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Short Commentary

Increase in Outpatient Visits for New-Onset Type 2 Diabetes in Alabama Youth during the COVID-19 Pandemic

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Introduction

Prevalence of type 2 diabetes (T2D) in youth has been increasing [1]. With the onset of the coronavirus disease 2019 (COVID-19) pandemic, increasing numbers of youth were hospitalized with new-onset T2D [2,3]. T2D is a progressive disease, and not all children are ill enough at diagnosis to require hospitalization. When diagnosed early, T2D in youth can often be managed in the outpatient setting. While the association of the COVID-19 pandemic with new-onset T2D requiring hospitalization has been established [2,3], less is known about the impact of the COVID-19 pandemic on diagnosis of T2D in youth who do not require hospitalization. As the sole children's hospital in the state and the primary recipient for outpatient referrals for new-onset T2D in youth, Children's of Alabama (COA) provides a unique opportunity for assessment of COVID-19 trends for outpatient-managed T2D in youth in the southeast, a region of the U.S. already characterized by high rates of obesity and diabetes prevalence [4]. We therefore aimed to evaluate the impact of the onset of the COVID-19 pandemic with the number of new outpatient evaluations for T2D in youth. We further aimed to evaluate for any changes in patient demographics, anthropomorphic measurements, and severity of hyperglycemia as measured by hemoglobin A1c (HbA1c) at the initial endocrinology evaluation in the pre- and post-COVID-19 periods.

Methods

Using data from this single-center institutional review board-approved retrospective review, electronic health records were queried to identify new patients seen as outpatients in the Endocrine and Diabetes Clinic for T2D at COA from March 2017 to March 2021. Only patients who had not previously been seen by the COA endocrine clinic were included. Inclusion criteria included patients of any age identified by the outpatient endocrinologist as having T2D based upon an ICD-10 diagnosis code corresponding to T2D (E11.xx) at the initial visit. Patients with an active cancer diagnosis were excluded to eliminate the potential of inclusion of patients with medication-induced diabetes.

Patient characteristics examined included demographic data, body mass index (BMI), hemoglobin A1c (HbA1c), and insurance status. Insurance status was defined as "Medicaid" and "Non-Medicaid". Time periods were defined as "pre-COVID-19" for those seen prior to April 2020, the onset of Alabama's stay-at-home order. The "post-COVID-19" period included patients seen after April 2020. The number of patients seen for new evaluation for T2D each month was summarized as monthly visit rate: visits per month. Chi-square test was used to assess for significance in proportion of categorical variables pre and post COVID-19. Normality was defined as those with an Anderson-Darling p-value of > 0.05. Student's t-test and Mann-Whitney tests were used to compare normally distributed and skewed variables respectively. Statistical analysis was done using QI Macros 2020 (Know Ware International, Inc, Denver, CO).

Results

A total of 298 individual patients were evaluated as outpatients for new onset T2D. The overall monthly visit rate from March 2017 through March 2021 was median 6.0, interquartile range (IQR) 3.5-7.0 visits per month. The majority of patients were insured through Medicaid (n=219, 73.5%), and non-Hispanic Black (n=199, 66.8%). A minority (n=105, 35.2%) were male.

Mean age was 13.5 ± 2.4 years. Median HbA1c at time of visit was 6.5% (IQR: 6.1-7.2). Median BMI was 35.8 kg/m^2 (IQR 32.3-41.6).

In comparison to patient demographics pre- and post-COVID-19, significant differences existed in monthly visit rate, sex, and insurance status (see Table 1). Notably, the monthly visit rate pre- to post-COVID-19 went from a median of 6.0 (IQR 3.0-7.0) to 9.5 (6.3-11.8) new patient visits per month (p=0.009). Proportion of male patients pre- and post-COVID-19 differed (31.1% vs 41.9%, p=0.042) as did proportion of Medicaid-insured patients (68.9% vs 81.9%, p=0.015). Patient BMIs were similar pre- and post-COVID-19, as was the breakdown in race/ethnicity, and hemoglobin A1c (see Table 1).

	All patients n=298	Pre COVID-19 n=193	Post COVID-19 n=105	p-value for pre-post comparison
Monthly Visit Rate: median (IQR)	6.0 (3.5-7.0)	6.0 (3.0-7.0)	9.5 (6.3-11.8)	0.009
Sex: n (%) Male	105 (35.2)	60 (31.1)	45 (41.9)	0.042
Age: mean (SD)	13.5 (2.4)	13.4 (2.4)	13.5 (2.6)	0.94
Ethnicity and Race: n (%) NHB: NHW: Hispanic: Other:	 199 (66.8) 69 (23.2) 27 (9.1) 3 (1.0)	 127 (65.8) 44 (22.8) 20 (10.4) 2 (1.0)	 72 (68.6) 25 (23.8) 7 (6.7) 1 (1.0)	0.77
Insurance status: n (%) Medicaid-Insured	219 (73.5)	133 (68.9)	86 (81.9)	0.015
BMI: median (IQR)	35.8 (32.3-41.6) n=297	35.4 (32.0-41.3) n=192	36.6 (33.1-41.6)	0.33
HbA1c: median (IQR)	6.5 (6.1-7.2) n=296	6.5 (5.0-7.2) n=191	6.6 (5.0-7.4)	0.14
NHB = non-Hispanic Black; NHW = non-Hispanic white; BMI = body mass index; HbA1c = hemoglobin A1c; SI conversion factors: to convert HbA1c from % to mmol/mol: 10.929 * (A1c in % - 2.15). Percentages may not sum to 100% due to rounding				

Table 1: Outpatient Evaluations for Type 2 Diabetes in Youth.

Discussion

Data from COA revealed a significant change in monthly outpatient visits for new-onset T2D during the first 12 months of the COVID-19 pandemic in the U.S. The increase occurred disproportionately among Medicaid enrolled and male patients and was not associated with a significant change in BMI at the initial visit.

The increase in the proportion of male patients deserves further evaluation. A group in Italy evaluating physical activity and dietary habits of 51 adolescents with obesity prior to and after COVID-19 related lock-downs found that relative to females, males were more likely to have significantly changed their dietary habits and increase sedentary time during lock-down periods [5]. Our study did not address questions about dietary and activity habits prior to and after COVID-19, however the significant increase in proportion of male patients raises the question of if COVID-19 related lock-downs and changes in daily routine impacted males and females in Alabama differently. The high baseline proportion of patients insured through Medicaid with the notable increase in proportion of patients insured through Medicaid highlights the need for focused efforts to reduce the risk of T2D in high-risk populations, including low-income youth [1,6,7].

The generalizability of findings is limited since the data is drawn from one state. Further, while patients seen outpatient were screened with questions to identify active COVID-19 infection, no information was available on past COVID-19 infection in patients, limiting ability to comment on associations between past COVID-19 infection on development of new onset T2D. Additionally, only records and history from the COA Endocrinology Division were available. Therefore, we are unable to comment on how many of the newly referred patients had previously been diagnosed with pre-diabetes by their primary care providers.

In conclusion, the results emphasize the need for pediatric endocrinologists to work together with primary care practitioners to ensure that even amidst the disruptions caused by the pandemic, risk factors like excessive weight gain, overweight status, and high glycemic diets are being monitored, and appropriate health care including nutrition and physical activity counseling provided, to protect vulnerable youth from progressing to T2D.

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