 0.05) when group A is compared with group B while non-significant (p > 0.05) when group A is compared with groups C and D. The systolic BP values show a non-significant difference (p > 0.05) when group A is compared with groups B, C and D.

The comparison of the characteristic parameters among the diabetic patients is given in table-2. The IDDM patients show the longest duration of diabetes i.e. 14.69 ± 9.41 yrs, while it is 6.70 ± 5.12 yrs in NIDDM on oral hypoglycemics and NIDDM on diet control has the shortest duration with 0.67 ± 0.70 yrs.

The blood-glucose level shows a significant difference (p < 0.05) when group B is compared with group D while non-significant difference (p > 0.05) is observed when group C is compared with groups B and D. The hemoglobin level is 12.78 ± 1.97 gm/dl in group B, 12.55 ± 1.86 in group C and 14.26 ± 2.69 in group D. The difference is statistically significant (p < 0.05) when group C is compared with Group D while non-significant (p > 0.05) when group B is compared with groups C and D.

A comparison of associated complications is shown in table-3. This table projects that group C (NIDDM on oral hypoglycemics) shows the highest percentage of complications with greatest frequency of muscular (86%) followed by cardiovascular (78%), neuropathy (72%) and visual (69%) complications whereas the NIDDM patients on diet control show least positive associated complications.

Table-1, Characteristics Of Diabetic Patients Compared With Control Subjects

Parameters	Group (N)				p-value/sig.		
	A (26)	B (13)	C (36)	D (16)	A	A	A
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	with B	with C	with D
Age, yrs	44.60 ± 9.71	45.38 ± 9.93	51.53 ± 11.54	46.25 ± 11.20	0.05 NS	0.05 NS	0.05 NS
BMI, wt/h ²	24.84 ± 4.08	24.89 ± 3.96	25.53 ± 4.53	23.64 ± 3.63	0.05 NS	0.05 NS	0.05 NS
Blood glucose, mg/dl	102.00 ± 37.42	202.46 ± 91.01	257.53 ± 114.15	305.69 ± 129.3	0.05 S	0.05 S	0.05 S
BP (Systolic), mm Hg	117.88 ± 9.29	125.00 ± 21.96	124.17 ± 15.88	120.94 ± 12.94	0.05 NS	0.05 NS	0.05 NS
BP (Diastolic), mm Hg	74.81 ± 9.54	85.00 ± 15.08	80.00 ± 11.83	77.50 ± 6.32	0.05 S	0.05 NS	0.05 NS
R.B.C count/mm ³	5.82 ± 1.16	5.58 ± 1.32	6.52 ± 2.34	6.11 ± 1.80	0.05 NS	0.05 NS	0.05 NS
Hb, gm/dl	14.08 ± 1.18	12.78 ± 1.97	12.55 ± 1.86	14.26 ± 2.69	0.05 S	0.05 S	0.05 NS
PCV, %	43.96 ± 4.18	40.00 ± 4.26	39.14 ± 5.13	41.50 ± 4.97	0.05 S	0.05 S	0.05 NS

A = Control, B = NIDDM (Diet Control), C = NIDDM (Oral pogylicemic), D = IDDM, n = Number of subjects, S = Significant, NS = Non-significant

Table-2 Comparison Of Characteristic Parameters Among Diabetic Patients

Parameters	Group (N)			p-value/sig.		
	B (13)	C (36)	D (16)	B	B	C
	Mean ± SD	Mean ± SD	Mean ± SD	with C	with D	with D
Age, yrs	45.38 ± 9.93	51.53 ± 11.54	46.25 ± 11.20	0.05 NS	0.05 NS	0.05 NS
BMI, wt/h ²	24.89 ± 3.96	25.53 ± 4.53	23.64 ± 3.63	0.05 NS	0.05 NS	0.05 NS
Duration of Diabetes, yrs	0.67 ± 0.70	6.70 ± 5.12	14.69 ± 9.41	0.05 S	0.05 S	0.05 S
Blood glucose mg/dl	202.46 ± 91.01	257.53 ± 114.15	305.69 ± 129.3	0.05 NS	0.05 S	0.05 NS
Blood pressure (Systolic), mm Hg	125.00 ± 21.96	124.17 ± 15.88	120.94 ± 12.94	0.05 NS	0.05 NS	0.05 NS
Blood pressure (Diastolic), mm Hg	85.00 ± 15.08	80.00 ± 11.83	77.50 ± 6.32	0.05 NS	0.05 NS	0.05 NS
R.B.C count/mm ³	5.58 ± 1.32	6.52 ± 2.34	6.11 ± 1.80	0.05 NS	0.05 NS	0.05 NS
Hb, gm/dl	12.78 ± 1.97	12.55 ± 1.86	14.26 ± 2.69	0.05 NS	0.05 NS	0.05 S
PCV, %	40.00 ± 4.26	39.14 ± 5.13	41.50 ± 4.97	0.05 NS	0.05 NS	0.05 NS

B = NIDDM (Diet Control), C = NIDDM (Oral Hypoglycemic), D = IDDM, n = Number of subjects, S = Significant, NS = Non-significant

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Table-3a Comparison Of Clinical Symptoms And Associated Complications

No.	Symptoms/ Complications	GROUP A N = 26 (%)	GROUP B N = 13 (%)	GROUP C N = 36 (%)	GROUP D N = 16 (%)
1.	Visual	NIL	6 (46%)	25 (69%)	9 (56%)
2.	Muscular	NIL	3 (23%)	31 (86%)	12 (75%)
3.	CVS	NIL	5 (38%)	28 (78%)	6 (38%)
4.	Neuropathy	NIL	2 (15%)	26 (72%)	7 (44%)
5.	Nephropathy	NIL	2 (15%)	24 (67%)	9 (56%)

n = Number of subjects, A = Control group, B = NIDDM (Diet Control), C = NIDDM (Oral hypoglycemic), D = IDDM group

Discussion

Diabetes mellitus has become a major health problem in Pakistan. This study endeavors to provide a comprehensive picture of the pattern of diabetes and the nature of its complications. NIDDM was more prevalent accounting for 75% of the diabetic patients studied, which is in accordance with the results of other studies conducted in other parts of the world as well as in Pakistan^{12,2}. It was observed that the diabetic patients in our study group had poorly controlled diabetes as random blood glucose level in these patients was significantly higher ($p < 0.05$) when compared with control subjects and much higher than the normal recommended values¹¹.

The incidence of development of complications among diabetics appears to be strongly related to the duration of diabetes and proper glycaemic control^{1,2}. The NIDDM patients on oral hypoglycemics showed the highest incidence of complications although the known duration of disease was shorter in them as compared to IDDM patients. It is probably because IDDM patients develop symptoms at a younger age, are diagnosed and put on treatment earlier, whereas NIDDM patients might be having asymptomatic hyperglycemia since long time leading to the development of microvascular complications⁶.

The hemoglobin level was significantly lower ($p < 0.05$) in NIDDM patients as compared to IDDM and control groups but was around the lower limit of normal which might be due to diet control. The diastolic blood pressure tended to be higher in NIDDM patients especially on diet control and could be due to age associated vascular changes. The relationship of DM and elevated blood pressure has been well documented as both being important causes of morbidity and mortality^{13,14}.

The earlier development of complications is due to poorer metabolic control of DM in our population on account of multiple factors such as lack of understanding of the disease due to illiteracy, poverty, improper management and paucity of medical facilities available to the general public. The patients in our country are reluctant to take long term drugs as mild to moderate diabetes is usually asymptomatic. Proper counseling is required so that they start taking their disease seriously. Therefore, a strong need arises for the health education of the community and establishment of diabetic clinics at community level. This will reduce an enormous and costly burden on medical resources.

Conclusion

This study shows that:

NIDDM is more prevalent (75%) in our country.

NIDDM patients on oral hypoglycemics have highest percentage of associated complications which might be due to interrupted drug intake and lack of education.

NIDDM patients on diet control have lowest percentage of complications probably because of shorter duration of disease.

The poor glycaemic control is associated with complications and raised blood pressure.

There is need of health education at mass level to avoid these hazards and routine general physical examination would be helpful in detecting complications by symptomatology.

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