# Bone mineral density and bone turnover markers in children with Haemophilia A

P. Xafaki[1], H. Pergantou[1], A. Doulgeraki[2], H. Athanasopoulou[2], H.Platokouki[1]

[1]Haemophilia Centre/Haemostasis Unit, "Aghia Sophia" Children's Hospital, Athens, Greece
[2] Institute of Child Health, "Aghia Sophia" Children's Hospital, Athens, Greece

## OBJECTIVES

Persons with Haemophilia might have a predisposition for low bone mineral density because of recurrent hemarthroses, prolong immobilization and limited physical activity.

Bone status evaluation

✓Dual energy X-Ray absorptiometry (DXA) is the gold standard for bone mineral density (BMD) measurement (static evaluation)

✓Bone turnover markers are specific bone-derived molecules that reflect the bone metabolic activity (dynamic evaluation)

**Aim**

•To assess bone mineral density (BMD) using dual-energy X-Ray absorptiometry (DXA)

•To investigate possible correlations of DXA findings with serum markers of bone turnover in children with Haemophilia A

## METHODS

### A. Dual energy X-Ray absorptiometry (DXA)

- Total body **(TB)** and/or lumbar spine **(LS)** scanning was applied for BMD measurement
- Bone Mineral Density (BMD) expressed as **z-score**, according the Official Position of International Society for Clinical Densitometry, ISCD 2007
- z-score is defined as the number of SD above or below the mean, determined using age- and gender-matched reference data (z-score < -2, established as low BMD for chronological age)

### B. Bone turnover markers

| | |
|---|---|
| Bone resorption markers | • urinary deoxypyridinoline/cretinine (uDPD/uCr, nmol/mmol cr)<br>• urinary excretion of calcium (uCa/uCr, mmol/mmol)<br>• tartrate-resistant acid phosphatase (Trap, ng/ml) |
| Bone formation markers | • serum total alkaline phosphatase (ALP, IU/L)<br>• bone specific alkaline phosphatase (bALP, IU/L)<br>• osteocalcin (OC, ng/ml)<br>• carboxy-terminal propeptides of type I collagen (PICP, ng/ml) |
| Other | • Vitamin D (25OHD), parathormone (PTH)<br>• serum Ca (mmol/l) and urinary excretion of phosphorus (uP/uCr) |

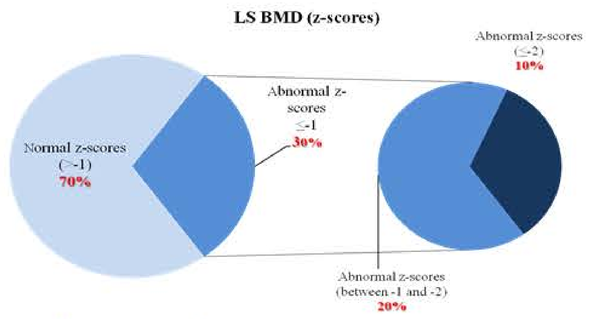
## RESULTS

### I) Demographic data

51 children with Haemophilia A were included in the study
41 children had severe type of the disease (FVIII<1 iu/dl)
mean age:11.7±3.6 years (range 7-19)
on prophylaxis:43/51 patients (secondary in the majority of the cases)

### II) LS and TB BMD z-scores

| | Mean z-score | Z-score between -1 and -2 | Z-score <-2 |
|---|---|---|---|
| LS BMD (40 children) | -0.51±0.98 | 8/40 children (20%) | 4/40 children (10%) |
| TB BMD(44children) | 0.18±0.85 | 4/44 children (9.1%) | - |




### III) Bone formation markers

- Osteocalcin levels were significantly decreased in the patients compared to a standard control group (19.06±5.8 vs 22±10.8, p<0.05), whereas the other bone formation markers were within normal range. Fig 1
- OC was positively correlated with LS and TB z-scores (r=0.337 and r=0.313 respectively, p<0.05). Fig 2a,b

| | Group | N | Mean | Std. Deviation | P |
|---|---|---|---|---|---|
| ALP | Patients | 51 | 351,6 | 99,3 | NS |
| | Controls | 40 | 348,0 | 137,9 | |
| bALP | Patients | 50 | 115,3 | 53,5 | NS |
| | Controls | 51 | 117,0 | 63,2 | |
| OC | Patients | 50 | 19,0 | 5,8 | <0.05 |
| | Controls | 49 | 22,0 | 10,8 | |
| PICP | Patients | 50 | 161,6 | 96,9 | NS |
| | Controls | 49 | 173,5 | 139,0 | |

Fig. 1

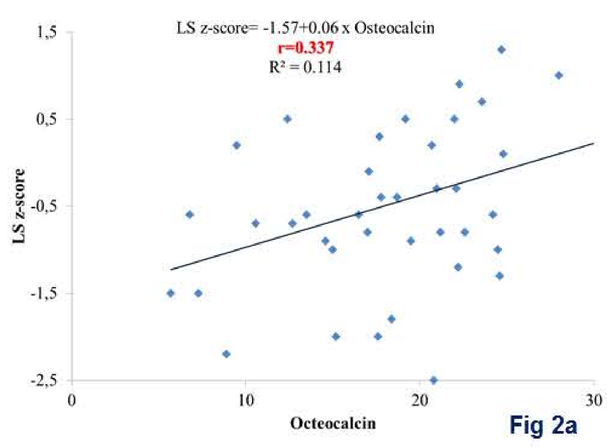



Fig 2a

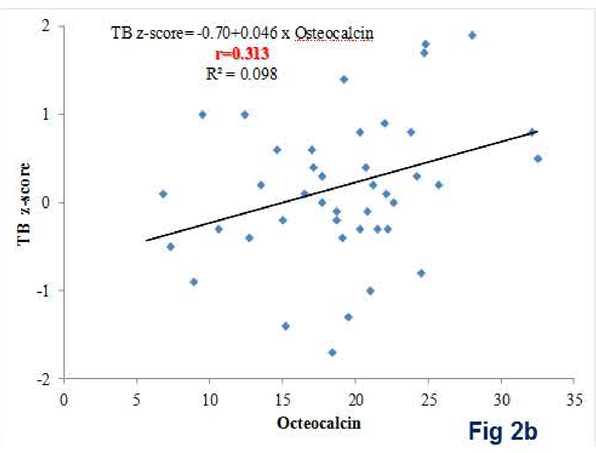



Fig 2b

### IV) Bone resorption markers

- 38/49 children (77.6%) had increased uDPD/uCr (mean:32.35±14.6, n.v <22)
- The patients with abnormal levels of uDPD/uCr had lower LS z-scores (mean -0.82±0.85 vs -0.20±0.97, p<0.05) and TB z-scores (mean -0.08±0.69 vs 0.37±0.91)
- No significant differences were detected in uCa/uCr and bone Trap.
- uDPD/uCr inversely correlated with LS BMD (r=-0.677) and TB BMD (r=-0.569), p<0.01. Fig 3a,b

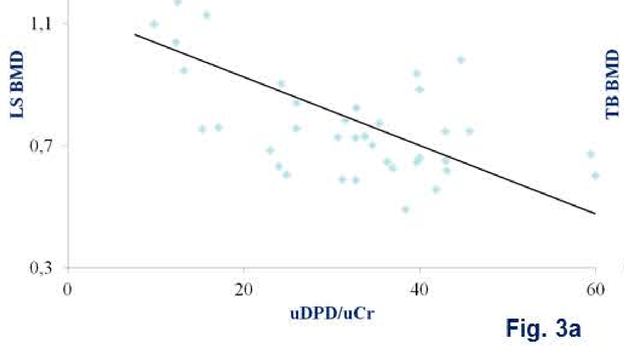



Fig. 3a

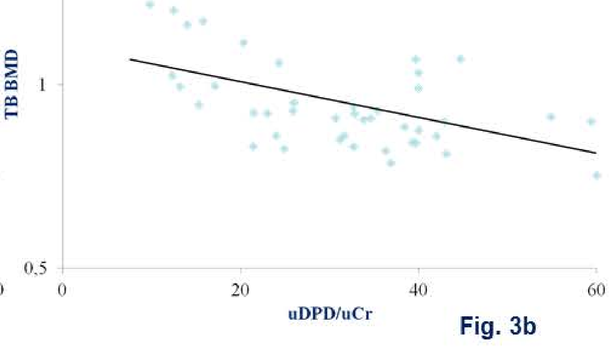



Fig. 3b

V) Decreased **vitamin D** levels (mean 27.9±19.33, normal values >20ng/ml) were found in 18/49 children (36.7%). No differences were observed in z-scores between children with adequate or not vitamin D levels.

## CONCLUSIONS

In our study, 30% of children with Haemophilia A had low for chronological age Lumbar Spine Bone Mineral Density, not related to vitamin D levels. Almost 80% of them had increased uDPD/uCr (bone resorption marker), without parallel increase of bone formation markers. Haemophilic children are prone to develop bone metabolic disturbances; thus, close monitoring of bone status and therapeutic intervention, if required, might be beneficial for long term outcomes.

WFH2014 169-P-W
Musculoskeletal-Orthopedic Issues
PANAGIOTA XAFAKI
DOI: 10.3252/pso.eu.WFH2014.2014
Poster presented at: WFH 2014 World Congress Melbourne, Australia May 11-15
PosterSessionOnline.com