

Early Detection of Bone Turnover among Children and Adolescents with Type 1 Diabetes

Amina M. Abdel Wahab*, MD, Sonia El Sharkawy*, MD,
Fadia Attia**, MD, Mona Amin*, MD

*Pediatrics Department, **Clinical Pathology Department, Suez Canal University, Ismailia, Egypt

BACKGROUND

Significant metabolic changes occur in Type 1 Diabetes that affect most organs of the body. Bone can be affected through multiple mechanisms. However the exact mechanisms by which bone derangement occurs are still unknown.

AIM OF WORK

To determine the relationship between Type 1 Diabetes and bone turnover among children and adolescents.

OBJECTIVES

- Comparing urinary Pyridinoline crosslinks (PYD) levels among children with Type 1 diabetes and non-diabetics.
- Correlation between ALP & PYD crosslinks in diabetic group.

Subjects and Methods

Thirty nine Type 1 diabetic patients aged 6-18 years (diabetes duration for at least 2 years) & 39 age and sex matched healthy controls were enrolled in the study. Patients with history of autoimmune diseases, renal affection, hyperparathyroidism, hypertension or taking any medication interfering with bone metabolism were excluded. Good history taking and thorough clinical examination were performed. Laboratory investigations; HbA1c by quantitative colorimetric determination of hemoglobin in whole blood, Parathyroid hormone assayed by ELISA kits, Alkaline phosphatase by the kinetic method as per recommendation of German society for clinical chemistry were performed for diabetics only. Urine samples for pyridinoline cross links (PYD) by ELISA were performed for both groups.

- All authors declared no conflict of interest.
- Written informed consent obtained from all participants.
- The study was approved by Faculty Ethical Committee.

Results

One third of the patients had high level of ALP. The PYD level was significantly higher among diabetic patients ($p \leq 0.001$). Values of PYD/creatinine among type 1 diabetics (12.6 ± 4.3 nmol/mmol) were + 3 SD away from the mean of the control group (2.9 ± 1.5 nmol/mmol). No statistically significant correlation between ALP & HbA1c among diabetics. No statistically significant correlation between PYD/creatinine & PYD alone and HbA1c, BMI, age, duration of diabetes, or ALP among diabetics.

Table 1. PYD & PYD/Creatinine levels among diabetics & control

	Control	Diabetic	P-value
PYD (nmol/l)	13.5 ± 6.7	49.7 ± 9.8	≤ 0.001
PYD/Cr (nmol/mmol)	2.9 ± 1.5	12.6 ± 4.3	≤ 0.001

Table 2. Correlation between ALP & different study variables among diabetic group

	ALP(U/L)	P-value
BMI(Kg/m ²)	-0.436	0.005*
Age(years)	-0.473	0.002*
HbA1C	0.254	0.119
Duration of DM(years)	-0.254	0.119
PYD(nmol/L)	-0.030	0.856
PYD/Cr (nmol/mmol)	0.091	0.582

Table 3. Correlation between PYD PYD/creatinine & different study variables

	PYD	P	PYD/cr	p
BMI	-0.064	0.700	-0.259	0.111
Age(years)	0.154	0.350	-0.108	0.511
HbA1c	0.130	0.431	0.211	0.196
Duration of Diabetes	0.201	0.220	-0.069	0.674
ALP(U/L)	-0.030	0.856	0.091	0.582

Conclusion

- Urinary Pyridinoline crosslinks are markedly higher in diabetics than non-diabetics.
- Bone resorption is significantly higher in type 1 diabetes without coupling bone formation.
- Bone turnover (resorption & formation) in type 1 diabetes is neither dependent on glycemic control nor on the duration of the disease.
- The use of PYD or its corrective ratio with urinary creatinine almost gives the same results.

References:

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2. Dhaon P. & Shah V. : Indian J Endocr. Metab 2014; 18:159-165