New Onset Type-1 Diabetes Mellitus in a Toddler with SARS-CoV-2 Infection Presenting in Diabetic Ketoacidosis: A Case Report

Joy Ekezie
Department of Pediatrics, BronxCare Health System, Bronx, New York, US
jekezie@bronxcare.org

KEYWORDS:
Type 1 diabetes mellitus;
Diabetic ketoacidosis;
SARS-CoV-2; COVID-19

TO CITE THIS ARTICLE:
Ekezie J, Haddad D. New Onset Type-1 Diabetes Mellitus in a Toddler with SARS-CoV-2 Infection Presenting in Diabetic Ketoacidosis: A Case Report. Journal of Scientific Innovation in Medicine. 2021; 4(2): 11, pp. 1–3. DOI: https://doi.org/10.29024/jsim.110

ABSTRACT

Introduction: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), though mostly sparing the lungs in children, has been found to affect other organs including the endocrine system [1, 2]. Diabetes mellitus (DM) from SARS-CoV-2 infection occurs through direct negative effects of the virus on beta cell function, [3, 4] and may rapidly progress to complications such as diabetic ketoacidosis (DKA) which can be potentially fatal [3]. We present a case of new-onset type 1 DM presenting as DKA in a toddler with SARS-CoV-2 infection.

Case presentation: A 3-year-old previously healthy male presented with 4 days history of fever and generalized body weakness, and “deep breathing” of 1 day. Review of systems was notable for increased thirst and urination, nausea, vomiting, fatigue, and visible weight loss noted in the last 4 days. Initial investigations done showed elevated blood glucose (582 mg/dL), ketonuria (2+ or 80 mg/dL), increased anion gap metabolic acidosis (pH 6.95, bicarbonate <6 mEq/L, lactate 2.7 mmol/L, anion gap 23), and positive SARS-CoV-2 polymerase chain reaction (Table 1). He was immediately commenced on intravenous fluids and insulin with progressive improvement. Subsequent laboratory findings include elevated HbA1c (10.0%), low insulin and low C-peptide (<15 mIU/L and <0.1 ng/mL respectively) suggestive of type 1 DM. Antibodies to insulin and glutamic acid decarboxylase (GAD) 65 were within normal range (<0.4 U/mL and <5 IU/mL respectively). Screening for celiac disease and thyroid disorders were also within normal limits. He remained otherwise asymptomatic with other coronavirus disease-2019 (COVID-19) symptoms and was discharged on hospital day 6 on subcutaneous insulin.

Conclusion: The association between COVID-19 and new-onset type 1 diabetes mellitus (T1DM) is becoming increasingly prevalent. The case highlights the possibility of SARS-CoV-2 acting as an infectious precipitant for T1DM and DKA. Although the presence of multiple autoantibodies greatly increases the probability for T1DM with about 96% of affected individuals being positive for at least one of the autoantibodies, the index case did not have autoantibodies suggesting a different mechanism of pancreatic beta cell destruction. Since children have been mostly spared the respiratory symptoms in acute COVID, it is important to remember that other organ systems can be affected distinct from the post-infectious multi-inflammatory syndrome. We therefore recommend that caregivers, parents, and medical professionals should have a high index of suspicion so that diagnosis can be early and DKA potentially prevented.
COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR AFFILIATIONS

Joy Ekezie orcid.org/0000-0002-6932-7314
Department of Pediatrics, BronxCare Health System, Bronx, New York, US

Diana Haddad
Division Of Pediatric Intensive Care, Department of Pediatrics, Maria Fareri Children’s Hospital, Westchester Medical Center, Westchester, New York, US

REFERENCES

1. Lim S, Boe JH, Kwon HS, Nauck MA. COVID-19 and diabetes mellitus: from pathophysiology to clinical management. Nat Rev Endocrinol. 2021; 17: 11–30. DOI: https://doi.org/10.1038/s41574-020-00435-4

2. Rubino F, Amiel SA, Zimmet P, Alberti G, Bornaestin S, Eckel RH, et al. New-Onset Diabetes in Covid-19. N Engl J Med. 2020 Aug 20; 383(8): 789–790. DOI: https://doi.org/10.1056/NEJMc2018688

3. Apicella M, Campopiano MC, Mantuano M, Mazoni L, Coppelli A, Del Prato S. COVID-19 in people with diabetes: understanding the reasons for worse outcomes. Diabetes & Endocrinology. 2020 Sept; 8(9): p782–p792. DOI: https://doi.org/10.1016/S2213-8587(20)30238-2

4. Boddu SK, Aurangabadkar G, Kuchay MS. New onset diabetes, type 1 diabetes and COVID-19. Diabetes Metab Syndr. 2020; 14(6): 2211–2217. DOI: https://doi.org/10.1016/j.dsx.2020.11.012

Table 1 Laboratory results.

| Test                  | Result                          |
|-----------------------|---------------------------------|
| VBG                   |                                |
| First: pH 6.95, pCO₂ 19, pO₂ 75, HCO₃ 4.2, BE -26.6  |
| Final: pH 7.37, pCO₂ 32, pO₂ 75, HCO₃ 18.5, BE -5.8  |
| BMP                   |                                |
| First: Na 134, K 4.8, HCO₃ <6, Cl 111, BUN 16, Cr 1.24, Gluc 582  |
| Final: Na 140, K 3.5, HCO₃ 13, Cl 120, BUN 11, Cr 0.65, Gluc 138  |
| Urinalysis            |                                |
| First: pH 6, SG 1.028, glucose 3+ (>500 mg/dl), ketones 2+ (80 mg/dl), protein 2+ (100 mg/dl), nitrate negative, LE negative  |
| Final: pH 9, SG 1.011, glucose 3+ (>500 mg/dl), ketones negative, protein negative, nitrate negative, LE negative  |
| Respiratory multiplex panel | SARS-CoV-2 RT-PCR: Positive  |
|                       | Influenza A: Negative           |
|                       | Influenza B: Negative           |
|                       | RSV: Negative                   |
| CBC                   | WBC 26.5, Hb 12.9, Hct 41.2, N 70.3, L 18.1, M 8.3, B 0.3, E 0, Plt 406  |
| CRP                   | <0.1 mg/dl                      |
| Serum osmolality      | 322 mOsm/kg                     |
| Hemoglobin A1c        | 10.0%                           |
| C-peptide             | <0.1 ng/ml                      |
| Insulin autoantibody  | <0.4 U/ml                       |
| Insulin               | <15.7 mIU/L                      |
| Gliadin deamminated IgA antibody | <10.0 U  |
| Gliadin deamminated IgG antibody | <10.0 U  |
| TTG IgG antibody      | 9 U/ml                           |
| GAD65 antibody        | <5 IU/mL                         |
| BNP                   | 24 pg/ml                         |
| Troponin I            | <0.02 ng/ml                      |
| Thyroid peroxidase antibody | <1  |
| Thyroglobulin antibody | <1.8                            |
| Thyroglobulin tumor marker | 30 ng/ml                    |
