Original Article

Clinical Profile of Type 1 Diabetes Mellitus in Saudi Children: a Hospital Based Study

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Abstract

Objective: To determine the clinical characteristics of newly diagnosed type 1 diabetes mellitus (T1DM) in children under15 years of age. Cross sectional study conducted at Aseer Central Hospital Abha, South-western Saudi Arabia from June 2011 – May 2015.

Patients and Methods: Study included 141 Saudi children, < 15 years old with newly diagnosed T1DM. The demographic and laboratory data were collected from file records. The patients were divided into younger (< 5 yr), middle (5 – 10 yr) and older (>10 – 15 yr) age groups. Data were analyzed by using SPSS version 16.

Results: Age of 141 children at onset of T1DM (mean ± SD) was 6.5 ± 3.2 years and majority 62 (44%) belonged to middle age group. Older 43 (30.5%) age group had female predominance (2:1) ($p < 0.0001$). Diabetic keto-acidosis (DKA) (39%), obesity (11%) and male predominance (2.6:1) were found in younger 36 (25.5%) age group ($p < 0.0001$). Family history (F/Hx) of T1DM 29 (20.6%) and HbA1c (10.36 ± 1.8%) successively increased with advancing age of patients. Main presenting symptoms like polyuria (96%), polydipsia (85%), weight loss (62%), nocturia (47%), polyphagia (28%) and DKA (22%),were significantly more frequent in children with F/Hx of T1DM ($p < 0.0001$). Duration of symptoms at first presentation was 17.3 ± 10.7 days and daily insulin requirement was found 0.82 ± 0.2 units/Kg.

Conclusion: Polyuria, polydipsia, weight loss, nocturia and polyphagia were the main presenting symptoms and more frequent in middle age group children especially having F/Hx of T1DM. Under five years, obese and male children were found at higher risk for DKA development. Girls usually present late in adolescent age.

Key Words: Type 1 diabetes mellitus, Saudi Arabia, diabetic ketoacidosis, children, symptoms.

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Contribution

All Authors have contributed in Study Design, Data Collection, Data Analysis, Data Interpretation, Manuscript Writing and Approval.

Introduction

Type 1 diabetes mellitus (T1DM) is a common endocrinal, chronic illness affecting more than 15 million people in the world[1]. It is caused by β cell mass des-

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truction leading to insulinopenia (low or absolute insulin deficiency) and is characterized by hyperglycemia and glycosuria.[2,3]

Insulin dependent diabetes mellitus trend has been increasing for last few decades. Apart from adults, children and even young infants are also affected by it. A recent population based study regarding T1DM incidence and prevalence reported that 15,000 youths are newly diagnosed each year globally.[1] Data from European diabetes centers suggest that the annual rate of increase in T1DM incidence is 2 – 9%. The rate of increase is greatest among the youngest children.[1] Its incidence varies remarkably ranging from 0.1/ 100,000 per year in Venezuela, 0.7/100,000 per year in Karachi, Pakistan to 57.6/100,000 per year in Finland.[1, 4,5] Similarly, highly variable incidence of T1DM among Arab countries has been reported ranging from 2.54/ 100,000 in Oman to 29/100,000 in Saudi Arabia.[6,7] This variation seems to be due to genetic makeup of specific ethnic groups in different countries but also seen in different regions within the same country that reflects complex and multi-factorial inheritance.

The genetic susceptibility to T1DM in siblings is 6% and in parents is 3% of a diabetic child.[1] However, 85% of newly diagnosed type 1 diabetic patients have no family member with T1DM.[1] The risk of diabetes is increased in offspring; 3-4% if mother is diabetic and 5 – 6% if father is patient.[1] Genetic determinants play a role in the susceptibility to T1DM up to 40% but environmental factors are also responsible for it.[1] Changes in incidence between urban and rural population of same ethnic group, occurrence of seasonality and relation with migration, all point to environmental factors as well, the possible cause.Children with T1DM have wide range of clinical presentation like intermittent polyuria, weight loss to diabetic ketoacidosis (DKA), altered consciousness and coma. Studies revealed different clinical symptoms at onset of disease with varying frequency like dry sensation in mouth (95%), polydipsia (84%), polyuria (65%), weight loss (49%) and nocturia (27%).[8,9] Diabetic children are more prone to develop DKA as compared to adults. This severe metabolic imbalance carries high morbidity and mortality in children.[10,11] In Saudi Arabia, due to poor parental knowledge of diabetes especially in paediatric age group, their children may suffer from symptoms of diabetes which are usually overlooked and ignored leading to delayed seeking of medical help unless the children develop more serious problems like DKA. Primary healthcare providers may also overlook or miss these symptoms when child presents to them with concomitant diseases like acute respiratory tract infections or gastroenteritis etc. leading to delay in diagnosis and management.

Awareness among parents/public regarding common symptoms of diabetes in children is needed as it may result in timely diagnosis of diabetes mellitus (DM) and may prevent further severe metabolic derangements and long term complications related to the disease. Although diabetes is quiet common endocrinal problem and lot of research has been carried out so far in many countries to explore different aspects of this disease, we conducted this study in Southwest region of Saudi Arabia as only a handful studies are available from this area. So it was planned to determine the clinical spectrum of newly diagnosed cases of T1DM in children, in this region.

Patients and Methods

The file record of 141 Saudi children aged less than 15 yearsadmitted with newly diagnosed T1DM from June 2011 to May 2015 at Aseer Central Hospital, Abha, Southwestern Saudi Arabia, were reviewed. Children with previously diagnosed diabetes, above 15 years of age and non-Saudis' were excluded from the study. Children with syndromes and diabetes related with other causes like steroid induced and cystic fibrosis were also excluded.

The study population was categorized according to age into three groups, younger (< 5 years), middle (5 – 10 years) and older (> 10 – 15 years). The demographic variables and clinical symptoms preceding diagnosis, duration of symptoms, family history including consanguinity, first/second degree relatives with diabetes and duration of hospital stay were also recorded. Anthropometric measurements were determined. The data regarding glycosylated haemoglobin (HbA_1c) and daily doses of insulin required to control blood sugar were also collected.

Data were analyzed by using SPSS version 16. The quantitative or numerical variables were presented in the form of mean, standard deviation (SD) and maximum and minimum values (range). Student t test and analysis of variance was used as test of significance at 5% level. Categorical or demographic variables were expressed in frequency and percentage. These variables were tested by Chi-square test. A p value < 0.05 was considered significant.

The study proposal was approved by concerned Institutional Research Ethical Committee.

Results

The mean age of diabetic children at onset of disease was 6.8 ± 3.2 years. The age distribution was categorized as younger, < 5 years: 36 (25.5%), middle aged 5 – 10 years: 62 (44%) and older > 10 – 15 years: 43 (30.5%). There were 69 (48.9%) girls and 72 (51.1%) boys. We found male predominance in under 5 years age group with M:F ratio 2.6:1 while it was reverse in older age > 10 years (M:F ratio 1:2). Table 1 depicts the spectrum of clinical profile of children with T1DM in different age groups.

History of consanguinity was seen in 30 (21.3%) parents. Forty eight (34%) cases had diabetes in first degree relatives. Among those, siblings accounted for 16 (11%), fathers 26 (18%) and mothers 6 (4.2%). Of 44 children 11 had positive F/Hx for both T1DM and T_2DM in 1st degree relatives. History of T1DM was seen in 29 (20.5%) families. Of those, 21 had F/Hxin first degree relatives while eight had affected second degree family members.

Regarding symptoms, polyuria (96%) was found to be the commonest, followed by polydipsia (85%), weight loss (62%), nocturia (47%) and polyphagia (28%). The mean duration of symptoms before diagnosis was 17.3 ± 10.7 (range: 2 – 60) days. Forty three (30%) of diabetic children had less than two weeks duration of symptoms. DKA was observed in 31 (22.3%) children as an initial complaint. Of those significantly higher percentage 14/31 (45%) belonged to < 5 years age group ($p < 0.0001$). Mean duration of symptoms was 17.3 ± 10.7 days (Table 1). Clinical features of children with and without family history of T1DM are compared in Table 2.

Mean HbA1c value was found to be 10.36 ± 1.8%. Its value successively increased with age of patients (Table 1). However daily mean insulin requirement in these children was 0.82 ± 0.16 U/Kg. Mean duration of hospital stay were 5.5 ± 2 days.

Table 1: *Demographic and clinical characteristics of children with type 1 diabetes mellitus.*

Parameters		Overall n = 141	<5 yrs; n = 36	5-10 yrs; n = 62	>10– 15 yrs; n = 43
F/Hx of DM in1st degree relatives, n (%)	Siblings	16 (11.3)	2 (5.5)	06 (9.6)	08 (18.6)
	Fathers	26 (18.4)	0	14 (22)	12 (28)
	Mothers	6 (4.2)	0	2 (03)	4 (09)
F/Hx of DM in 2nd degree relatives, n (%)		74 (52.5)	18(50)	32 (51.6)	24 (55.8)
Consanguinity, n (%)		30 (21.3)	8 (22)	8 (13)	14 (32)
Presenting complaints, n (%) Polyurea Polydipsia Weight loss Nocturia Polyphagia		 136 (96.5) 120 (85.1) 87 (61.7) 66 (46.8) 39 (27.7)	 33 (91.6) 22 (61) 19 (52.7) 9 (25) 2 (5)	 62 (100) 57 (92) 43 (69) 35 (56) 22 (35)	 41 (95) 41 (95) 25 (58) 22 (51) 15 (34.8)
DKA at initial presentation, n (%)		31 (22)	14 (39)	7 (11)	10 (23)
Weight > 120% (obesity), n (%)		6 (4.3)	4 (11)	0	2 (4.6)
HbA1c (%), mean ± SD		10.4 ± 1.8	9.9 ± 1.4	10.3 ± 1.6	10.9 ± 2.2
Male : female ratio		51:49	2.6:1	1:1	1:2
Age at onset of DM (yr.), mean ± SD		6.8 ± 3.2	2.8 ± 1.23	6.5 ± 1.53	10.8 ± 2.47
Duration of symptoms (days) mean ± SD (range)		17.3 ± 10.7 (2 – 60)	17.8 ± 27.6 (4-60)	16.2 ± 27.57 (3 – 30)	18.2 ± 32.52 (2 – 60)
Insulin required (units/kg/day) mean ± SD		0.82 ± 0.2	0.82 ± 0.2	0.83 ± 0.2	0.79 ± 0.1
Duration of stay in hospital (days), mean ± SD		5.5 ± 2	5.9 ± 2.4	5.3 ± 1.8	5.2 ± 1.84

F/Hx–Family history, DKA – diabetic keto-acidosis, DM- diabetes mellitus, HbA1c – Glycosylated haemoglobin

Table 2: *Comparison of clinical features between children with and without family history of T1DM.*

Clinical Features	Total Children of T1DM n = 141 (100%)	With F/Hx of T1DM n = 29(100%)	Without F/Hx of T1DM n = 112 (100%)	p-value
Polyuria	136 (96.5)	29 (100)	107 (96)	0.0001
Polydipsia	120 (85)	27 (93)	93 (83)	0.0001
Weight loss	87 (62)	22 (76)	65 (58)	0.0001
Nocturia	66 (47)	19 (66)	47 (42)	0.0001
DKA at initial presentation	31 (22)	04 (14)	27 (24)	0.0001
Duration of symptoms (days), mean ± SD	17.3 ± 10.7	18.41 ± 13.5	17.02 ± 9.9	0.538

F/Hx – family history, T1DM – Type 1 diabetes mellitus

Discussion

Diabetes mellitus incidence is increasing globally and annual rise is reported to be 3%.[12] T1DM in children is responsible for 5-10% of the total cases of diabetes in world.[13]

In the present study, almost half of the study population (44%) belonged to middle (5 – 10 yrs) age group that matches with the peak age of onset of T1DM as it corresponds to the time of increased exposure to infectious agents coincident with the beginning of school. This is in agreement with similar studies from Saudi Arabia and India (mean age ± SD, 6.9 ± 3.5 yrs. and 7.4 ± 3.9 yrs. respectively).[7,14] In contrast, a study from China reported older children (10 – 14 yrs.) with newly diagnosed T1DM.[15]

We noted difference in gender distribution between younger and older age groups. There was female predominance in older (10 – 15 yrs.) T1DM children compared to younger age group (< 5 yrs). These results are in concordance with another study conducted in the Eastern province of Saudi Arabia.[16] This indicates that girls usually present late in adolescence probably due to stressful age group.

Significantly frequent (34%) F/Hx of DM (both T1DM and T2DM) was found in first degree relatives. Moreover, 52% children had affected second degree family members (grandparents, uncles and aunts) with DM. These results are comparable to the findings of another study conducted at Riyadh, Saudi Arabia.[17] This strongly proves the role of genetics in T1DM. We noted successive increase in F/Hx of DM in first and second degree relatives with advancing age of diabetic children (Table 1).

In the current study, majority of patients (70%) presented at time of diagnosis with symptoms for longer than two weeks while 30% had less than two weeks history. Similarly in a European study, 25% children had duration of symptoms less than two weeks at diagnosis.[18] This little difference may be due to geographical and environmental variations. We found no significant difference regarding duration of symptoms in different age groups. On contrary, studies from Oman and Tuzla Paediatric Hospital revealed significantly shorter duration of symptoms in younger age group.[19,20]

Polyuria (96%), polydipsia (85%), weight loss (62%), nocturia (47%) polyphagia (28%) DKA (22%) were the main presenting symptoms in our study participants. Some others also reported the similar symptoms.[18-21] Table 2 displays that these symptoms were significantly more frequent in children with F/Hx of T1DM except DKA which was significantly less frequent (14% versus 24%, $p < 0.0001$). Most probably parents of the children without F/Hx of T1DM were not aware of diabetic symptoms so they brought their children to hospital on severe presentation of DKA.

Britta and Nicholas noted DKA 20 – 40% as an initial presentation in newly diagnosed T1DM children which is in concordance with our results as 22%.[1] Younger children (< 5 yrs.) were found to be at significantly higher risk with DKA presentation ($p < 0.0001$) which is in agreement with our findings.[25-27] Almost half (44%) of our children who developed DKA belonged to younger (< 5 yrs.) age group. Different studies showed variable prevalence of DKA among different countries ranging from 17% (Egypt) to 67% (Saudi Arabia)[22,23] but a systematic review of 25 different studies covering 12 Arab countries revealed overall

DKA frequency as 46.7%,[24] that may be attributed to marked β cell damage and late diagnosis. However this is in sharp contrast to the SW lone findings from Pakistan who reported that more than one half (55.5%) of the children with DKA were older than 10 yrs. of age.[28] Variable frequency of DKA in different communities is probably due to variable genetic and geographical variations.

This retrospective study was cross sectional and from one tertiary care hospital of Aseer Region in Saudi Arabia that may not represent the early presentation of the whole paediatric population with T1DM in the country. So, more, multicenter large studies are needed to describe the actual density of this disease and its early presentation.

Conclusion

The study concludes that polyuria, polydipsia, weight loss, nocturia and polyphagia were the main presenting symptoms. Those were more frequent in middle age group children especially having F/Hx of T1DM. Under five years male children with obesity were found to be at higher risk for DKA presentation. Girls usually present late in adolescent age. By early picking major symptoms of T1DM, in time diagnosis can be made which may prevent further severe metabolic derangements like DKA especially in pre-school children. Public awareness programs regarding T1DM may be helpful to reduce the gravity of this critical fast growing issue.

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