Clinical presentation and course of Type 1 diabetes: A Hospital based longitudinal study over a period of ten years
Jour of Diab and Endo Assoc of Nepal Vol 9, No. 1, January-June, 2025
ISSN Print 2594-3367 ISSN Online 2631-2107

Journal of Diabetes and Endocrinology Association of Nepal

ORIGINAL ARTICLE OPEN ACCESS

Clinical presentation and course of Type 1 diabetes: A Hospital based longitudinal study over a period of ten years

Karki ST[1], Yadav AK[2], Joshi P [3], Karki BB[4], Mall D[5]

[1]Associate Professor, NAMS, Sr. Consultant paediatrician, Kanti Children's Hospital, [2]Assistant Professor, NAMS, Sr. Consultant paediatrician, Kanti Children's Hospital, [3]Associate Professor, NAMS, Chief Consultant paediatrician, Kanti Children Hospital, [4]Associate Professor, NAMS, Bir Hospital, [5]Associate Professor, NAMS,Bir Hospital.

https://doi.org/10.3126/jdean.v9i2.83001

Abstract

Background: Type 1 Diabetes Mellitus in children once considered a very rare disease is no rarer. Being chronic illness diabetes in early life increases the risk of morbidity thereby impairing physical, mental as well as social development. This retrospective study was planned to find the clinical picture, complications and course of Type 1 diabetes among Nepalese children aiming for the result thus obtained will help in proposing strategies for future management planning and resource allocation. **Method**: A longitudinal study of children with Type1 Diabetes Mellitus (T1DM) presented to pediatric endocrinology unit of Kanti Children's Hospital (KCH) over the period of ten years (January 2013 to Dec 2023) was conducted. The data were retrieved retrospectively from patient's record file, OPD record book, and the diabetic logbook of each patient regarding the basic demographic profile, clinical presentations, complications, investigations and course of disease. As per need interviewing was done to get further information and clarification. Data were entered into MS Excel and analyzed using SPSS version 26. Result: Among one hundred eighty-five children with T1DM enrolled in study 104 (56.2%) were male and 81 (43.8%) were female with M:F ratio of 1.27:1. The mean age of the patients was 9.5±4.1 years. More than two thirds (73.6%) were between the age of 5 to 14 years at the time of diagnosis. In terms of BMI, 123 (66.5%) were within the normal range, 41 (22.2%) were underweight, and 5 each (2.7%) were overweight and obese. The presenting complaints at the time of diagnosis were polyuria (93.5%), polydipsia (89.2%), weight loss (82.2%), polyphagia (69.2%) and weakness (67.6%). Presentation with diabetic ketoacidosis (DKA) and infection at the time of diagnosis was found in 54.1% and 18.9% children respectively. **Conclusion**: Most common clinical presentation of T1DM were typical osmotic features like polyuria, polydipsia and complications like DKA. The most common age of presentation was 5 to 14 years.

Key words: Diabetic Ketoacidosis, Diabetes Mellitus, Polydipsia, Polyuria.

Introduction

In the past, Diabetes Mellitus was considered as disease of adult only, so despite children having typical features of diabetes the diagnosis of diabetes was never considered. Findings of the current 11th edition 2025 Diabetes Atlas confirm that diabetes is one of the fastest-growing global health challenges of the 21st century.[1] It is estimated that over 9.5 million people had type 1 diabetes in 2024, of which 1.9 million were children and adolescents under the age of 20.[1] The total number of people living with diabetes is projected to reach 853 million by 2050.[1] In 2024, there were an estimated 9.15 million individuals worldwide living with diagnosed clinical T1D, with 22.3% (2.04 million) of these living in low-income and lower-middle-income countries.[2] The incidence of type 1 diabetes varies around the world, with some regions having much higher incidences than others. Though the incidence has been increasing in majority of countries studied, there is evidence that this increase is stable or tailing

Correspondence Author

Dr Subhana Thapa Karki, Associate Professor, NAMS, Sr. Consultant paediatrician, Kanti Children's Hospital, Kathmandu. Email ID: subhanakarki@gmail.com

Jour of Diab and Endo Assoc of Nepal Vol 9, No. 1, January-June, 2025
ISSN Print 2594-3367 ISSN Online 2631-2107
Journal of Diabetes and Endocrinology Association of Nepal
ORIGINAL ARTICLE OPEN ACCESS

off in some high-income countries. The reasons for this are unclear but the rapid increase over time is most likely due to environmental changes.[3,4,5,6]

The overall age adjusted incidence of Type 1 diabetes varies from 0.1/100000 per year in China,36.8/100000 per year in Venezuela and 36.5/100000 per year in Finland.[7,8,9] The genetic susceptibility to T1DM in siblings is 6%. The risk of diabetes is increased in offspring; 3-4% if mother is diabetic and 5 – 6% if father is diabetic. Genetic determinant plays a role in the susceptibility to T1DM up to 40% but environmental factors are also responsible for it.[7]

In developing countries like Nepal T1DM in children was considered a very rare disease. After the introduction of International Diabetic federation (IDF) in the year 2011'Life for a child "program at Kanti Children's Hospital, Patan Hospital and BP Koirala Institute of Health Sciences (BPK) Dharan, an increased number of Type 1 DM diabetic children each year have been faced. Being the only tertiary care government pediatric hospital in the country, KCH caters for services to the children referred from all over the country. The pediatric endocrinology unit of KCH has been providing services for the last 10-11 years. To our knowledge, till the date, we do not have any official data on T1DM among children in Nepal. We planned this study at KCH to find the clinico-demographic profile of T1DM children with aim that the result thus obtained will help in proposing strategies for future management planning of childhood diabetes mellitus and resource allocation.

Material and Methods

Record files of all the children presented or referred to the pediatric endocrinology unit of Kanti Children's Hospital (KCH), who were diagnosed with Type 1 DM during a period of ten years from January 2013 to Dec 2023 were analyzed retrospectively. After the approval from Institutional Review Board (IRB) of the hospital, patient's record file, OPD record book, and the diabetic logbook of each patient were reviewed during which 185 children's record were found to have complete data set and hence were included for analysis. Diagnosis of Type 1 DM was made based on the World Health Organization (WHO) criteria.[10] Variables recorded were ±is the capital city comprising of Kathmandu, Lalitpur and Bhaktapur districts. As per need interviewing was done to get further information and clarification. The data were entered into MS Excel and analyzed using SPSS version 26. Categorical variables were summarized using frequency and percentage, while numerical data were presented as mean± standard deviation, median interquartile range based on distribution.

Result

Table 1. Baseline and Demographic characteristics of children with type 1 Diabetes Mellitus

	Indicators	**Frequency**	**Percentage (%)**
Age (In years)	**Mean±SD**	9.5±4.1	
	< 5 years	31	16.8
	5-10 years	68	36.8
	10-14 years	68	36.8
	> 14 years	18	9.7
Sex	**Male**	104	56.2
	Female	81	43.8
Residence	**Within Kathmandu valley**	44	23.8

	Outside Kathmandu Valley	141	76.2
Fathers Education	**Illiterate**	20	10.8
	Primary	43	23.2
	Secondary	58	31.4
	Undergraduate	25	13.5
	Post Graduate	14	7.6
Mothers Education*	**Illiterate**	50	27.0
	Primary	41	22.2
	Secondary	50	27.0
	Undergraduate	18	9.7
	Post Graduate	4	2.2
Season	**Winter**	48	25.9
	Spring	55	29.7
	Summer	49	26.5
	Autumn	33	17.8
Cow's Milk Intake within 6 months*		17	9.2
History of Mumps*		14	7.6
History of Rubella		0	0
History of Chicken Pox*		2	1.1
Family History of DM*		37	20.0
Birth Weight*(in Kgs)	**<2.5**	3	1.6
	2.5 to <4	104	56.1
	≥4	6	3.2
BMI*	**Normal**	123	66.5
	Underweight	41	22.2
	Overweight	5	2.7
	Obesity	5	2.7
FBS, Median (IQR)*		233.0(155.0-3.3.0)	
RBS, Median (IQR)*		394.0(292.0-475.0)	
HbA1c, Median (IQR)*		11.5(9.7-14.0)	

Table No.2. Clinical presentation at the time of diagnosis of Type 1 DM

Clinical Features	Frequency	Percentage
Polyuria	173	93.5
Polydipsia	165	89.2
Weight loss	152	82.2
Polyphagia	128	69.2
Weakness	125	67.6
Diabetic Ketoacidosis	100	54.1
Infection	35	18.9

Jour of Diab and Endo Assoc of Nepal Vol 9, No. 1, January-June, 2025
ISSN Print 2594-3367 ISSN Online 2631-2107
Journal of Diabetes and Endocrinology Association of Nepal
ORIGINAL ARTICLE OPEN ACCESS

Table no.3. Complications during the course of Type 1DM over 10 years

Complications	Frequency	Percentage
Severe Hypoglycemia	25	13.5%
Recurrent DKA	10	5.4%
Microalbuminuria	9	4.8%
Mortality	4	2.16%
Diabetic Cataract	2	1.08%
Hypertension	2	1.08%
Retinopathy	1	0.54%

Discussion

The mean age of the children with Type 1 Diabetes mellitus was 9.5±4.1 years and majority of our patients were diagnosed between 5 and 14 years of age. Around 9.7% of our diabetic patients were diagnosed after the age of 14 years. The mean age of onset of T1DM in a study by Saha LR et al from eastern Nepal was 11.1±4.9 years [11] which is similar to study from Ghana (12.6±3.8 years) [12]. In contrast, studies from Saudi Arabia (6.8±3.2 years) [13] and Bangladesh (9±3.9 years)[14] reported younger age of onset. This agrees with similar studies from Saudi Arabia and India (mean age ± SD, 6.9 ± 3.5 yrs. and 7.4 ± 3.9 yrs. Respectively.[15,16]

In contrast, a study from China [17] reported older children (10 – 14 years) with newly diagnosed Type 1 Diabetes Mellitus. In a study by Muhammad Rafique et al [18] from Saudi Arabia, almost two third of children with T1DM belonged to 5 – 10 years 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.

Our study revealed male predominance with male female ratio of 1.27:1. Similar result of male predominance with 60% was found in a study of type 1 DM from Egypt [19] and 52% males in a study from Oman. [20] Though few studies reported difference in gender distribution between younger and older age groups, we found male predominance in all age groups. The reason behind the male predominance could be because of early attendance of male child as prioritized by the parents. Contrast to our result female predominance was reported in older (10 – 15 years) compared to younger age group (< 5 years) in a study conducted in the Eastern province of Saudi Arabia.[18]

The most common clinical presentation at the time of diagnosis of T1DM in our study were polyuria (93.5 %), polydipsia (89.2 %), weight loss (82.2%), polyphagia (69.2%), weakness (67.6%). Some others also reported the similar symptoms.[20-23] A study from Oman also reported the most common presenting symptoms polyuria (94%), polydipsia (82%), and weight loss (59%) and DKA (Diabetic ketoacidosis) in 31% of the patients.[20] Amritanshu K et al from North India found all children with type 1 DM at the time of diagnosis presented with the polyuria and the polydipsia (100%) followed by polyphagia (76.74%) and weight loss (60.46%). [24]A study from Nigeria also reported all children presented with polyuria and the polydipsia (100%) followed by polyphagia (75%) weight loss (62%).[25] The predominant clinical pictures at the time of diagnosis in T1DM children is that of typical osmotic features as shown in several studies across the globe including the present study.

Almost half of our children with Type 1 Diabetes (54.1%) presented in DKA at the time of diagnosis, which is almost similar to that found in eastern Nepal (59.5%) , Pakistan (55.5%) and Saudi Arabia (55%).[11,25,26] However it was

found to be lower in the studies reported from Sweden (12.8%), Finland (19%), UK (25%) and Kuwait (37%).[27,28,29,30] Variable frequency of DKA in different communities is probably due to variable genetic and geographical variations. The low frequency of DKA at presentation of T1DM in children showed prompt diagnosis and referral before development of DKA. Almost half of our children presented in DKA at the time of diagnosis might be due to maximum number of patients coming from outside the Kathmandu valley(76.2%) and late recognition of osmotic symptoms and landed in DKA. Mean HbA1C 11.5 % (9.7–14.0) of our children with diabetes at the time of diagnosis is comparable to the mean HbA1C reported from eastern Nepal (10.6±2.7), Ghana (12.7±1.9), Saudi Arab (10.4±1.8) and Pakistan (10.36 ± 1.8).[11,12,15,18]

In present study, family history of diabetes mellitus (DM) was reported in 37 (20.0%) cases like that reported from Oman (22%) [20] but slightly higher than in Sudan (14.9 %) [31] and lower than that reported from Libya (32%).[32] These results showed that family history is an important risk factor for development of T1DM.

During follow up of T1DM children around 25(13.5%) had at least one episode of severe hypoglycaemia. The incidence of severe hypoglycemia was 16.6 per 100 patient years and 19 per 100 patient years in large pediatric cohorts in Western Australia and Colorado.[33, 34] During the course of disease, we found 9 (4.8%) T1DM children developed persistent microalbuminuria which much lower than reported by Amritanshu K et al from North India (20%).[24] Another study from Australia 35reported wide prevalence rate of 6-18% which may be related to the degree of diabetes control as it is affected by education, socioeconomic status and influence of race/ ethnicity. Besides, improper collection and storage of urine samples may affect measured levels of microalbuminuria. Regarding the diabetic complications in T1DM children we found retinopathy (0.46%), hypertension (1.08%) and diabetic cataract (1.08%), whereas a study reported from India by Venkataraman et al[36] revealed higher and wider range of complications including nephropathy (4%), retinopathy (5.6%) and neuropathy (15.1%) over 6 to 9 years of duration of Type 1 DM. Over the duration of ten years, mortality was 4 (2.16%) only. Three out of four belonged to adolescent age group and had some psychological and family issues and had recurrent DKA.

Conclusion

Most common clinical presentation of Type 1 DM were typical osmotic features like polyuria, polydipsia and most common presented age was 5 to 14 years. DKA as an initial presentation is frequent. Being a single centered study it may not represent cannot represent the entire pediatric population with T1DM in the country and hence a large multicentric study is warranted to describe the actual density of this disease and its early presentation.

Reference:

1. IDF Diabetes Atlas 11th Edition - 2025
2. Ogle, G. et al. Global type 1 diabetes prevalence, incidence, and mortality estimates 2025: Results from the International Diabetes Federation Atlas, 11th Edition and the T1D Index. Diabetes Res Clin Pract (2025).
3. Mayer-Davis, E. J. et al. Incidence Trends of Type 1 and Type 2 Diabetes among Youths, 2002-2012. N Engl J Med 376,

Jour of Diab and Endo Assoc of Nepal Vol 9, No. 1, January-June, 2025
ISSN Print 2594-3367 ISSN Online 2631-2107
Journal of Diabetes and Endocrinology Association of Nepal
ORIGINAL ARTICLE OPEN ACCESS

1419–1429 (2017).
4. Mayer-Davis, E. J. et al. ISPAD Clinical Practice Consensus Guidelines 2018: Definition, epidemiology, and classification of diabetes in children and adolescents. Pediatr Diabetes 19 Suppl 27, 7–19 (2018).
5. Ogle, G. D. et al. Global estimates of incidence of type 1 diabetes in children and adolescents: Results from the International Diabetes Federation Atlas, 10th edition. Diabetes Res Clin Pract 183, 109083 (2022).
6. Tuomilehto, J., Ogle, G. D., Lund-Blix, N. A. & Stene, L. C. Update on Worldwide Trends in Occurrence of Childhood Type 1 Diabetes in 2020. Pediatr Endocrinol Rev 17, 198–209 (2020).
7. Britta SM, Nicholas J. Type 1 Diabetes Mellitus (Immune mediated) In: Robert M Kliegman, Stanton, St Geme and Schor editors. Nelson text book of Pediatrics, 20th edition. New York: Elsevier Saunders, 2016: 2763-8.
8. Patterson C, Guariguata L, Dahlquist G. Diabetes in the young – a global view and worldwide estimates of numbers of children with type 1 diabetes. Diabetes Res Clin Pract. 2014; 103: 161–75
9. International Diabetes Federation. IDF Diabetes Atlas, 6th ed. Brussels, 2013: p-5.
10. World Health Organization. Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia: report of a WHO/ IDF consultation. World Health Organization, 2006.
11. Lok raj Shah, Sunetra Sanyal, Gauri Shankar Shah and Mukesh Bhatta. Clinical profile and outcome of type 1 diabetes mellitus in tertiary care center of Eastern Nepal. J Diabetes Metab.
12. Ameyaw E, Asafo-Agyei SB, Thavapalan S, Middlehurst AC, Ogle GD. Clinical profile of diabetes at diagnosis among children and adolescents at an endocrine clinic in Ghana. World J Diabetes. 2017;8(9):429-35.
13. Rafique M, Ishaq F, Masood MK, Al-Qahtani YA, Assiri WI, Assiri MA, et al. Clinical Profile of Type 1 Diabetes Mellitus in Saudi Children: a Hospital Based Study. Annals King Edward Med Univ. 2016;22(4).
14. Mohsin F, Zabeen B, Zinnat R, Azad K, Nahar N. Clinical profile of diabetes mellitus in children and adolescents under eighteen years of age. Ibrahim Med Coll J. 2007;1(1):11-5.
15. Habeb AM, Al-Magamsi MS, Halabi S, Eid IM, Sha laby S, Bakoush O. High incidence of childhood type 1 diabetes in Al-Madinah, North West Saudi Arabia (2004 – 2009). Pediatr Diabetes, 2011; 12: 676–81.
16. Kanwal SK, Bando A, Kumar V. Clinical profile of diabetic ketoacidosis in Indian children. Indian journal of paediatrics, 2012; 79 (7): 901-4.
17. Xin Y, Yang M, Chen XJ, Tong YJ, Zhang LH. Clinical features at the onset of childhood type 1 diabetes mellitus in Shenyang, China. J Paediatr Child Health 2010; 46 (4): 171-5.
18. Muhammad Rafique, Fouzia Ishaq, Muhammad Khalid Masood, et al. Clinical Profile of Type 1 Diabetes Mellitus in Saudi Children: a Hospital Based Study. Annals of King Edward Medical University Lahore Pakistan · December 2016 DOI: 10.21649/akemu. v22i4.1458
19. M.H. Elsamahy, Y.I. Elhenawy, N. Altayeb. Long-term prognosis of type 1 diabetes in relation to the clinical characteristics at the onset of diabetes Egyptian Pediatric Association Gazette 65 (2017) 90–94
20. Saif AY, Irfan U, Sharef SW, Al Shidhani

A, Al Hanai S, Al Kalbani R et al. Demographic and Clinical Characteristics of Type 1 Diabetes Mellitus in Omani Chil dren Single Centre Experience. Oman Medical Journal 2014; 29 (2): 119-122.
21. Levy-Marchal C, Patterson CC, Green A. Geographical variation of presentation at diagnosis of type 1 diabetes in children: the Eurodiab study. Eurodiab ACE Study Group, Europe and Diabetes Diabetologia 2001; 44 Suppl. 3: B75-80.
22. Tahirovic H, Toromanovic A, Feukic A, Ostrvica D. Clinical and laboratory characteristics at the onset of type 1 diabetes mellitus in children. Lijec Vjesn 2007; 129 (3-4): 61-5.
23. Stipancic G, Sepec MP, Sabolic LL, Radica A, Skrabic V, Severinski S et al. Clinical characteristics at presentation of type 1 diabetes mellitus in children younger than 15 years in Croatia. J Pediatr Endocrinol Metab. 2011; 24 (9-10): 665-70.
24. Amritanshu K et al. Clinical profile and factors associated with microalbuminuria in type 1 diabetes mellitus in children and adolescents Int J Res Med Sci. 2015 May;3(5):1247-1251DOI: 10.5455/2320-6012.ijrms20150538
25. C John, I I Abok, and C Yilgwa. Clinical profile of childhood type 1 diabetes in Jos, Nigeria. African Journal of Diabetes Medicine. Vol 21 No 1 May 2013 DOI: 10.13140/2.1.3598.4008
26. Al-Magamsi MS, Habib HS. Clinical presentation of childhood type 1 diabetes mellitus in the Al-Madina region of Saudi Arabia. Pediatr Diabetes 2004 Jun;5(2):95-98.
27. Samuelsson U, Sten Hammar L. Clinical characteristics at onset of Type 1 diabetes in children diagnosed between 1977 and 2001 in the south-east region of Sweden. Diabetes Res Clin Pract 2005 Apr;68(1):49-55.
28. Hekkala A, Knip M, Veijola R. Ketoacidosis at diagnosis of type 1 diabetes in children in northern Finland: temporal changes over 20 years. Diabetes Care 2007 Apr;30(4):861-866.
29. Ali K, Harnden A, Edge JA. Type 1 diabetes in children. BMJ 2011;342: d294
30. Blanc N, Lucidarme N, Tubiana-Rufi N. [Factors associated with childhood diabetes manifesting as ketoacidosis and its severity]. Arch Pediatr 2003 Apr;10(4):320-325
31. A. Elamin, H. Aitahir, B. Ismail and I Tuvemo. Clinical pattern of childhood Type 1 (insulin-dependent) diabetes mellitus in the Sudan. Diabetologia · August 1992 DOI: 10.1007/BF00400256
32. Kadiki OA, Gerryo SE, Khan MM. Childhood diabetes mellitus in Benghazi (Libya). J Trop Pediatr 1987 Jun;33(3):136-139.
33. Bulsara MK, Holman CD, Davis EA, Jones TW. The impact of a decade of changing treatment on rates of severe hypoglycemia in a population-based cohort of children with type 1 diabetes. Diabetes Care. 2004; 27:2293-2298
34. Rewers A, Chase HP, Mackenzie T, et al. Predictors of acute complications in children with type 1 diabetes. JAMA. 2002;287: 2511-2518
35. Gallego PH, Bulsara MK, Frazer F, Lafferty AR, Davis EA, Jones TW. Prevalence and risk factors for microalbuminuria in a population-based sample of children and adolescents with Type1diabetes mellitus in western Australia. Pediatr Diabetes. 2006; 7:165-72.
36. Venkatraman S, Suresh K, Sundaram A, Hariharan RS, Madhavan R, Manjula N, Seshiah V. Diabetes in the young: a profile. Int J Diab Dev Countries 1990; 10:21-23