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

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PUBLISHED ABSTRACT

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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.

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

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VBG	First: pH 6.95, pCO2 19, pO2 35, 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), nitrite negative, LE negative
	Final: pH 9, SG 1.011, glucose 3+ (>=500 mg/dl), ketones negative, protein negative, nitrite 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 deaminated IgA antibody	<10.0 U
Gliadin deaminated 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

Table 1 Laboratory results.

B Basophils, BE Base excess, BMP Basic metabolic panel, BNP Brain natriuretic peptide, BUN Blood urea nitrogen, CBC Complete blood count, Cl Chloride, Cr Creatinine, CRP C-reactive protein, E Eosinophils, GAD65 Glutamic acid decarboxylase 65, Gluc Glucose, Hb Hemoglobin, HCO3 bicarbonate, Hct Hematocrit, L Lymphocytes, LE Leukocyte esterase, M Monocytes, N Neutrophils, Na Sodium, pCO2 Partial pressure of carbon dioxide, pO2 Partial pressure of oxygen, SG Specific gravity, RSV Respiratory syncytial virus, TTG Tissue transglutaminase, VBG Venous blood gas, WBC white blood cell.

COMPETING INTERESTS

The authors have no competing interests to declare.

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