

Original article:

Clinical Study of association between Glycemic control in Type 2 Diabetes Mellites and Complications

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Abstract

Background: The incidence of type 2 diabetes mellitus is increasing worldwide. Long term hyperglycaemia is associated with dysfunction and failure of various organs. Glycemic levels are closely associated with occurrence and intensity of complications.

Aims and Objectives: To study the prevalence of complications of Type 2 Diabetes mellites and its relation with glycemic control

Material and methods: After approval of ethical committee, 150 patients who were known type-2 diabetic patients were evaluated by detailed history, clinical examination, and biochemical parameters.

Results: 77 % patients had either one or more complications and 23% patients had no complications. Among the patients who had complications, 48.7 % patients had Retinopathy, 38.7% patients had Nephropathy and 31.3 % patients had neuropathy. Further, 36.0% patients had Coronary artery disease and 24.0 % patients had peripheral vascular disease. 20.7 % patients had Cerebrovascular accidents. In good control group 50.0 % patients had no complications. In 80.4 % patients in suboptimal control group and 95 % patients in poor control group had at least one or more complications.

Conclusion: The prevalence of Diabetes mellites and its associated complications was higher among the diabetic individuals in south India.

Background

The incidence of type 2 diabetes mellitus is increasing worldwide. The World Health Organization predicts that the number of people with diabetes will rise dramatically by which time India & China may face the problem of dealing with 50 million affected individuals(1). The Asia pacific region contains some of the most populous countries & is at the fore front of the current epidemic of diabetes. India has the largest diabetes population thus becoming diabetes capital of the world, with an estimated 42 million patients comprising 6% of adult population(2)

In broader definition, Diabetes Mellitus is a group of metabolic disease characterised by

hyperglycemia resulting from defective beta cell function and insulin secretion. Long term hyperglycemia is associated with dysfunction and failure of various organs which include retinopathy with potential loss of vision, nephropathy leading to renal failure, peripheral neuropathy with risk of developing diabetic foot, autonomic neuropathy causing gastrointestinal, genitourinary, cardiovascular and sexual dysfunctions. Patients with diabetes mellitus have an higher incidence of atherosclerotic, cardiovascular, peripheral arterial and cerebrovascular disease, hypertension and abnormalities of lipoprotein metabolism. Various studies have demonstrated that interventions which improve glycemic control in diabetic patients

reduces the risk of development and slows the progression of diabetic micro and macro vascular disease. The landmark Framingham Heart Study noted that the incidence of type 2 diabetes has doubled over the last 30 years(3,4).

Apart from the expanding prevalence of diabetes, points of particular importance are onset at younger age & increasing prevalence of Type II DM in children, adolescents and young adults. As incidence of diabetes is moving to earlier years, the co morbidity & mortality of disease are likely to increase as patients are living longer with the disease. Adding to this burden is the increasing complexity of caring for patients with type I diabetes and the expanding armamentarium of medications for patients with type II diabetes(5).

The primary pathologies in type 2 diabetes mellitus include a deficient beta-cell function and insulin resistance leading to a high blood glucose concentration. The degree of hyperglycemia and diabetes duration is associated with an increased risk of the development of mainly micro vascular complications, i.e. retinopathy, neuropathy and nephropathy. The development and progression of diabetic complications, especially micro vascular complications, can be reduced through improved blood glucose control(6). The UK Prospective Diabetes Study for example showed that each 1% reduction in glycated haemoglobin (HbA_{1c}) was associated with a 37% decrease in relative risk for micro vascular complications and a 21% decrease in relative risk of any end point or death related to diabetes(7).

For better control of diabetes requires frequent monitoring of blood glucose which can be done by self monitoring of blood glucose (SMBG) and regular glycated haemoglobin (HbA_{1c}) checking once in 2 to 3 months. Research have proven over the years that Haemoglobin A_{1c} (HbA_{1c}) is the gold standard for monitoring glycemic control and

serves as a surrogate for diabetes-related complications(8).

The ADA recommends measuring HbA_{1c} at least 2 times per year in patients who have met their treatment goals and quarterly in those in whom therapy has changed or who are not meeting their glycemic targets. Analysis of data in terms of HbA_{1c} levels revealed a continuous relationship between HbA_{1c} and the risk of complications, with each 1% decrease in HbA_{1c} resulting in statistically significant reductions of 37% for microvascular complications and 14% for myocardial infarction (P<.0001).

Methodology

Present research aims to study prevalence of complications of Type 2 Diabetes mellitus and its relation with glycemic control in 150 patients.

Inclusion criteria

- 1) Age more than 30 Years.
- 2) Diagnosed patients of Type 2 diabetes mellitus attending the hospital.
- 3) Only the patients who are on treatment.(either dietary restriction/ OHA's/insulin/combinations for > 6months)

Exclusion criteria

- 1) The patients who do not satisfy WHO criteria of Type 2 Diabetes mellitus.
- 2) The patients with newly diagnosed Type 2 DM not on treatment.
- 3) The patients with Type 1 DM
- 4) The patients with chronic inflammatory diseases e.g. rheumatoid arthritis, vasculitis.
- 5) The patients on long term steroid therapy.
- 6) Pregnant women & patients on hormonal therapy.

7) The patients with terminal illness like malignancies, AIDS etc

Diabetic patient attending the general OPD of the hospital during the study period fulfilling inclusion criterion was recruited in the study. Known cases of diabetes were recorded by questioning the study subjects during hospital visits for registration for

the study. The diagnosis was confirmed from medical records or from the treatment prescriptions. Subjects who could not identify the drugs were asked to produce the prescriptions or the medicines in the original packing. Detailed history was taken and laboratory findings were recorded in proforma.

Results

Table.1 Age profile

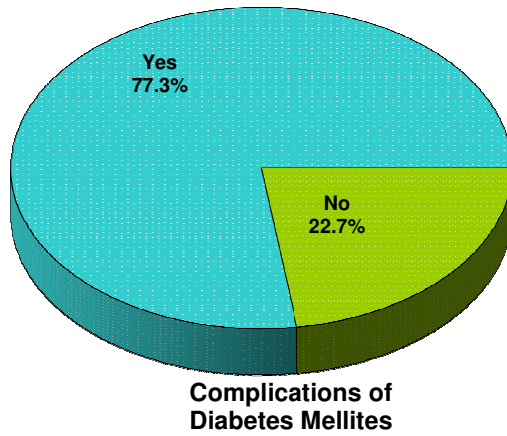
Age in years	Number of patients	%
31-40	14	9.3
41-50	35	23.4
51-60	48	32.0
61-70	42	28.0
>70	11	7.3
Total	150	100.0

Table. 2 Glycemic parameters of patients

Sugar parameters	Number of patients (n=150)	%	Mean ± SD
FBS (mg/dl)			156.97±45.96
• <110	20	13.5	
• 110-140	44	29.5	
• >140	86	58.0	
PPBS (mg/dl)			226.87±67.01
• <140	6	4.1	
• 140-200	61	40.8	
• >200	83	56.1	
HbA1C			8.72±2.13
• <7	44	29.3	
• 7-9	46	30.7	
• >9	60	40.0	

Table .3 Complications of Diabetes mellites

Complications	Number of patients (n=150)	%
No	34	22.7
Yes	116	77.3
Micro		
• RET	73	48.7
• NEPH	58	38.7
• NEURO	47	31.3
Macro		
• CAD	54	36.0
• PVD	36	24.0
• CVA	31	20.7



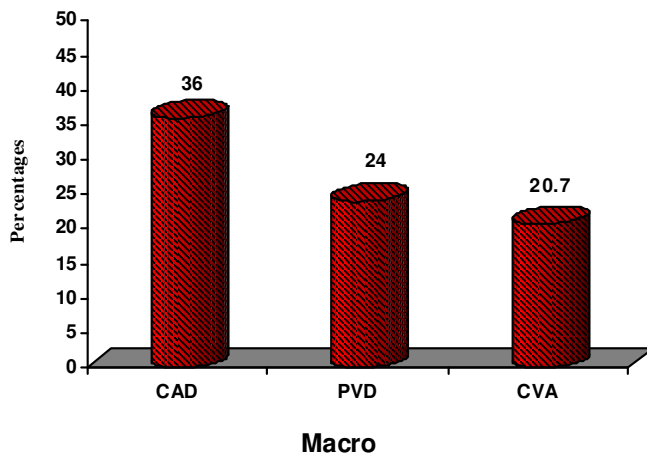
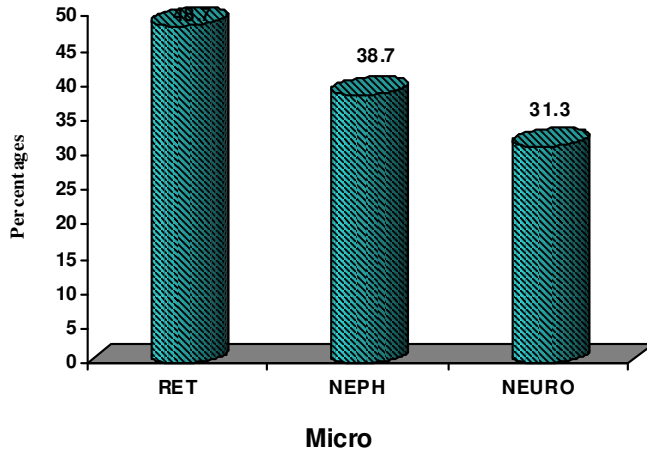


Table.4 Complications & HBA1C levels

Variables			HBA1C_			Total
			Good Control	Suboptimal Control	Poor Control	
Complication	Yes	Count	22	37	57	116
		% within HBA1C	50.0%	80.4%	95.0%	77.3%
	No	Count	22	9	3	34
		% within HBA1C	50.0%	19.6%	5.0%	22.7%
Total		Count	44	46	60	150
		% within HBA1C	100.0%	100.0%	100.0%	100.0%

Table .5Association of Complications with levels of HbA1c

Complications	HbA1c			P value
	<7.0% (n=44)	7.0-9.0% (n=46)	>9.0% (n=60)	
Micro	22(50.0%)	37(80.4%)	57(95.0%)	<0.001
Macro	8(18.2%)	20(43.4%)	51(85.0%)	<0.001

*Statistically significant

Discussion

In our study population 77 % patients had either one or more complications and 23% patients had no complications. Among the patients who had complications, 48.7 % patients had Retinopathy. This was high compared to other studies probably as we have screened all patients by ophthalmologist and have included patient with even Mild NPDR changes also in this group and probably due to longer duration of diabetes & poor glycemc control in our study population. Among the patients who had complications 38.7% patients had Nephropathy and 31.3 % patients had neuropathy. Further, 36.0% patients had Coronary artery disease and 24.0 % patients had peripheral vascular disease. 20.7 % patients had Cerebrovascular accidents.

In a similar study by Vaz NC et al, among the diabetics, the prevalence of CHD, peripheral vascular disease, CVA, retinopathy, cataract and neuropathy were 32.3%, 11.5%, 6.9%, 15.4%, 20% and 60% respectively. The various complications were found to be significantly associated with DM. The prevalence of CHD (32.3%) was higher among the diabetics compared to non-diabetics (3.3%)(9).

In a South India, a similar high prevalence of CHD (30.3%) among the diabetics was revealed by Ramachandran et al (10). Yet in another study

Ramachandran et al reported a prevalence of 0.9% and 61.9% for stroke and neuropathy respectively among the diabetes subjects while the prevalence of PVD was 4.1%(11). Around 17.2% of diabetics had cataract as a complication in a study (Mohan V et al) carried out in Southern India (12). Rema M et al reported a retinopathy prevalence of 34.1% among diabetics, in South India(13).

In our study, in good control group 50.0 % patients had no complications. In 80.4 % patients in suboptimal control group and 95 % patients in poor control group had at least one or more complications.

Conclusion

The prevalence of Diabetes mellites and its associated complications was higher among the diabetic individuals in India. All the diabetic complications should to be addressed and preventive health programmes need to be implemented to percolate the knowledge about the diabetic complications, the available screening facilities for their early detection, treatment and care.

Limitation of the study

This was a hospital-based survey and therefore may not represent true status of the risk of the community as a whole.

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