Type 2 Diabetes Mellitus in Adolescents From Southern India – A Single Center Experience

This 1-year follow-up study was conducted on 21 subjects with type 2 diabetes mellitus. We found reduction in glycosylated hemoglobin from 10.5% to 8.1%, and maintenance of BMI *z*-scores from 3.9 to 3.8. Majority of the patients could be weaned-off from insulin. Heterogeneous presentation, frequent co-morbidities and complications, and familial clustering were observed.

Keywords: *Diabetic nephropathy, HbA1C, Outcome.*

Pediatric data on T2DM from various Indian centers been described [1-3], but there is paucity of studies on response to therapy. We, herein, describe the profile of children and adolescents with T2DM and response to one year of therapy from a single center in Southern India. With the increasing prevalence of obesity [4,5], type 2 diabetes mellitus (T2DM) in young is also increasing [1,2].

With institutional review board approval, we recruited newly diagnosed children with T2DM: Fasting blood sugar ≥125mg/dL, 2 hour post 75 gram glucose challenge ≥200 mg/dL (screening in asymptomatic obese adolescents), glycosylated hemoglobin (HbA1C) ≥6.5%, C-peptide >4 ng/mL and negative anti-glutamic acid decarboxylase antibody titre (<10 mIU/mL) [6]. Data on demography, history, clinical presentation, anthropometry and Tanner staging collected. T2DM complications assessed: urine albumin creatinine ratio (ACR) (normal, <30 mg/g creatinine) [6], fundus evaluation by indirect ophthalmoscopy, lipid profile after 12 hours of fasting and hypertension (≥95th percentile more than three occasions). Genetic testing for monogenic diabetes (first degree relative with diabetes onset <40 years, autosomal dominant family history, negative antibody, no diabetic ketoacidosis and insulin resistance) performed using targeted next generation gene sequencing for thirteen MODY genes [7]. Comorbidities like obstructive sleep apnea syndrome, fatty liver, polycystic ovaries diagnosed as per standard criteria and Homeostatic model for assessment of insulin resistance calculated as (fasting glucose (in mg/dL) x fasting insulin (in μU/mL)/405.

Children were managed with fluid therapy, intravenous insulin, lifestyle measures, oral metformin, subcutaneous glargine and multiple daily injection (MDI) regimen using glargine and aspart insulin, as appropriate [6]. Self-monitoring of blood glucose and log book maintenance advised. Subjects were followed up 3-monthly for one year with assessment of adherence of lifestyle measures, medications, anthropometry, hypoglycemic episodes and HbA1C. Management was escalated or deescalated as indicated [6]. Data were entered in excel sheet, and summarized as mean (SD), or numbers (percentages).

We recruited 21 subjects with mean (SD) age of 14.5 (2.1) years (10 boys) and all with Tanner stage ≥2), out of 265(7.9%) registered in the diabetic clinic (**Table I**). Monogenic diabetes testing was performed in five subjects: all were negative. Of these, 9 (42.8%), 12 (57.1%) and none had a parent, relative or sibling with T2DM, respectively; 6 (28.5%) had history of gestational diabetes mellitus in the mother. Co-morbidities in our subjects included fatty liver and obstructive sleep apnea syndrome in 5 (23.8%) and 2 (9.5%), respectively. 19.0% had systolic hypertension [mean (SD) systolic blood pressure Z-score 0.9 (0.3)], 14.2% had diastolic hypertension [mean (SD) diastolic blood pressure *z*-score 0.7 (0.2)] and 47.6% subjects had dyslipidemia as complications. Echocardiographic evaluation was performed in these four children, and two had left ventricular hypertrophy (initiated on enalapril). On screening for microvascular complications, two had diabetic nephropathy (persistent elevation of urine albumin-creatinine ratio) and none had diabetic retinopathy.

Subjects who had life threatening complications were initiated on metformin and MDI regimen (14.2%). Those with ketosis started on metformin with basal insulin (28.5%) and remaining 57.1% of subjects were on metformin monotherapy. On follow-up at 6 months, one, one and 13 subjects were on metformin with MDI, metformin with basal insulin and metformin monotherapy. None, one and 13, of the 14 subjects

Table I Clinical and Laboratory Profile of Adolescents With Type 2 Diabetes Mellitus (*N*=21)

Study parameters	*Value*
Clinical presentation, n (%)	
Asymptomatic	6 (28.5)
Classical symptoms[b]	12 (57)
Atypical features[c]	3 (14.2)
Ketosis without acidosis	6 (28.5)
Hyperosmolar non-ketotic syndrome	2 (9.5)
Diabetic ketoacidosis	1 (4.7)
Anthropometry	
Height SD score[a]	0.6 (0.5-0.7)
BMI SD score[a]	3.9 (3.1-4.2)
Waist circumference *z*-score[a]	2.8 (2.5-3.2)
Biochemical assessment	
C-Peptide (ng/mL)[a]	4.9 (4-5.2)
HbA1C (%)	10.5 (1.1)
HOMA-IR[a]	9.4 (8.1-10.3)
LDL cholesterol (mg/dL)	152.5 (12.3)
HDL cholesterol (mg/dL)	35.5 (8.6)
Triglyceride level (mg/dL)	178 (21.4)

Values in mean (SD) or [a]median (IQR); [b]polydipsia, polyuria and polyphagia; [c]foot ulcer, delayed menarche, pruritus vulvae.

who were followed up at 12 months were on metformin with MDI, metformin with basal insulin and metformin monotherapy, respectively.

During the one year follow-up, the HbA1c was 10.5% (at baseline), 8.5% (at 6 months) and 8.1% (at 1 year). Correspondingly, the BMI z-scores were +3.9 (at baseline), +3.7 (at 6 months) +3.8 (at 12 months). Two episodes of hypoglycemia observed during the study period. Both episodes occurred early morning with autonomic symptoms and both subjects were on insulin therapy). On follow-up, two children with hypertension had normal blood pressure, two adolescents had reduction in LDL levels, and one child with diabetic nephropathy had control of microalbuminuria and no adverse reactions to therapy.

In our series, 28.5% were asymptomatic and 14.2% presented as emergencies. It is very important that pediatricians recognize existence of hyperosmolar non-ketotic coma [8] as a diabetic emergency in obese adolescents requiring aggressive fluid therapy vs DKA where over-hydration results in cerebral edema. We observed significant complications at diagnosis, endorsing ISPAD guidelines which recommend early screening of vascular complications in T2DM [3]. Asymptomatic phase results in prolonged exposure to hyperglycemia and early complications. On follow-up, safety of metformin, good improvement in HBA1C, static BMI *z*-scores observed. Similar safety profile, reduction in BMI *z*-score of -0.045 and a reduction of HbA1C of -1.3 has been reported [9,10]. Strengths of our study include management as per ISPAD guidelines and one year follow-up period. Inability to quantify adherence of lifestyle measures and 33.3% drop-out at 12 months are limitations in our study.

Adolescents with T2DM have heterogeneous presentation, significant comorbidities and complications; familial clustering and good biochemical response to metformin therapy observed.

Contributors: The study was conceptualized by HKP, SW and ST; study design was framed by HKP and KN. UG: data collection; HKP, SW, UG: analysis; HKP, KN, SW, ST: clinical management of cases. All authors approve the final manuscript.

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Outcome of Covid-19 Positive Newborns Presenting to a Tertiary Care Hospital

Neonatal data regarding SARS-CoV-2 is sparse from India. On review of hospital records from April- August, 2020, 18/423 (4.25%) neonates were SARS-CoV-2 RT-PCR positive. 15 (83.3%) neonates recovered and 3 (16.6%) succumbed. Only 50% of the positive babies had positive mothers/ caretakers, a contact could not be traced in others.

Keywords: *Contact tracing, Horizontal transmission, Vertical transmission.*

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The symptoms of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) positive cases are highly variable and within the paediatric population, neonates and infants are more severely affected. Neonates can acquire infection vertically during delivery or horizontally from caregivers. As neonatal data on the disease is limited, we, herein, share our experience.

Medical records of all out-born neonates presenting for admission to the NICU from April 1 to August 31, 2020 were reviewed. Clearance from institutional ethics committee was taken.

For planned referrals and untested neonates in the