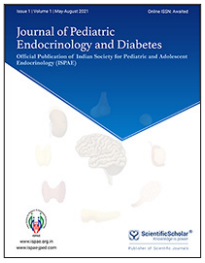
ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

https://ispae-jped.com/

Journal of Pediatric Endocrinology and Diabetes



Editorial Commentary

COVID-19 and the surge in youth diabetes: Fleeting effect or lasting consequence?

Melkunte Shanthaiah Dhananjaya[1], Vijaya Sarathi[1]

[1]Department of Endocrinology, Vydehi Institute of Medical Sciences and Research Center, Bengaluru, Karnataka, India.

***Corresponding author:**
Vijaya Sarathi,
Department of Endocrinology,
Vydehi Institute of Medical
Sciences and Research Center,
Bengaluru, Karnataka, India.

drvijayasarathi@gmail.com

Received: 14 November 2024
Accepted: 14 November 2024
Published: 03 December 2024

DOI
10.25259/JPED_52_2024

Quick Response Code:

The COVID-19 pandemic, caused by the novel coronavirus, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), emerged in late 2019. The virus, first identified in Wuhan, China, quickly spread across international borders, leading to widespread outbreaks in nearly every country, leading to widespread illness, significant loss of life, and overwhelming strain on healthcare systems.[1] By early 2020, COVID-19 was declared a pandemic by the World Health Organization.[1] While the immediate focus was on respiratory complications, evidence soon emerged that COVID-19 could trigger or exacerbate various other health conditions, including metabolic and autoimmune disorders.[2,3] One such condition is diabetes mellitus, including both type 2 diabetes (T2D) mellitus, a metabolic disorder, and type 1 diabetes (T1D) mellitus, an autoimmune disorder.

A large number of studies have reported a higher incidence of diabetes mellitus in youth during the COVID-19 pandemic. A similar trend was reported for both T1D and T2D. A meta-analysis revealed, in comparison with the pre-pandemic year, a 14% and 27% increase in the incidence rates of T1D in the pandemic years 1 and 2, respectively.[4] These incidence rates were remarkably higher than the usual 2% annual increase in the incidence rate of T1D during the pre-pandemic period. The incidence rates of T2D increased were much greater (62–470%).[5-10] However, caution was raised to interpret these trends to avoid overestimation of the incidence during the COVID-19 pandemic, which may result from under-seeking of care during the immediate pre-pandemic or early pandemic period. Nonetheless, the comparison with the trends over a longer duration of pre-pandemic and pandemic periods in some studies strengthens the occurrence of a true increase in the incidence.[10]

A study published by Montgomery *et al.* reported increased incidence rates of new-onset T1D (11%) and T2D (238%) in youth from the United States than those in the pre-pandemic period and reiterated the observations from most of the previous studies.[11] A striking increase in T2D than that of T1D is mostly attributed to increased body mass index (BMI) due to forced sedentary lifestyle during the pandemic.[8] However, the reasons for the increased incidence rates of T1D are intriguing. Although a direct effect of the virus on β-cells of pancreatic islets was initially proposed as a potential cause for the increased incidence of T1D during the pandemic, it remains futile.[12,13] Another possible reason could be increased rates of obesity, even in T1D. The accelerator hypothesis, although not widely accepted, proposes earlier manifestation of T1D in obese individuals.[14,15] A study from Germany also reported an association between increased time-varying BMI and overweight risk at 9 months of age during the COVID-19 pandemic and their association with increased risk for developing islet autoimmunity in children at increased risk for T1D.[16] Another

plausible mechanism is the triggering of autoimmunity by SARS-CoV-2. Studies have reported an increased frequency of islet-related antibodies as well as other-organ related antibodies in newly diagnosed T1D children during the COVID-19 pandemic than those in the pre-pandemic period.[6,17-20] However, this observation is inconsistent;[21,22] Hence, the reasons for higher incidence rates of T1D during COVID-19 are unclear and likely multifactorial.

Besides increased incidence rates of diabetes mellitus in youth, higher rates of diabetic ketoacidosis (DKA) and presentation with severe DKA are also reported during the pandemic.[23] This was observed among youth with both T1D and T2D.[6] A higher prevalence of hyperosmolar coma was also noted among youth with T2D. More frequent presentations with severe disease were attributed to delay in seeking health care. Unlike the majority of the studies, there was no increased frequency of DKA among youth with T1D and T2D; however, the frequency of severe DKA among youth with T1D was greater than the pre-pandemic period but not in those with T2D. Interestingly, youth with T2D were younger during the pandemic than in the pre-pandemic period, which suggests an earlier onset of T2D in youth. However, this observation was not found in the majority of the studies.[5,6,9,10] Mefford *et al*. indeed reported a 28% decrease in the incidence rate of T2D during the pandemic in children younger than 9 years.[10] However, in the study by Sasidharan Pillai *et al*., the age at onset of T2D was significantly lower during the pandemic year 1 but not during the pandemic year 2 than the pre-pandemic period.[5] A study by Magge *et al*. reported significantly higher BMI of youth diagnosed with T2D during the pandemic (34.3 vs. 35.1 kg/m^2).[23] Surprisingly, most of the studies, including Montgomery *et al*., have not reported a greater BMI of youth with T2DM during the pandemic period despite the increased incidence rate.[5,10,11] This may be due to a specific threshold of BMI for the development of T2D in youth. Indeed, an increase in the BMI z-score of these individuals from the pre-pandemic to the pandemic period might have occurred but is not well studied.

Typically, a higher incidence of T1D was noted during the winter seasons in the pre-pandemic years.[24] In contrast, Montgomery *et al*. reported the peak incidence rates of T1D in the summer seasons of both the pandemic years (2020 and 2021).[11] A similar trend has also been reported in other studies from Europe and North America, with a peak incidence rate during the summer season in the pandemic year 1.[20,25-28] Notably, the seasonal trend in the incidence rate of pediatric T1D returned to the pre-pandemic pattern in Europe during pandemic year 2 but not in North America, where the incidence rate peaked during the last months of 2021.[25] In contrast to the latter observation, the study by Montgomery *et al*. from the United States reports a peak incidence rate of T1D during the spring-summer of pandemic year 2, with a gradual decline subsequently.[11] Interestingly, the seasonal variations were less pronounced for pediatric T2D. A large study from the United States demonstrated a gradual increase in the incidence rates of T2D beginning in the third quarter of 2020, with peak incidence rates during the last quarter of 2020 and the first two quarters of 2021, with a gradual decline thereafter.[10]

As a novel observation, Montgomery *et al*. also reported a decline and stabilization of the incidence of T1D and T2D in youth in 2022.[11] Several such reports have emerged recently. Grundman *et al*. also reported higher incidence rates of T2D in youth from the United States (18.7 cases/month) during the pandemic year 1 that declined during the pandemic year 2 (4.3 cases/month) to pre-pandemic incidence rates (3.9 cases/month).[8] The authors attributed to the increased incidence rate during the pandemic year 1 to virtual learning. In another recent study from the USA, Kim *et al*. reported higher incidence rates (cases/month) of T2D in youth in the pandemic years 1 (20.1 ± 6.0) and 2 (25.9 ± 8.9), which declined in the subsequent year (14.5 ± 4.1) near to that in the pre-pandemic year (11.8 ± 3.7).[7] Such trends have also been reported for T1D. In a study from Scotland, the incidence rate of T1D in 6–14-year-old children peaked around early 2021, followed by a gradual decline to pre-pandemic incidence rates by mid-2022 with stabilization thereafter.[29] Hence, the effect of the COVID-19 pandemic on the incidence rates of T1D and T2D in youth is transient. However, more long-term data are required to understand the long-term impact of the pandemic on the incidence rate of diabetes in youth.

Ethical approval

Institutional Review Board approval is not required.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

Financial support and sponsorship

Nil.

Conflict of interest

There are no Conflict of Interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of Artificial Intelligence (AI)-Assisted Technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. Acta Biomed 2020;91:157-60.
2. Laddu DR, Biggs E, Kaar J, Khadanga S, Alman R, Arena R. The impact of the COVID-19 pandemic on cardiovascular health behaviors and risk factors: A new troubling normal that may be here to stay. Prog Cardiovasc Dis 2023;76:38-43.
3. Chang R, Chen TY, Wang SI, Hung YM, Chen HY, Wei CJ. Risk of autoimmune diseases in patients with COVID-19: A retrospective cohort study. EClinicalMedicine 2023;56:101783.
4. D'Souza D, Empringham J, Pechlivanoglou P, Uleryk EM, Cohen E, Shulman R. Incidence of diabetes in children and adolescents during the COVID-19 pandemic: A systematic review and meta-analysis. JAMA Netw Open 2023;6:e2321281.
5. Sasidharan Pillai S, Has P, Quintos JB, Gonzalez MS, Kasper VL, Topor LS, *et al*. Incidence, severity, and presentation of type 2 diabetes in youth during the first and second year of the COVID-19 pandemic. Diabetes Care 2023;46:953-8.
6. Marks BE, Khilnani A, Meyers A, Flokas ME, Gai J, Monaghan M, *et al*. Increase in the diagnosis and severity of presentation of pediatric type 1 and type 2 diabetes during the COVID-19 pandemic. Horm Res Paediatr 2021;94:275-84.
7. Kim A, Geller D, Min H, Miyazaki B, Raymond J, Vidmar AP, *et al*. Decline in case rates of youth onset type 2 diabetes in year three of the COVID-19 pandemic. J Pediatr Endocrinol Metab 2024;37:360-2.
8. Grundman JB, Chung ST, Estrada E, Podolsky RH, Meyers A, Marks BE, *et al*. Virtual learning and youth-onset type 2 diabetes during the COVID-19 pandemic. Horm Res Paediatr 2024;97:218-24.
9. Magge SN, Wolf RM, Pyle L, Brown EA, Benavides VC, Bianco ME, *et al*. The Coronavirus disease 2019 pandemic is associated with a substantial rise in frequency and severity of presentation of youth-onset type 2 diabetes. J Pediatr 2022;251:51-9.e2.
10. Mefford MT, Wei R, Lustigova E, Martin JP, Reynolds K. Incidence of diabetes among youth before and during the COVID-19 pandemic. JAMA Netw Open 2023;6:e2334953.
11. Montgomery EL, Jawad K, Wintergerst K, Watson S. Patterns of incidence and characteristics of youth with new-onset diabetes mellitus during the COVID era. J Pediatr Endocrinol Diabetes 2024;4(2):70-8.
12. Kamrath C, Holl RW, Rosenbauer J. Elucidating the underlying mechanisms of the marked increase in childhood type 1 diabetes during the COVID-19 pandemic-The diabetes pandemic. JAMA Netw Open 2023;6:e2321231.
13. Tiberti C, Nenna R, Tromba V, Filardi T, Petrarca L, Silvestri F, *et al*. No effects of COVID-19 on the development of type 1 diabetes autoimmunity and no evidence of an increased frequency of SARS-CoV-2 antibodies in newly diagnosed type 1 diabetes patients relative to healthy subjects. Acta Diabetol 2023;60:1301-7.
14. Kang HM, Jeong DC, Suh BK, Ahn MB. The impact of the Coronavirus Disease-2019 pandemic on childhood obesity and vitamin D status. J Korean Med Sci 2021;36:e21.
15. Dabelea D, D'Agostino RB Jr., Mayer-Davis EJ, Pettitt DJ, Imperatore G, Dolan LM, *et al*. Testing the accelerator hypothesis: Body size, beta-cell function, and age at onset of type 1 (autoimmune) diabetes. Diabetes Care 2006;29:290-4.
16. Hummel S, Rosenberger S, von dem Berge T, Besser RE, Casteels K, Hommel A, *et al*. Early-childhood body mass index and its association with the COVID-19 pandemic, containment measures and islet autoimmunity in children with increased risk for type 1 diabetes. Diabetologia 2024;67:670-8.
17. Al-Abdulrazzaq D, Albatineh AN, Khalifa D, Alrefae A, Al-Awadhi E, Alkandari A, *et al*. Prevalence and factors associated with thyroid autoimmunity among children newly diagnosed with type 1 diabetes before and during the COVID-19 pandemic: Evidence from Kuwait. Diabetes Metab Res Rev 2024;40:e3824.
18. Margolis MG, Weizman S, Lazar L, Yakobovich-Gavan M, Tenenbaum A, Phillip M, *et al*. Clinical and immunological characteristics of children diagnosed with-type 1 diabetes during the COVID-19 pandemic. Diabet Med 2024;41:e15250.
19. Boboc AA, Novac CN, Marin AG, Ieșanu MI, Plătică C, Buzescu T, *et al*. SARS-CoV-2 positive serology and islet autoantibodies in newly diagnosed pediatric cases of type 1 diabetes mellitus: A single-center cohort study. Int J Mol Sci 2023;24:8885.
20. İzci Güllü E, Akin L, Gökler ME, Aydin M. Increased severity of presentation signs in children with newly diagnosed type 1 diabetes during the COVID-19 pandemic: A tertiary center experience. Ann Nutr Metab 2024;80:161-70.
21. Krischer JP, Lernmark Å, Hagopian WA, Rewers MJ, McIndoe R, Toppari J, *et al*. SARS-CoV-2 - No increased islet autoimmunity or type 1 diabetes in teens. N Engl J Med 2023;389:474-5.
22. Elgenidy A, Awad AK, Saad K, Atef M, El-Leithy HH, Obiedallah AA, *et al*. Incidence of diabetic ketoacidosis during COVID-19 pandemic: A meta-analysis of 124,597 children with diabetes. Pediatr Res 2023;93:1149-60.
23. Magge SN, Wolf RM, Pyle L, Brown EA, Benavides VC, Bianco ME, *et al*. The Coronavirus disease 2019 pandemic is associated with a substantial rise in frequency and severity of presentation of youth-onset type 2 diabetes. J Pediatr 2022;251:51-9.e2.
24. Gerasimidi Vazeou A, Kordonouri O, Witsch M, Hermann JM, Forsander G, de Beaufort C, *et al*. Seasonality at the clinical onset of type 1 diabetes-Lessons from the SWEET database. Pediatr Diabetes 2016;17:32-7.
25. Reschke F, Lanzinger S, Herczeg V, Prahalad P, Schiaffini R, Mul D, *et al*. The COVID-19 pandemic affects seasonality, with increasing cases of new-onset type 1 diabetes in children, from the worldwide SWEET registry. Diabetes Care 2022;45:2594-601.
26. Kostopoulou E, Eliopoulou MI, Rojas Gil AP, Chrysis D. Impact of COVID-19 on new-onset type 1 diabetes mellitus - A one-year prospective study. Eur Rev Med Pharmacol Sci 2021;25:5928-35.
27. Wolf RM, Noor N, Izquierdo R, Jett D, Rewers A, Majidi S, *et al*. Increase in newly diagnosed type 1 diabetes in youth during the COVID-19 pandemic in the United States: A multi-center analysis. Pediatr Diabetes 2022;23:433-8.
28. Baechle C, Eckert A, Kamrath C, Neu A, Manuwald U, Thiele-Schmitz S, *et al*. Incidence and presentation of new-onset type 1 diabetes in children and adolescents from Germany during the COVID-19 pandemic 2020 and 2021: Current data from the DPV registry. Diabetes Res Clin Pract 2023;197:110559.
29. Berthon W, McGurnaghan SJ, Blackbourn LA, Bath LE, McAllister DA, Stockton D, *et al*. Incidence of type 1 diabetes in children has fallen to pre-COVID-19 pandemic levels: A population-wide analysis from Scotland. Diabetes Care 2024;47:e26-8.

How to cite this article: Dhananjaya MS, Sarathi V. COVID-19 and the surge in youth diabetes: Fleeting effect or lasting consequence? J Pediatr Endocrinol Diabetes. 2024;4:52-4. doi: 10.25259/JPED_52_2024