Case report: Hyperglycemic hyperosmolar state in an obese prepubertal girl with newly diagnosis of type 2 diabetes

N. Polidori, C. Giannini, L. Comegna, F. Chiarelli, A. Mohn, A. Blasetti
Department of Pediatrics, University of Chieti, Chieti, Italy

**CLINICAL PRESENTATION**
A 11-year-old Italian severely obese prepubertal female (BMI: 32.4 kg/m²; SDS-BMI: 2.63) was admitted to the emergency department due to worsening dyspnea and chest pain associated with severe polyuria, lethargy and lost weight from (85 kg to 78 kg in 7 days). She has a history of severe hypertension treated with amlodipine and bisoprolol and a positive family history of Type 2 diabetes. At admission, she was dehydrated and lethargic, but can be awakened after painful and verbal stimulation, and motor strength was quite.

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**LABORATORY TEST**
Plasma glucose concentration was >600 mg/dL with mild metabolic acidosis at blood gas and Na values were 150 mmol/L.
IA2 and GAD auto-antibodies measurements were negative.
Insulin, c-peptide and HbA1c levels were significantly high.
Effective serum osmolality >320 mOsm/kg.

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**HYPEROSMOLAR HYPERGLYCEMIC SYNDROME (HHS)**
is a clinical state characterized by
- Hyperglycemia (blood glucose 33 mmol/L or 600 mg/dL),
- Hyperosmolarity (serum osmolality 320 mmol/kg)
- Minimal ketonemia, often described in adults with established diabetes, but rarely described in pediatric age especially in the prepubertal phase.

Additionally, almost 28% of pediatric patients with HHS can also present with concomitant diabetic ketoacidosis (DKA). Due to the high mortality rate and severe complications associated with HHS, it is imperative to distinguish between DKA and HHS as the initial management can highly influence clinical outcomes.

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**TREATMENT**
Rehydration was started with isotonic saline (0.9% NaCl) infusion and thereafter continued with 0.45% NaCl.
In addition, continuous insulin administration at 0,012 UI/kg/h was introduced with the dosage titrated thereafter to achieve a decrease in serum glucose concentration of 50-75 mg/dl/h.
Basal-bolus insulin administration was started during the third day of admittance.

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**CONCLUSIONS**
Although HHS represent a relatively common condition in adult obese subjects with T2D at onset, the rising prevalence of severe obese and type 2 diabetes in children might be associated in the next future to a parallel increase of its diagnosis in childhood. Therefore, new cases and especially pediatric guidelines for most appropriate treatment of this condition are needed.