

# Clinical Manifestation of Type I Diabetes Mellitus Patients Presented in a Tertiary Care Hospital in Karachi

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## ABSTRACT

**OBJECTIVE:** To determine the frequency of clinical manifestation of type 1 diabetes mellitus patients presented in tertiary care hospitals in Karachi

**METHODOLOGY:** A descriptive cross-sectional study was conducted from July 2015 to January 2016 at Out Patient Department of National Institute of Child Health, Karachi, Pakistan. A total of 90 children aged less than 18 years of either gender with type 1 diabetes mellitus (T1DM) were included through the non-probability consecutively sampling technique. Children who were immunocompromised or taking any drug which could cause hyperglycemia were excluded from the study. Various clinical presentations in terms of Diabetic ketoacidosis (DKA), weight loss, polydipsia, and polyuria were recorded. Data were entered and analyzed by using SPSS version 19.0.

**RESULTS:** The age range was from 1 to 18 years (average age of  $8.5 \pm 4.15$  years) with a mean duration of symptoms  $2.3 \pm 1.2$  weeks. Out of 90 patients, 48 (53%) were male and 42 (47%) were female. There were 56 (62.2%) were with DKA, 33 (36.66%) were with weight loss, 65 (72.2%) were with polydipsia, and 76 (84.4%) were with polyuria. A significant association of polyuria was observed with the age of the patients ( $p$ -value  $< 0.001$ ) whereas the duration of symptoms was found to be significantly associated with DKA ( $p$ -value  $< 0.001$ ) and polyuria ( $p$ -value 0.032).

**CONCLUSION:** The frequency of clinical presentations at the onset of type I diabetes mellitus (T1DM) is significant. Polydipsia, polyuria, and diabetic ketoacidosis are the most common symptoms of presentation.

**KEYWORDS:** Clinical manifestations, type 1 diabetes mellitus, diabetic ketoacidosis, polyuria, polydipsia, tertiary care.

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## INTRODUCTION

Type 1 Diabetes (T1D) is the most common endocrinal and metabolic chronic disorder of children, affecting 15 million people worldwide<sup>1</sup>. T1D is also recognized as insulin-dependent diabetes mellitus, childhood or maturity-onset, and juvenile diabetes, characterized by a very low or absolute deficiency of insulin due to  $\beta$  cell destruction in the pancreas, resulting in high blood and urine sugar levels<sup>2</sup>.

T1D is prevalent in both developed and underdeveloped parts of the world and has been considered an emerging public health issue across the world<sup>3</sup>. Globally, the overall burden of DMT1 rises to 3%, and approximately 78,000 children and adolescents are affected every year<sup>4</sup>. The range of incidence shows remarkable variations in different parts of the world. Researchers conducted in developing countries such as Venezuela and Pakistan mentioned incidence rates of T1D, 0.1%, and 0.7% per 100,000/annum, respectively<sup>1,5</sup>. Developed countries reported incidence rate of 19.1% (Australia), 20.7-21.3% (USA) and 57.6% (Finland) per 100,000

per year<sup>6,7</sup>. The annual rate of increase in incidence in European countries is 2-9%, especially in young children<sup>1</sup>. The variations in incidence rates might be due to genetic susceptibility with their specific ethnic groups of different countries. Studies mentioned genetic propensity in siblings (6%) and parents (3%) of diabetic children, though 85% of cases have no family history with T1D<sup>1</sup>. Hence, the cause of DMT1 remains unclear and even the means to prevent the condition.

T1D shows great variability and pattern in its clinical presentation, hence, considered a self-evident disease. The children with T1D present with a wide range of stern symptoms of varying frequencies and intensity such as dryness of the mouth (95%), polydipsia (84%), polyuria (65%), and nocturia (27%)<sup>3</sup>. Children are often present with an acute serious life-threatening complication; Diabetic Keto Acidosis (DKA) which is associated with cerebral edema, stroke, and pulmonary edema leading to altered consciousness and coma<sup>8</sup>. DKA accounts for a large proportion of DM-related medical emergencies with a 1-10% risk per patient per year<sup>9</sup>.

Pakistan, being a developing country faces health challenges including T1D. Unawareness due to unsatisfactory literacy rates and socioeconomic circumstances causes the situation to get worse. Although T1D is a quite common metabolic disorder and a variety of researches conducted so far in different countries, limited data is available from Pakistan, especially from the city Karachi. Considering the worldwide variations in the pattern of presentation and outcome, the main aim of the study is to determine the early and most common presenting symptom/s of T1D. The findings of this study could be helpful for health care professionals for early diagnosis and management of complications associated with T1D.

### METHODOLOGY

It is a descriptive cross-sectional study conducted at the Outpatient Department of the National Institute of Child Health Karachi from July 2015 to January 2016. This study was approved by the College of Physicians & Surgeons Pakistan REU dissertation approval letter No. CPSP/REU/PED-2012-196-2349, Dated March 14, 2016. A total of 90 children of age 1 to 18 years of either gender having T1DM were included in this study using the non-probability consecutively sampling. While children suffering from immunosuppressive disorders like Human Immunodeficiency Virus (HIV) infection, Chemotherapy, transplantation, and neoplastic disorder as well as those receiving the drugs that increase blood glucose level like Corticosteroids, beta-glucose, thyroid hormones were excluded. Type I diabetes mellitus in children were confirmed based on the presence of plasma glucose of 200 mg/dL at the time of presentation in the Outpatient Department (OPD) /emergency department. To avoid bias single laboratory technician performed the test.

DKA was labeled as positive based on the presence of an altered level of consciousness (GCS <15), low PH <7.35, decrease HCO<sub>3</sub>< 22 mEq, and High level of random blood sugar >250mg/dl. The presence of any of the above or more was labeled as Diabetic ketoacidosis. Weight loss was defined as a history of greater than 10% weight loss. Polydipsia was defined as excessive oral intake of water (> 2 liters/24hours) whereas polyuria was defined as more than 10 times urination during daytime.

The sample size was selected taking the least prevalence of weight loss in type 1 DM i.e. 33%, the margin of error d=10%, and 95% level of confidence. The sample size comes out to be 90.

Informed consent from the guardian of the study population with the assurance to keep their information confidential was obtained to include their demographics in the study. Moreover, approval from the Research Evaluation Unit of the College of Physicians of Pakistan was obtained before

conducting the study. To avoid bias single laboratory technician performed the test and the researcher himself look after the procedure. The outcome was recorded on the attached Performa in terms of DKA, weight loss, polydipsia, and polyuria.

Data were entered and analyzed by using SPSS version 19.0. Mean and standard deviation was calculated for continuous variables like age, weight, and duration of symptoms. Frequency and percentage were calculated for gender and outcome variables (Diabetic ketoacidosis, weight loss, polydipsia, polyuria). Effect modifiers were controlled through stratification of age, gender, and duration of symptoms. Chi-square test was applied to see the effect of these on outcome variables taken P≤ 0.05 was taken as significant.

### RESULTS

Out of the total Ninety patients, the mean age of the children was 8.50±4.15 years. Most of the patients (n=48, 53%) were presented with >12 years, followed by 5-12 years (n=26, 29%) and ≤5 years of age (n=16, 18%). There were 48 (53%) males and 42 (47%) females. The mean duration of symptoms was 20.34±12.31 weeks. The majority of the patients (n=66, 73%) were presented with >1 week while 24 (27%) children were presented with ≤1 week of the duration of symptoms. The clinical presentation shows that polyuria was predominantly higher (n=76, 84%) followed by polydipsia (n=65, 72%), diabetic ketoacidosis (n=56, 62%), whereas weight loss was observed in 33 (37%) children. (**Table I**)

Comparison of clinical characteristics concerning age showed a significant association of polyuria with the age of the patients (p-value <0.001) while DKA (p-value 0.837), weight loss (p-value 0.744), and polydipsia (p-value 0.101) were found to be insignificantly associated with the age of the children. (**Table II**). When compared based on gender all variables were found insignificant (p-value >0.05) (**Table III**). However, the duration of symptoms was found to be significantly associated with DKA (p-value <0.001) and polyuria (p-value 0.032). (**Table IV**).

**TABLE I: BASELINE CHARACTERISTICS OF THE CHILDREN (n=90)**

	n	%
<b>Age, years</b>	8.50 ±4.15	
≤5	16	18
5-12	26	29
>12	48	53
<b>Gender</b>		
Male	48	53
Female	42	47
<b>Weight, kg</b>	20.34±12.31	

Duration of symptoms, weeks	2.32±1.24	
≤1	24	27
>1	66	73
Clinical Presentations		
Diabetic ketoacidosis	56	62
Weight Loss	33	37
Polydipsia	65	72
Polyuria	76	84

Kg: Kilogram, n: number

**TABLE II: COMPARISON OF CLINICAL PRESENTATION FOR AGE (n=90)**

	≤5 (n=16)	5-12 (n=26)	>5 (n=48)	p-value
Diabetic Ketoacidosis				
Yes	9 (16)	17 (30)	30 (54)	0.837
No	7 (21)	9 (27)	18 (53)	
Weight Loss				
Yes	6 (18)	11 (33)	16 (49)	0.744
No	10 (18)	15 (26)	32 (56)	
Polydipsia				
Yes	9 (14)	17 (26)	39 (60)	0.101
No	7 (28)	9 (36)	9 (36)	
Polyuria				
Yes	11 (15)	21 (28)	44 (58)	<0.001
No	15 (63)	5 (21)	4 (17)	

Chi-square test applied, p-value <0.05 taken as significant, All data presented as number (%)

**TABLE III: COMPARISON OF CLINICAL PRESENTATION FOR GENDER (n=90)**

	Gender		p-value
	Male (n=48)	Female (n=42)	
Diabetic Ketoacidosis			
Yes	32 (57)	24 (43)	0.353
No	16 (47)	18 (53)	
Weight Loss			
Yes	19 (58)	14 (42)	0.539
No	29 (51)	28 (49)	
Polydipsia			
Yes	33 (51)	32 (49)	0.432
No	15 (60)	10 (40)	
Polyuria			
Yes	42 (55)	34 (45)	0.393
No	6 (43)	8 (57)	

Chi-square test applied, p-value <0.05 taken as

significant, All data presented as number (%)

**TABLE IV: COMPARISON OF CLINICAL PRESENTATION FOR THE DURATION OF SYMPTOMS (n=90)**

	Duration of Symptoms (in weeks)		p-value
	≤1 (n=48)	>1 (n=42)	
Diabetic Ketoacidosis			
Yes	8 (14)	48 (86)	<0.001
No	16 (47)	18 (53)	
Weight Loss			
Yes	11 (33)	22 (67)	0.244
No	13 (48)	14 (52)	
Polydipsia			
Yes	13 (20)	52 (80)	0.021
No	11 (44)	14 (56)	
Polyuria			
Yes	17 (22)	59 (78)	0.032
No	7 (50)	7 (50)	

Chi-square test applied, p-value <0.05 taken as significant, All data presented as number (%)

## DISCUSSION

This cross-sectional study described the various clinical presentation of T1D in children of different age groups visiting the outpatient department of a tertiary care hospital. In the current study, a cohort of 90 diabetic children was studied to determine the various ways of clinical presentation and/or diabetic complications. The mean age of children presented with symptoms of T1D was 8.5 years. The study conducted in Saudi Arabia and Pakistan mentioned a mean age of 8.7 and 7.5 years, respectively which are close to the finding of this study<sup>3</sup>. However, most of the study participants belong to the age group 12 years or older. This is in line with the findings of the study conducted in China<sup>10</sup>. The overall prevalence was higher in participants of age 12 years or older followed by age groups of less than 12 years. Conversely, AL-Ghamdi and Fureeh reported high prevalence in age group 6-10 years which increased with the increasing age<sup>4</sup>. This research showed male predominance in suffering from DMTI, similar to the researches of other countries<sup>11</sup>. On the contrary, researchers mentioned female predominance rather than males<sup>3, 4, 12</sup>. Regarding the clinical presentation of the hyperglycemic symptoms, this study revealed female predominance, similar to the findings of the other researches<sup>4, 11</sup>.

The findings of the current study revealed that the most frequent initial presentation of T1D was

hyperglycemic symptoms. Polyuria was the most common clinical feature reported followed by polydipsia and weight loss. However, more than half presented with DKA. Research conducted by Rafique et.al. also highlighted polyuria, the most common presenting complaint of T1D patients<sup>2</sup>. The clinical symptoms of T1D were appeared more common in the age group 12 years or older in comparison to lesser age groups according to this research. In contrast, research conducted in Saudi Arabia reported that symptoms appeared earlier in youngest age groups and frequency increases with older age advancement<sup>4</sup>.

Current research also revealed that more than half of the children of this study presented with DKA as the first manifestation. It is not surprising as a similar finding has been reported in researches conducted in Ethiopia<sup>13</sup> and Italy<sup>14</sup>. Furthermore, some countries (UAE, Romania, Taiwan) have a higher prevalence<sup>15</sup>, though all nations reflect wide geographical variations in the occurrence of DKA at the onset of T1D. The result variations concerning the magnitude among nations might be due to differences in the study population, the background prevalence of T1D, influence of family history, financial status, late diagnosis, and treatment as well as the criteria of DKA used in particular researches<sup>13</sup>. About age and gender, DKA was found more common in the age group 12 years or older and in male children, however, the reason for this finding cannot be explained and wasn't associated with DKA with age<sup>9</sup>. In the present research, more than half of the children presented with T1D symptoms had a history of symptoms longer than 1 week. Literature shows variations in durations from the time of diagnosis with presentation of symptoms with more than 1 to 2 weeks of history<sup>2</sup>. Environmental and geographical factors might be the reason for a slight difference in variations. However, a shorter duration of symptoms has been associated with the youngest age group<sup>16</sup>.

The study has significant limitations. First, the study was a single-center with a limited sample size that may not represent the entire pediatric population of the city or country. Second, because of the cross-sectional methodology, it was not possible to determine the temporal relationship of independent variables on the development of T1D symptoms. Hence, multicentered longitudinal studies with a large study population are required to define the actual magnitude and pattern of the condition and its early clinical presentation.

### CONCLUSION

The finding of this study has reported polydipsia, polyuria, and DKA as the most frequent clinical symptoms. It is observed from the study findings that T1DM has common symptoms which can be recognized by parents and physicians, to improve the

diagnosis of this serious disease and avoid its complications.

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### AUTHOR CONTRIBUTIONS

Chachar S: Idea conceived  
Ashfaq M: Analysis  
Nisa B: Text writing  
Ahmed N: Data collection  
Ahmed A: Data collection  
Ibrahim MN: Supervision of research

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