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Epidemiological Study of Diabetes Mellitus in North India

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ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disease. Its prevalence increases every year. Aim of the present study was to see the clinical features of DM cases and to predict the prevalence of complication in both types of DM (T1DM and T2DM).

Materials and Methods: Total 325 DM cases including 150 of T1DM and 175 of T2DM were taken from the OPD of Endocrinology and Nephrology, S.S. Hospital, BHU, Varanasi during the period 2012-2014. Data was collected from DM patients who were interviewed through a questionnaire. Data were analyzed using SPSSsoftware.

Results: In T1DM, age of onset of disease were 31.3% in < 14 years, 46.0% in 15-25 years and 22.7% cases in >25 years. However in T2DM, most of were diagnosed in age between 40-55 years of age. In all cases males were more affected than females in both types of DM. T1DM patients had lower BMI (18.64 ± 5.46). Weight loss, polyphagia, polyuria, abdominal pain and fever were significantly more in T1DM patients while weight gain was more in T2DM. Complication was significantly more seen in T2DM.

Conclusion: Thus, we conclude that More than 75% cases of T1DM affected the patients in the age below 25 yrs, while in T2DM cases above the 40 Yrs age. Age, gender and BMI are important risk factor for DM cases. T2DM was more affected by complication than T1DM.

Keywords: *Diabetes mellitus, Type 1 DM, Type 1 DM, symptom of DM, complication of DM*

Introduction

Diabetes Mellitus (DM) is an enduring metabolic disease. About 424.9 million adult (20-79 years) and 1.11 million children (0-19 years) was affected by DM. Large portion of its covered by western pacific (159 million) and South East Asia region (82 millions) (1).

DM is mainly divided into two types: Type 1 (T1DM) caused by autoimmune destruction of beta cells (β-cell) of the pancreas and Type 2 (T2DM) caused by insulin resistance and β-cell dysfunction. In DM population, T2DM represents 90-95% cases and T1DM 5-10% cases of the total DM (2). Prevalence of T1DM varies from country to country. The lowest incidence in the general population is less than 1 of 100000 in China while in Finland its incidence is high that is 40 per 100000 populations (3).

Symptoms of T1DM include excessive excretion of urine (polyuria), thirst (polydipsia), constant hunger, weight loss, vision changes, and fatigue. These symptoms may occur suddenly. T2DM is mainly the consequence of excess body weight and physical inactivity. Symptoms may be similar to those of T1DM, but it may be undiagnosed several years. Until recently, this type of diabetes was seen only in adults but it is now also occurring frequently in children (2, 4).

Aim of the present study was to see the clinical features (age, BMI, gender, symptoms and family history) of DM cases and to predict the prevalence of complication in both types of DM. Further the effect of disease duration with the diabetic complication was also seen.

Materials and Methods

Total 325 patients of Diabetes mellitus including 150 of T1DM and 175 of T2DM were taken via consent form from the outpatient Department of Endocrinology of S.S. Hospital, Banaras Hindu University, Varanasi during the period 2012-2014. Data was collected through a questionnaire on the on the basis of feasibility and availability of cases. All patients had hyperglycemia and T1DM patients had kitoacidosis.

Data were analyzed using Statistical Package for Social Sciences (SPSS), version 16. Mean, standard deviation, Pearson's Chi-square test were used for comparison. *p* value <0.05 was considered significant for all analysis.

Result

In the present study a total of 325 cases of diabetes, containing 150 of T1DM and 175 of T2DM were taken.

Mean age of DM patients were 23.78 years for T1DM and 54.06 for T2DM (table 1).

In the study, males were significantly predominated over females in both types of DM. Male and female ratio in T1DM and T2DM were respectively 1.7:1 and 2.1:1 (Table 2).

Study of Body Mass Index (BMI) in DM patients showed T1DM patients had lower BMI (18.64 ± 5.46) than T2DM patients (25.28 ± 4.70). About 54.0% cases of T1DM have underweight, 36.7% cases have normal weight, 6.0% cases were overweight and 3.3% cases had obesity, whereas in T2DM, 4.0% cases were lower weight, 46.9% cases were normal weight, 33.1% cases were overweight and 16.0% cases had obesity. Comparison of Mean showed that T1DM had significantly lower BMI than T2DM (Table 3).

In present study, about 31.3% patients developed T1DM in their first decade of life (less than 14 years), 46.0% in second decade (15-25 years) and 22.7% cases in third decade of life. However in T2DM, the diabetes developed in third, fourth and fifth decade of their life and the percentage were 20.6%, 53.7% and 25.7% respectively (Table 4).

Study of disease duration in diabetes exhibited that in T1DM maximum cases were diagnosed within a year (52.0%) and during 1 to 5 years (27.3%), whereas in T2DM, almost equal percentage (34-43%) of cases were observed for all category of disease duration (table 5).

Study of Family history of DM patients showed T1DM and T2DM patients had almost equal proportion of family history. Out of 48 cases, 30 cases have first degree relative, 16 cases of second degree relative and 2 cases of both parent affected by T1DM. On the other hand in T2DM, 37cases of first degree relative, 19 cases of second degree relative and 10 cases of both parent affected (table 6).

Clinical details showed Weight loss, polyphagia, polyuria, abdominal pain and fever were significantly more in T1DM patients, whereas use of tobacco was significantly seen in T2DM patients. Weight gain had not showed significant relationship in T2DM (table 7).

Comparison of complication in two groups of DM showed that T2DM patients have significantly more complication like neuropathy, retinopathy, hypertension, diabetic foot and joint pain (table 8).

Study of relationship between complications with disease duration in T1DM patients showed that neuropathy, nephropathy retinopathy, heart disease and diabetic foot occurs when disease duration was more than 5 years (table 9).

In T2DM, nephropathy and joint pain were common when disease duration was more than 1 year while UTI was seen in T2DM when disease duration was even less than one year (table 10).

Table 1: Distribution of cases and their present Age.

S. No.	Type of DM	Number	Percent	Age (Mean±SD)
1	DM	325	100	
A	T1DM	150	46.15	23.78±11.17
B	T2DM	175	53.85	54.06±9.29

Table 2: Gender of the patients in DM Cases.

S.N.	Group	Males	Females	Male: Female Ratio	A Vs B	
					X2	p-value
A	**T1DM**	96 (64.0%)	54 (36.0%)	1.7 :1	0.422	0.5158
B	**T2DM**	118 (67.4%)	57 (32.6%)	2.1:1		

Table 3: BMI of the patients in DM Cases.

Group			BMI (kg/m2)				Mean ± SD	A Vs B	
<18.5	18.5-22.9		F-Value 23-27.5	P-value >27.5					
A	**T1DM**	**No**	81	55	9	5	18.64 ± 5.46	11.777	0.000*
		%	54.0	36.7	6.0	3.3			
B	**T2DM**	**No**	7	82	58	28	25.28 ± 4.70		
		%	4.0	46.9	33.1	16.0			

** Statistically significant*

Table 4: Prevalence of DM in the Age of Onset.

Groups No %		T1DM			T2DM		
		Mean ± SD	No	%	Mean ± SD		
A	<14	47	31.3	10.09±3.66	0	0.0	-
B	15-25	69	46.0	20.87±3.16	0	0.0	-
C	26-40	34	22.7	31.30±2.75	36	20.6	37.53±2.95
D	41-55	0	0.0	-	94	53.7	47.91±4.38
E	>55	0	0.0	-	45	25.7	60.48±4.49
	Total	150		19.86±8.41	175		49.01± 8.89

Table 5: Disease Duration in DM Cases.

Group <1 yrs 1-5 yrs			Disease Duration (Yrs)			Mean ± SD	A Vs B	
			>5 yrs		T-value	P-value		
A	T1DM	No	78	41	31	3.92 ± 5.94	1.824	0.069
		%	52.0	27.3	20.7			
B	T2DM	No	62	53	60	5.05 ± 5.24		
		%	43.1	30.3	34.3			

Table 6: Family history of DM Types.

Group	A. T1DM		B. T2DM		A Vs B	
	No	%	No	%	X2	P
Absent	102	68.00	108	61.7	1.396	0.237
Present	48	32.00	67	38.3		
Positive Family History						
First degree relative	30	62.50	37	55.22	0.609	0.435
Second degree relative	16	33.33	19	28.36	0.327	0.567
Both Parent affected	2	4.17	10	14.93	3.464	0.063

Table 7: Clinical details of DM Types.

Group	A. T1DM (150)		B. T2DM (175)		A Vs B	
	NO	%	NO	%	X2	P-value
Wt Gain	25	16.7	44	25.1	3.470	0.062
Wt Loss	97	64.7	50	28.6	42.479	0.000*
Alcohol Intake	15	10.0	25	14.3	1.375	0.241
Smoking	11	7.3	21	12.0	1.982	0.159
Use of Tobacco	5	3.3	35	20.0	20.799	0.000*
Loss of Apettite	36	24.0	31	17.7	1.950	0.163
Polyphagia	30	20.0	16	9.1	7.836	0.005*
polydepsia	108	72.0	135	77.1	1.132	0.287
polyuria	98	65.3	91	52.0	5.901	0.015*
weakness	102	68.0	132	75.4	2.211	0.137
Nausea	32	21.3	45	25.7	0.857	0.354
Vomiting	24	16.0	30	17.1	0.076	0.783
Wound Healing	23	15.3	38	21.7	2.157	0.142
Abdomen pain	55	36.7	28	16.0	18.141	0.000*
indigestion	21	14.0	31	17.7	0.829	0.363
Loose Motion	16	10.7	20	11.4	0.048	0.827
Fever	11	7.3	4	2.3	4.674	0.031*

** Statistically significant*

Table 8: Complication in DM patients.

Groups	A. T1DM (150)		B. T2DM (175)		A Vs B	
	No.	%	No.	%	X2	P-value
Complication	77	51.3	156	89.1	56.895	0.000*
Neuropathy	19	12.7	48	27.4	10.755	0.001*
Nephropathy	22	14.7	34	19.4	1.284	0.257
Retinopathy	31	20.7	84	48.0	26.393	0.000*
Hypertension	19	12.7	77	44.0	38.099	0.000*
Respiratory Problem	15	10.0	29	16.6	2,980	0.084
Skin Infections	27	18.0	41	23.4	1.439	0.230
UTI	8	5.3	6	3.4	0.711	0.399
Diabetic Foot	6	4.0	17	9.7	4.011	0.045*
Celiac disease	16	10.7	13	7.4	1.042	0.307
Joint Pain	17	11.3	41	23.4	8.059	0.005*

** Statistically significant*

Table 9: Correlation of Complication with disease duration in T1DM.

Groups (No.)	<1 year (78)		2-5 yrs (41)		>5 yrs (31)		X2	P-value
	NO	%	NO	%	NO	%		
Complication (77)	34	43.6	19	46.3	24	77.4	10.725	0.005*
Neuropathy (19)	4	5.1	5	12.2	10	32.3	14.771	0.001*
Nephropathy (22)	7	9.0	6	14.6	9	29.0	7.131	0.028*
Retinopathy (31)	10	12.8	5	12.2	16	51.6	22.821	0.000*
Hypertension (19)	7	9.0	3	7.3	9	29.0	9.528	0.009*
Respiratory Problem (15)	8	10.3	2	4.9	5	16.1	2.495	0.287
Skin Infections (27)	14	17.9	5	12.2	8	25.8	2.216	0.330
UTI (8)	3	3.8	2	4.9	3	9.7	1.517	0.468
Diabetic Foot (6)	0	0	2	4.9	4	12.9	9.732	0.008*
Joint Pain (17)	10	12.8	2	4.9	5	16.1	2.581	0.275

** Statistically significant*

Table 10: Correlation of Complication with disease duration in T2DM.

Groups	<1 yrs(62)		1-5 yrs (53)		>5 yrs (60)		X2	P-value
	NO	%	NO	%	NO	%		
Complication (156)	48	77.4	49	92.5	59	98.3	14.641	0.001*
Neuropathy (48)	13	21.0	15	28.3	20	33.3	2.371	0.306
Nephropathy (34)	7	11.3	5	9.4	22	36.7	17.395	0.000*
Retinopathy (84)	24	38.7	32	60.4	28	46.7	5.440	0.066
Hypertension (77)	24	38.7	22	42.5	31	52.7	2.269	0.322
Respiratory Problem (29)	11	17.7	9	17.0	9	15.0	0.175	0.916
Skin Infections (41)	13	21.0	13	24.5	15	25.0	0.328	0.849
Urinary Tract Infection (UTI) (6)	5	8.1	1	1.9	0	0	6.535	0.038*
Diabetic Foot (17)	4	6.5	5	9.4	8	13.3	1.653	0.438
Joint Pain (41)	9	14.5	19	35.8	13	21.7	7.407	0.025*

** Statistically significant*

Discussion

DM is a very serious problem in the world. Currently, the exact etiology of DM remains obscure, however many factors have been implicated in the development of the disease. Some of the factors were studied and discussed hereunder.

American diabetic Association accounted 5-10% of T1DM and 90-95% of T2DM in total diabetic cases and described MODY as a rare entity (2). The incidence of having diabetes is different in the worldwide. Previous research showed the lowest incidence of T1DM in Venezuela and china (0.1 per 100000/yrs) while highest in Finland (40.9 per 100000/ year), Sardinia (37.8 per 100000/yrs) and Sweden (30.0 per 100000/yrs) (3, 5). In our study prevalence of T1DM was 7% and rest was T2DM and others. Study on Finland DM patients showed that 9.4% patients were classified as T1DM and 90.6% having T2DM (6).

Age and Diabetes: Age of onset of diabetes is the main issue of discussion at the present time. Exact age is not well defined in DM cases. T1DM is the major type of diabetes in young, accounting for ≥85% of all diabetes cases in youth < 20 years of age worldwide (5,6). Prevalence of T1DM increased from birth and peaks between the ages of 10–14 years during puberty (5, 7, 8). In adults the probability of having T1DM is lower than in children, although approximately one fourth of persons with T1DM are diagnosed in adults (5, 6). In our study, we found that about 77.3% patients developed T1DM in ≤25 yrs and 22.7% cases above 25 yrs.

Six percent of all diabetic subjects in the age between 15-19 years were classified as T2DM and their proportion increased rapidly in older age groups. Half of the patients with T2DM were diagnosed over the age of 64 (6, 9). Although, according to Neil et al. (9) most of diabetic cases were diagnosed after the age of 40 years. In our study we found that T2DM were occur in above the 40 years in more than 79.4% of cases and 20.6% cases in below the 40 yrs. Affected age of T2DM in developing countries was mainly between 40 to 60 years, while in developed countries it was >60 years (10). A Study conducted in India by Ramachandran, (11) supported that about 50% DM cases had the onset below the age of 50 years. In present study we found more percentage than Ramachandran.

Sex and Diabetes: In our study we found that male was predominance over the female in both T1DM and T2DM. Similar to our study other Indian researchers also reported increased prevalence of males in DM (12). According to Kautzky-Willer et al (13), T2DM is more frequently diagnosed in men at lower age and BMI. Female show an increase in incidence of T1DM between the ages of 0 to 9 years whereas, later in the age category from 15-40 years, its incidence stabilizes in men and decreases in women (6, 14). Previous study in Karnal district of India showed that about 11.56% men and 8.6% women per 100,000 populations were affected by DM (12).

BMI and Diabetes Many longitudinal studies have reported that increased body mass index (BMI) is a strong risk factor for T2DM in both men and women (15, 16). The findings in our diabetes sample are 9.33% in T1DM and 49.14% in T2DM cases of overweight and obesity. About 36.7% in T1DM and 46.9% in T2DM cases had normal BMI because most of the sample was collected after treatment. Similar to study Vikram, et al (17) reported up to 40% subjects of T2DM are of normal weight. A study on US population showed the 85% of cases with T2DM were overweight or obese (18). Logue, et al (19), found that mean BMI recorded within a year of diagnosis was 31.83 kg/m2 in men and 33.69 kg/m2 in women. In our study mean BMI of T2DM within a year of diagnosis was 23.13 kg/m2 in men and 24.87 kg/m2 in women in T2DM patients. In our study mean BMI within a year of diagnosis was 24.28 kg/m2 in T2DM and 16.97 kg/m2 in T1DM patients.

Family History and Diabetes Family history is an independent risk factor for most common chronic diseases including cardiovascular disease, cancer, and DM. Having family members with diabetes is a major risk factor (20, 21). The American Diabetes Association (2) recommends that anyone with a first-degree relative with T1DM – a mother, father, sister, or brother– should get screened for diabetes. The risk of developing T1DM in the Children from their mother is 2% and from their father is 7%. The risk of T2DM was increased to 40% in children if both parents are affected. Simultaneously incidence of T2DM in identical twins was estimated 70% to 90% (22).

Previous survey in US population indicated that the majority of diabetes cases were reported among first-degree relatives (88%–95%) and to a lesser extent in second-degree relatives (70%–77%) (23). In our study family history was found in equal percentage in T1DM and T2DM and the 55.2 to 62.5% patients having positive family history of first degree relative. It may provide a useful screening tool for detection and prevention of diabetes.

Disease Duration and Diabetic Complication The complications of diabetes are influenced by the duration of diabetes and the average level of chronic glycemia. Both micro and macro complications are develop simultaneously in diabetes. Previous Indian study observed the prevalence of complication like diabetic retinopathy in 10.3-21.2% (24, 25); overt diabetic nephropathy in 2.2%;

microalbuminuria in 29.9% (26) and diabetic neuropathy in 15.3-29.2% (25, 26). In the present study we found that 12.7% cases had neuropathy, 14.7% had nephropathy and 20.7% had retinopathy in T1DM cases whereas all microvascular complications were increased in T2DM cases. All complications were more occur after one years of disease duration. Chawla, et al. (25) documented the prevalence of microvasculopathy as 25–40% of diabetic patients aged more than 25 years with more than 5 years duration of diabetes. Previous studied identified the relation between exposure to glycemia over time and the risk of micro and macro complication in both DM cases (27, 28).

Clinical Details and Diabetes The important classical symptoms of marked hyperglycemia in DM include polyuria, polydipsia, weight loss, sometimes with polyphagia, and blurred vision (2, 29, 30) Al-Yaarubi et al (30) found 94% of polyuria, 82% of polydipsia and 59% of weight loss in diabetes cases. Diabetic ketoacidosis was diagnosed in 31% of the patients. T2DM frequently goes undiagnosed for many years. In our study, Weight loss, polyphagia, polyuria, abdominal pain and fever were significantly more in T1DM patients whereas weight gain was significantly associated with T2DM.

Conclusion

Thus, we can conclude that age, gender and BMI is important risk factor. Male was predominated over female in both T1DM and T2DM. Maximum cases of T1DM have low BMI whereas in T2DM patients only 7 cases having low BMI. More than 75% cases of T1DM were affected in the age below 25 yrs while T2DM cases were affected above the 40 yrs of age. T2DM cases were more affected by complication than T1DM. Thus study recommended that screening for diabetes should begin after 40 years of age for all patients and overweight adults of any age.

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