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An Institutional Cross-Sectional Study of Diabetes Mellitus in Young Adults: Etiology and Complications

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Abstract

Introduction: Although Type 2 DM was traditionally recognized as a disease of the middle aged and elderly, since the 2000s, relative increase in Type 2 DM incidence and prevalence has been observed in younger adults. As relatively scarce data is available about diabetes in young in Indian perspective, we conducted a study about etiology and complications of Diabetes in young adult patients in a tertiary care hospital.

Methodology: An observational Cross-Sectional study was carried out. Study commenced after approval from institutional ethical committee. A total of 114 adult patients were included in the study after fulfilling inclusion criteria.

Results: Among the 114 cases of young onset diabetes, 47.4% were of type 2 diabetes and 35.1% cases were of type 1 diabetes. Gestational diabetes was seen in 8.8% cases while diabetes due to atrophic pancreatitis was observed in 7.9% cases. One case of maturity-onset diabetes was seen (0.9%). Microvascular complications were seen in 23.7% cases of young onset diabetes. Microvascular complications were more common in cases of type 2 diabetes (40.7%) as compared to type 1 (7.5%) and diabetes due to atrophic pancreatitis (22.2%). All cases of diabetic ketoacidosis were associated with type 1 diabetes while other complications like diabetic foot, UTI and pyelonephritis were predominantly associated with type 2 diabetes.

Conclusion: Present study highlighted the importance of early diagnosis and regular follow up monitoring of young onset diabetes cases. Strict glycaemic control should be maintained in these cases, to delay the associated micro- and macrovascular complications.

Keywords: Diabetes mellitus, Strict glycaemic, NCV.

Introduction

Diabetes mellitus (DM) is a chronic endocrine disease characterized by hyperglycaemia, resulting due to either failure of the pancreas to produce enough insulin (Type

1) or inability of the body to utilise the produced insulin (Type 2) [6]. Diabetes has emerged as one of the leading health emergencies of the 21st century. The International Diabetes Federation estimated an average of 72.9 million Indians suffer from diabetes in 2017, with the projected number going up to 134.3 million in 2045, the highest in the world [9].

Both Type 1 DM and Type 2 DM are associated with increased morbidity and mortality due to the development of complications affecting almost all the organs of the body. For example, well-characterized macrovascular and microvascular complications include cardiovascular disease (CVD), retinopathy, neuropathy and chronic kidney disease. However, more diverse and non-vascular diabetes complications are becoming common, including non-alcoholic fatty liver disease, psychiatric disease (for example, depression), cancer, cognitive impairment, infections and disability [10].

Worryingly, individuals diagnosed at a younger age seems to have a more rapid deterioration of β-cell function than seen in those with later-onset T2DM as well as an increased risk of complications compared with young people with T1DM, suggesting a more aggressive disease phenotype [7] Young-onset T2DM now presents a challenging clinical entity.Patients with young onset DM have higher risk of complications because of the chronicity of the illness,

Relatively scarce data is available from Indian subcontinent regarding young onset diabetes mellitus. Hence present study was planned to assess the etiology and complications of diabetes mellitus in young adult patients (age 18-35 years).

Aims And Objectives

1.To study the etiology of diabetes mellitus in young adult patients (age 18-35 years).

2.To study the complications of diabetes mellitus in young adult patients (age 18-35 years).

Materials And Method

Study Design: Observational cross-sectional Study

Sample Size Calculation: Sample size of 114 (approx.) was calculated after considering 8% prevalence of diabetes.

Study duration: Two years

Inclusion Criteria

1. As per case definition, all adult patients with diagnosis of Diabetes mellitus <35 years of age (clinical diagnosis, laboratory investigations) were included in the study (Age taken as 18-35 years).
2. Paediatric patients who were diagnosed as Insulin dependent Diabetes mellitus in childhood and now are young adults <35 years.
3. Patient giving written informed consent.

Exclusion Criteria

1. Patients less than 18 years of age.
2. Patients not giving written informed consent.
3. Patients having onset of diabetes mellitus after 35 years of age.

Methodology

- Study commenced after approval from institutional ethical committee. (Ref. no. 0221119-119)
- A total of 114 adult patients diagnosed with diabetes < 35 years of age were included in the study after written informed consent.
- Detailed history and thorough clinical examination were performed in all cases.
- Height and weight of the patients were noted and BMI were calculated in each case.
- All cases were subjected to the following investigations:

Hemogram, RFT, Serum electrolytes, Lipid profile, Blood glucose levels (Random, Fasting, 2hr Post prandial), Urinary ketones, HbA1c level and other Biochemical tests if required such as C peptide levels, Serum insulin levels.

- All other relevant tests pertaining to underlying cause and complications were also performed like USG abdomen, Fundus examination, NCV testing and Urine examination.
- In relevant cases Immunological tests like antibodies (GAD 65, ICA, IAA) were done.
- Presence of any diabetic complication was noted.
- All the data was collected in a predesigned, pretested proforma.

Observation And Results

Table 1. Distribution of study groups as per etiology of diabetes

Etiology of Diabetes	N	%
Type 2 DM	54	47.4%
Type 1 DM	40	35.1%
GDM	10	8.8%
DM due to Atrophic pancreatitis	9	7.9%
MODY	1	0.9%
Total	114	100.0%

Among the 114 cases of young onset diabetes, 47.4% were of type 2 diabetes and 35.1% cases were of type 1 diabetes. Gestational diabetes was seen in 8.8% cases while diabetes due to atrophic pancreatitis was observed in 7.9% cases. One case of maturity-onset diabetes was seen (0.9%). Mean age of diagnosis of type 1 and 2 was 16.7 and 28.8 years respectively with slight male preponderance in both group.

Table 2. Distribution of study groups as per microvascular complications

Microvascular Complications	Type 1 DM	%	Type 2 DM	%
Nephropathy	2	0.5%	12	22.2%
Retinopathy	1	0.25%	10	18.51%
Neuropathy	0	0%	11	20.37%
Triopathy	0	0%	4	7.4%
P value	<0.01			

Microvascular complications were more commonly seen in type 2 DM than type 1 DM. (p value <0.01)

Nephropathy was seen in 22.2% cases of Type 2 DM and 0.55 cases of type 1 DM. Retinopathy was seen in 18.51% of type 2 DM cases and 0.25% of type 1 DM cases. Neuropathy was seen in 20.37% of type 2 DM cases, and triopathy was seen in 7.4 % of type 2 DM. Neuropathy and triopathy was not seen in case of type 1 DM.

Distribution of study groups as per Microvascular complications

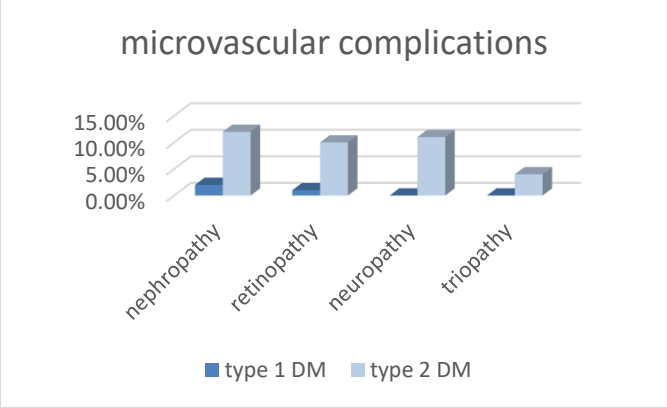


Table 3. Distribution of study groups as per presence of other complications

Other Complications	N	%
DKA	28	24.6%
Diabetic Foot	6	5.3%

UTI	5	4.4%
Pyelonephritis	4	3.5%
AKI	2	1.8%
Atherosclerosis	2	1.8%
Autoimmune Thyroiditis	2	1.8%
Cataract	2	1.8%
Metabolic syndrome	2	1.8%
HONK	1	0.9%
PCOS	1	0.9%
NASH	1	0.9%
Nephrotic syndrome	1	0.9%

Diabetic ketoacidosis was observed in 24.6% cases while we also encountered 5.3% cases of diabetic foot, 4.4% cases of UTI and 3.5% cases of pyelonephritis.

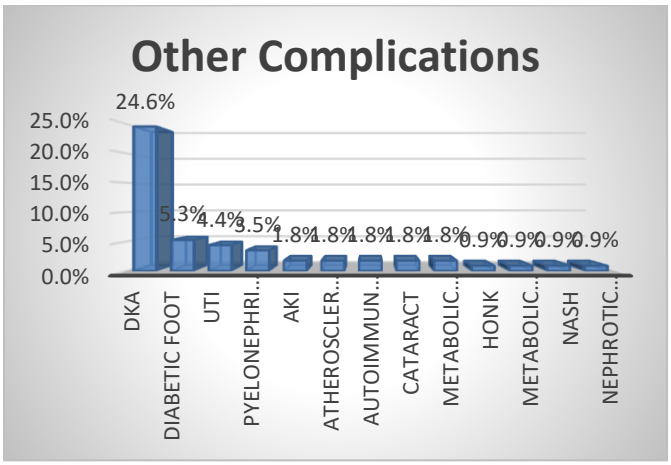


Table 4. Association of etiology of diabetes with microvascular complications

Etiology of Diabetes	N	Microvascular Complications	
Type 2 DM	54	22	40.7%
Type 1 DM	40	3	7.5%
GDM	10	0	0.0%
DM due to Atrophic pancreatitis	9	2	22.2%
MODY	1	0	0.0%
Total	114	27	23.7%

Microvascular complications were more common in cases of type 2 diabetes (40.7%) as compared to type 1 (7.5%) and diabetes due to atrophic pancreatitis (22.2%).

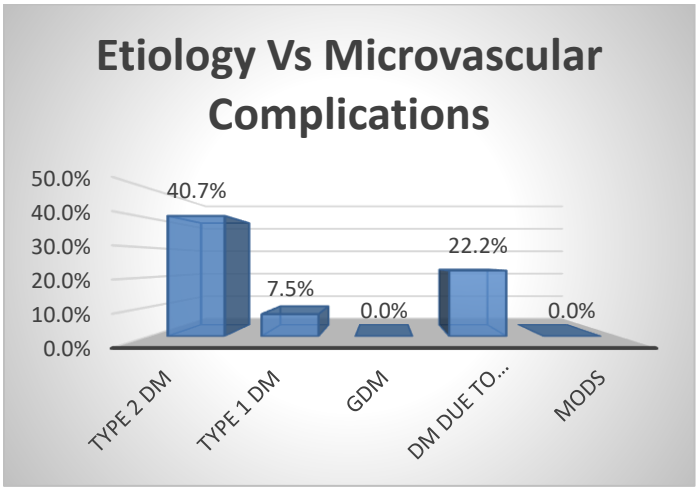


Table 5: Association of other diabetic complications with etiology

Other Complications	N	Type 1 DM	Total cases	%	Type 2 DM	Total cases	%	P value
DKA	28	28	40	70%	0	54	0%	<0.01
Diabetic Foot	6	0	40	0%	6	54	11.11%	<0.01
UTI	5	2	40	5%	3	54	5.55%	1
Pyelonephritis	4	0	40	0%	4	54	7.4%	0.13
AKI	2	1	40	2.5%	1	54	1.8%	1
Atherosclerosis	2	0	40	0%	2	54	3.7%	0.51
Autoimmune Thyroiditis	2	2	40	5%	0	54	0%	0.17
Cataract	2	1	40	2.5%	1	54	1.8%	1
Metabolic syndrome	2	0	40	0%	2	54	3.7%	0.51
HONK	1	0	40	0%	1	54	1.8%	1
PCOS	1	0	40	0%	1	54	1.8%	1
NASH	1	0	40	0%	1	54	1.8%	1
Nephrotic syndrome	1	0	40	0%	1	54	1.8%	1

All cases of diabetic ketoacidosis were associated with type 1 diabetes. Other complications like diabetic foot, UTI, pyelonephritis, atherosclerosis and metabolic syndrome were more commonly associated with type 2 diabetes. But statistical significance was only observed in Diabetic foot (p value <0.01).

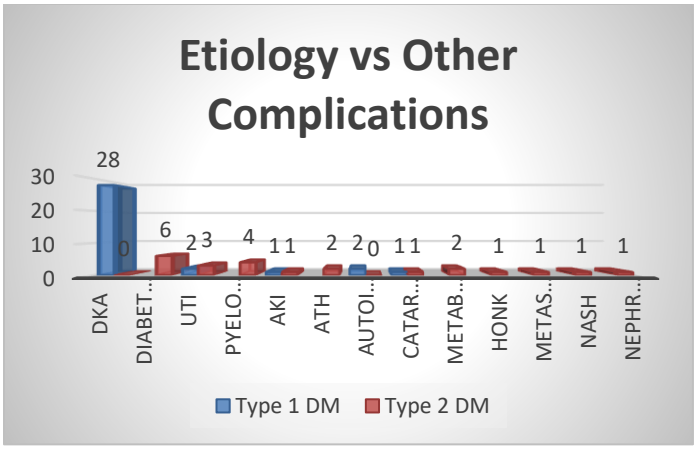


Table 6. Association of etiology of diabetes with age

Etiology of Diabetes	N	Mean Age	Age at Diagnosis
Type 1 DM	40	20.9 +/- 5.5	16.7 +/- 6.7
Type 2 DM	54	34.2 +/- 5.6	28.9 +/-4.1
p-value		<0.01	<0.01

Mean age at diagnosis and presentation, both were significantly lower in cases with type I diabetes (p<0.01).

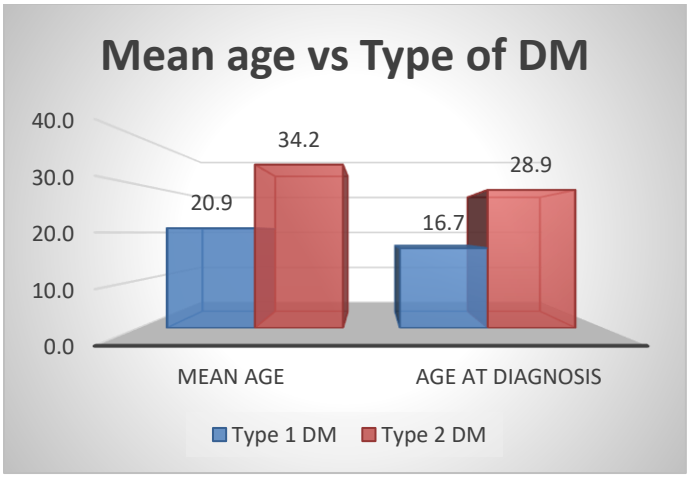


Table 7. Association of etiology of diabetes with gender

Etiology of Diabetes	N	Female	%	Male	%
Type 1 DM	40	17	42.5%	23	57.5%
Type 2 DM	54	20	37.0%	34	63.0%
p-value		0.67			

No association was observed between type of diabetes among young with any specific gender (p-0.67).

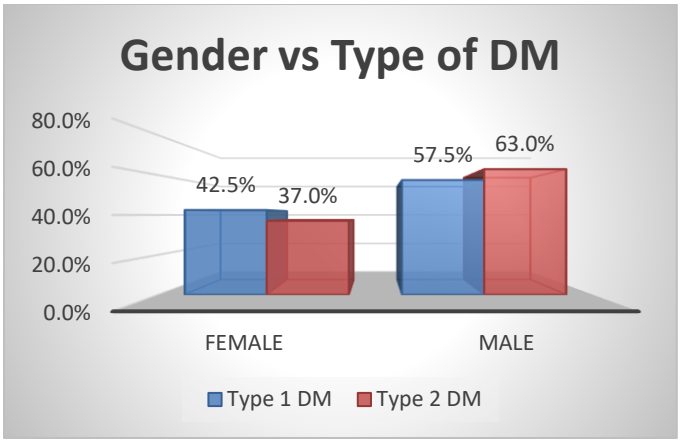


Table 8. Association of etiology of diabetes with BMI

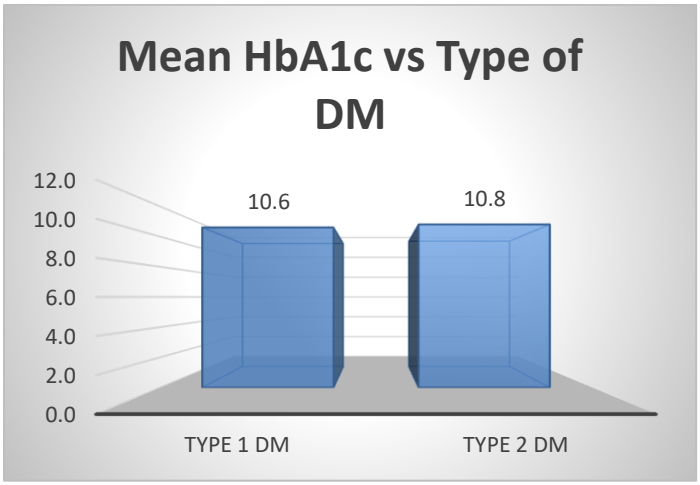
Etiology of Diabetes	N	Mean BMI	SD
Type 1 DM	40	22.2	3.8
Type 2 DM	54	26.3	2.9
p-value		<0.01	

Mean BMI was significantly higher in cases with type 2 diabetes as compared to type 1 diabetes (26.3 vs 22.2 Kg/m2; p<0.01).

Table 9. Association of etiology of diabetes with HbA1c

Etiology of Diabetes	N	Mean HbA1c	SD
Type 1 DM	40	10.6	1.9
Type 2 DM	54	10.8	2.7
p-value		0.67	

Mean HbA1c levels were comparable between cases of type 1 and type 2 diabetes (p-0.67).



Discussion

Etiology: Among the 114 cases of young onset diabetes, 47.4% were of type 2 diabetes and 35.1% cases were of type 1 diabetes. Gestational diabetes was seen in 8.8% cases while diabetes due to atrophic pancreatitis was observed in 7.9% cases. One case of maturity-onset diabetes was seen (0.9%).

Sahoo et al. [1] observed that most common etiologies for diabetes mellitus (DM) in young Indians were type 2 diabetes mellitus (T2DM, 40%), type 1 DM (T1DM, 40%), fibrocalculous pancreatic diabetes (FCPD, 15%), MODY (2%), flatbush diabetes (2%) and mitochondrial diabetes (1%). Panda JK et al. [67] observed Type I DM cases as 61%), type 2 DM as 28% and Fibro Calculous Pancreatic Diabetes as 11%. In a previous study by Registry of people with diabetes in India with young age at the onset (2006-2011), in canters like MDRF, Chennai and AMC, Dibrugarh, 40% of the total patients were from the Type 2 DM category.

Complications

Microvascular complications were seen in 23.7% cases of young onset diabetes. Prevalence of Nephropathy, neuropathy and retinopathy was 14.9%, 14% and 12.3% respectively. Diabetic ketoacidosis was observed in 24.6% cases while we also encountered 5.3% cases of

diabetic foot, 4.4% cases of UTI and 3.5% cases of pyelonephritis. Microvascular complications were more common in cases of type 2 diabetes (40.7%) as compared to type 1 (7.5%) and diabetes due to atrophic pancreatitis (22.2%). All cases of diabetic ketoacidosis were associated with type 1 diabetes while other complications like diabetic foot, UTI and pyelonephritis were significantly more associated with type 2 diabetes. (p value <0.01)

In the study by Panda JK et al. [2], Retinopathy is present in 29% of the study group. Retinopathy is present in 21% of FCPD, 22% cases in Type I DM and 44% in Type II DM. Nephropathy was present in 17% of the cases. Presence of Nephropathy was found highest in type1 DM cases (29.5%) followed by type 2 DM (12.5%). In the case of Peripheral neuropathy, the occurrence was only in 20% of the study group. Presence of Peripheral Neuropathy was found highest in Type 2 DM cases (56.2%). Jimnaz PA et al. [2] study observed that nephropathy was present in about a quarter of the patients 25.3%, neuropathy in 9.3% and retinopathy in 13.3% cases. [4,5]

In a similar study done by Hadjehkasemfatel et al, similar patterns of complications were seen and were related with the chronicity of the illness[8].

Thus, to summarize, we observed the clinical spectrum of diabetes in young adults. We observed that majority of the cases had type 2 diabetes followed by type 1 diabetes. Male dominance was seen in both groups and one third of the cases were overweight or obese. In most of the cases, glycemic control was very poor. Microvascular complications were present in one fourth of the study cases, with higher prevalence in type 2 diabetics.

Summary

A hospital based observational study was conducted at Department of Medicine of a tertiary care centre. Study aimed to evaluate the etiology, clinical presentation and complications associated with diabetes mellitus in young adult patients (age 18-35 years). Study included 114adult patients with diagnosis of Diabetes mellitus <35 years of age. All the cases were evaluated as per standard hospital protocol and were assessed for presence of micro- and macro-vascular complications. Following observations were made during the study:

1. Among the 114 cases of young onset diabetes, 47.4% were of type 2 diabetes and 35.1% cases were of type 1 diabetes. Gestational diabetes was seen in 8.8% cases while diabetes due to atrophic pancreatitis was observed in 7.9% cases. One case of maturity-onset diabetes was seen (0.9%).
2. Mean age of diagnosis of type 1 and 2 was 16.7 and 28.8 years respectively with slight male preponderance in both groups.
3. Microvascular complications were seen in 23.7% of total cases of young onset diabetes.
4. Diabetic ketoacidosis was observed in 24.6% cases of total while we also encountered 5.3% cases of diabetic foot, 4.4% cases of UTI and 3.5% cases of pyelonephritis.
5. Microvascular complications were more common in cases of type 2 diabetes (40.7%) as compared to type 1 (7.5%) and diabetes due to atrophic pancreatitis (22.2%).
6. All cases of diabetic ketoacidosis were associated with type 1 diabetes while other complications like diabetic foot (p value <0.01), UTI and pyelonephritis were predominantly associated with type 2 diabetes.

7. Mean age at diagnosis and presentation, both were significantly lower in cases with type I diabetes ($p<0.01$).
8. No association was observed between type of diabetes among young with any specific gender (p-0.67).
9. Mean BMI was significantly higher in cases with type 2 diabetes as compared to type 1 diabetes (26.3 vs 22.2 Kg/m2; $p<0.01$).
10. Mean HbA1c levels were comparable between cases of type 1 and type 2 diabetes (p-0.67).

Conclusion

Present study observed the clinical spectrum of diabetes in young adults. We observed that majority of the cases had type 2 diabetes followed by type 1 diabetes. In most of the cases, glycemic control was very poor. Microvascular complications were present in one fourth of the study cases, with higher prevalence in type 2 diabetics as compared to type 1 diabetics. Mean age of diagnosis and presentation were both significantly lower in type 1 DM

Whereas mean BMI were significantly higher in type 2 DM.

There is inverse relation between age of diagnosis and complications in case of type 2 DM. Complications increase with chronicity. Present study highlighted the importance of early diagnosis and regular follow up monitoring of young onset diabetes cases. Strict glycemic control should be maintained in these cases, to delay the associated micro- and macrovascular complications.

The various macro and microvascular complications seen in DM are life threatening. The risk is even more in patients with young onset diabetes. Such patients should be made aware of those complications and they should be inspired for even more strict BSL control and regular screening for complications.

Abbreviations

- DM-Diabetes mellitus
- UTI-Urinary tract infections
- CVD-Cardiovascular disorders
- RFT-Renal function tests
- NCV-Nerve conduction velocity
- GAD65-Glutamic acid decarboxylase
- ICA-Islet cell antibody
- IAA-Insulin autoantibody
- DKA-Diabetic ketoacidosis
- AKI-Acute kidney injury
- HONK-Hyperosmotic nonketotic coma
- PCOS-Polycystic ovarian syndrome
- NASH-Non-alcoholic steatohepatitis
- GDM-Gestational diabetes mellitus
- MODY-Maturity onset diabetes in young
- FCPD-Fibrocalculous pancreatic diabetes

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