

## Microvascular and hypoxic disorders in children with diabetic nephropathy

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### Abstract

**B**ackground: In diabetes mellitus type I (T1D) progression of cardio-renal disorders, i.e. arterial hypertension and its complications, diabetic nephropathy (DN), is still the most important side-effect. Search of the mechanisms underlying these damages is on priority list. Vitamin D deficiency identified as a common metabolic/endocrine disorder worldwide in health and diseases. There are data about the role of Vitamin D in T1D in adults. However, this issue remains to be open in pediatric practice.

**Aim:** To study the levels of Vitamin D, Endothelin-1 and primary cellular hypoxia markers in children with T1D and DN and to find out the network of these markers inter-relation.

**Material and Methods:** Thirty six (36) children T1D aged 6 to 17 years hospitalized in Endocrinology unit in Children Clinical Hospital №6 (Kyiv, Ukraine) studied. Vitamin D3 levels measured using ELISA assay and commercially available kit (Vitamin D3 (human) ELISA kit (BioVision, USA). Endothelin-1 levels measured using ELISA assay and commercially available Endothelin-1 ELISA kit (Abcam, USA). The O<sub>2</sub>-Hb dissociation rate studied spectrophotometrically. Results processed using STATISTICA 6.0 and non-parametric statistical method (Mann-Whitney test).

**Results:** In our study normal level, insufficiency and deficiency of the Vitamin D defined as  $\geq 30$  ng/mL, 21-29 ng/mL and  $\leq 20$  ng/mL, respectively. All patients included into the study during the period September-May. We show that the most prominent Vitamin D3 deficiency detected in the group of patients with diabetic nephropathy (DN). In control group Vitamin D3 was detected at level  $35.68 \pm 1.56$  ng/mL, in patients with T1D –  $32.37 \pm 5.1$  ng/mL, in patients with DN –  $19.39 \pm 1.76$  ng/mL ( $p < 0.01$  as compared to control group). Analysis of the Vitamin D3 levels and the disease course show negative correlation ( $R = -0.79$ ,  $p < 0.001$ ). In all children the hemoglobin affinity to O<sub>2</sub> molecule studied based on Sore peak analysis. Control group show this index at level  $3.05 \pm 0.23$  a.u., children with T1D –  $3.61 \pm 0.25$  a.u. ( $p < 0.05$ ), patients with DN  $1.76 \pm 0.27$  a.u. ( $p < 0.01$ , compared to control group value). In all children with T1D and DN increased level of ET-1 measured.

**Conclusion:** Our data show the prominent deficiency of Vitamin D in T1D patients and patients with DN, increased ET-1 level (a potent vasoconstrictor peptide), and reduction of the O<sub>2</sub>-Hb dissociation rate. We hypothesize that Vitamin D deficiency is a result of toxic effect of glucose. Increased ET-1 in all patients is a sign of early microvascular changes and resistant vessels damage leading to DN progression and arterial hypertension. All mentioned above changes accompanied by reduced O<sub>2</sub>-Hb dissociation as a result of increased level of HbA<sub>1C</sub> and may be a reason of cellular hypoxia.

**Key words:** T1D, diabetic nephropathy, children, ET-1, cardio-renal complications



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### Speaker Publications:

1. "P319 Attitude towards paediatric use of natural medicines: a cross-country survey conducted in general paediatrics"; Archives of Disease in Childhood / 2017/ 102 (Suppl 2): A156.3-A157 DOI: 10.1136/archdischild-2017-313273.407.
2. "Usage and attitudes towards homeopathy and natural remedies in general paediatrics: a cross-country overview"; Homeopathy / 2016/ 105 (1):35 DOI: 10.1016/j.homp.2015.12.061.

[19<sup>th</sup> World Congress on Clinical Pediatrics](#), Prague, Czech Republic, April 27-28, 2020, Webinar.

### Abstract Citation:

Ievgeniia Burlaka, Microvascular and hypoxic disorders in children with diabetic nephropathy, Clinical Pediatrics Congress 2020, 19<sup>th</sup> World Congress on Clinical Pediatrics; Prague, Czech Republic, April 27-28, 2020.

<https://clinicalpediatrics.pediatricsconferences.com/abstract/2020/microvascular-and-hypoxic-disorders-in-children-with-diabetic-nephropathy>