# Bone Mineral Density evaluation in children with Gaucher Disease.

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## INTRODUCTION

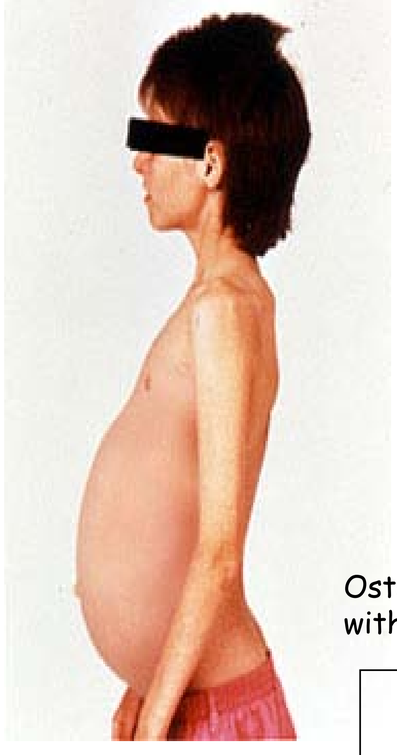
Gaucher disease is the most common metabolic disorder of lysosomal storage. It is a chronic, progressive, multisystemic disease. The enzyme replacement therapy is the current standard treatment and has significantly improved the quality of life of patients with Type 1 Gaucher disease. ß-glucosidase activity determination is essential for diagnosis and needed before starting enzyme replacement therapy.

## Bone Involment

The infiltration and accumulation of abnormal macrophages in bone marrow loaded alucocerebrosides intraosseous, causing mechanical pressure with release of enzymes and other substances from Gaucher cells.

***Inadequate modeling: 80% Erlenmeyer*** *deformity (femur distal - proximal tibia) Not patognomic*

***Osteonecrosis***:
avascular necrosis (chronic infarction). 50% of patients with bone involvement, vertebral bodies, **higher in weight-bearing bones**: femoral epiphysis and proximal humeral epiphysis.
necrosis avascular (chronic infarct).



***Bone Crisis***: 30-40% (+ Childhood and adolescents) acute, intense and localized, with fever. More in long bones

***Osteopenia***: trabecular and cortical bone. Localized bone loss (osteolysis) reflects foci of Gaucher cells.

***Osteoesclerosis***: More severe forms are associated with bone infarcts.

## REASON FOR STUDY:

Osteopenia (Low bone mass) has been described in 44% in children and 76% in adolescents with GD of the International Gaucher Registry.

**AIM**
Scan Bone mineral density in patients with GD for enzyme replacement therapy.

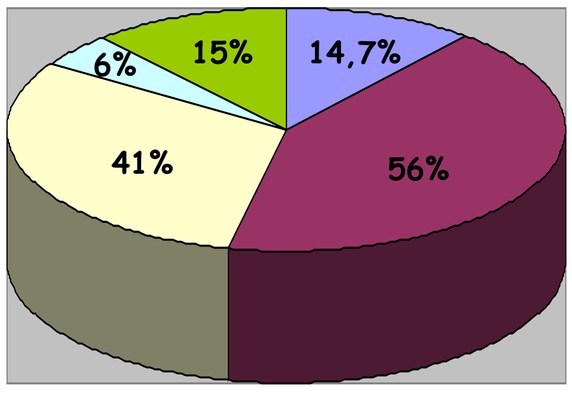
## PATIENTS AND METHODS

An observational retrospective study in a group of 34 pediatric patients with GD treated with enzyme replacement therapy. Fourteen males and 20 females, mean age 11.3 ± 3.9 years (median 10.5 years, range: 5-18 years), were evaluated.
Patients had received infusions with imiglucerase (mean dose: 57.7±17.4 IU/ kg) for a period of 7.7 ± 4.5 years.
Bone Mineral Density (BMD) was evaluated at total body (TB) (N: 24) and lumbar spine (LS) (L2-L4, N: 34) using a dual X-ray absorptiometry (DEXA) (GE Lunar). Results were compared with a normal control group, of children of the same sex and age. Following the guidelines of the International Society for Clinical Densitometry (ISCD) a **Z-Score≤-2.0** was considered pathological.
Patients were divided into two groups: pre pubertal (G1) and Pubertal (G2) for both girls and boys: G1G-G2G and G1B-G2B respectively.
The results were expressed as X ± SD.

## RESULTS

### Skeletal manifestations of patients with GD

From 34 patients with GD, **5** (14,7%) had **osteonecrosis lesions**, **19** (56%) **bone pain**, **14** (41%) **Erlenmeyer deformity**, **2** (6%) **fractures**, y **5** (15%) **bone crisis**.




| Patient | Age (years) | L2-L4 (Z score) | TB (Z score) |
|---|---|---|---|
| AL ♂ | 6 | 0,7 | - |
| BB ♀ | 16 | 0,0 | 0,1 |
| BF ♀ | 7 | 1,4 | 1 |
| BA ♀ | 7 | 0,7 | 0,8 |
| BK ♀ | 14 | 0,5 | 0,3 |
| BL ♀ | 15 | 0,1 | 0,0 |
| CD ♀ | 16 | 4 | - |
| CF ♀ | 14 | -1.4 | - |
| CMa ♀ | 10 | -1.9 | - |
| CPr ♀ | 12 | -1.0 | - |
| CPa ♂ | 12 | -1.8 | - |
| CMo ♀ | 7 | -0.2 | -0.2 |
| ChP ♂ | 9 | 0.5 | -0.5 |
| EY ♀ | 10 | -2.4 | -1.6 |
| FN ♂ | 9 | -1.6 | -0.9 |
| GR ♂ | 8 | -1.0 | - |
| GM ♀ | 9 | 0.4 | -0.2 |
| JL ♀ | 8 | 1.1 | -0.3 |
| LM ♀ | 10 | 0.0 | 0.9 |
| LD ♂ | 6 | -1.1 | - |
| MM ♀ | 18 | 0.6 | - |
| MF ♀ | 11 | -1.2 | -0.8 |
| ML ♂ | 9 | -2.0 | -1.6 |
| PA ♂ | 12 | 1.5 | 1.9 |
| PM ♂ | 16 | 0.0 | 1.2 |
| QC ♀ | 11 | -1.0 | 1.5 |
| QF ♀ | 18 | 1.5 | 3.3 |
| RR ♀ | 16 | -1.7 | -1.8 |
| RG ♂ | 10 | -1.5 | - |
| RM ♂ | 18 | -1.9 | -1.1 |
| RN ♂ | 5 | -1.2 | 0.1 |
| SD ♂ | 6 | 1.8 | 1.7 |
| VC ♀ | 11 | 1.3 | 0.9 |
| ZG ♀ | 17 | -2.1 | -1.9 |
| Media ± DS / (♀: 20, ♂: 14) | 11.3 ± 3.9 | 0.26 ± 1.4 (N: 34) | 0.11 ± 1.3 (N: 24) |

**TABLE 1:** Sex age and lumbar spine: L2-L4 and total body (TB).BMD in patients with GD

| | BMD LS (L2-L4) | BMD TB |
|---|---|---|
| G1G | -0.23±1.4 | -0.08±0.9 |
| G2G | -0.51±1.9 | 0.05±1.9 |

**Table 2**: BMD in Lumbar Spine (L2-L4) orTotal Body (TB), pre pubertal (G1G), or pubertal (G2G). Girls (X±SD)
8 pubertal girls have presented their **menarchiy** at the moment of BMD evaluation: L2-L4: **-0.34±1.2** y ET: **-0.4±1.16**.

| | BMD LS (L2-L4) | BMD TB |
|---|---|---|
| G1B | -0.6±1.28 | -0.07±1.4 |
| G2B | -0.15±1.4 | 0.58±1.2 |

**Table 3**: BMD values in Lumbar Spine (L2-L4) or Total Body (TB), in pre pubertal (G1B) or pubertal: (G2B) Boys (X±SD).

## Conclusions

**Patients with GD receiving therapy with imiglucerase have normal BMD.**
**It seems that in pubertal groups BMD is better than in pre pubertal ones , perhaps reflecting the action of sexual steroids on bone.**
**A longitudinal study is needed to confirm this observation.**