# Prevalence of genu varum / valgum in Algerian children and adolescents with low vitamin D and calcium status

M.Djennane [1,2] , J.C.SOUBERBIELLE [3]

(1) Rheumatology department, University hospital center Tizi ouzou, Algeria; (2) University Mouloud Mammeri Tizi ouzou, Algeria
(3) functional explorations department, Necker Hospital, Paris, France

## INTRODUCTION

The prevalence of lower extremity deformities is high in some areas of the world, often associated with low vitamin D status and low calcium intake. These bone deformities are physiological until the age of five. There is no published data on bone deformities in the lower limbs of healthy children living in North Africa.

## Aims and Objectives

**PRIMARY OBJECTIVE**

✓ Identify bone deformities of the lower limbs

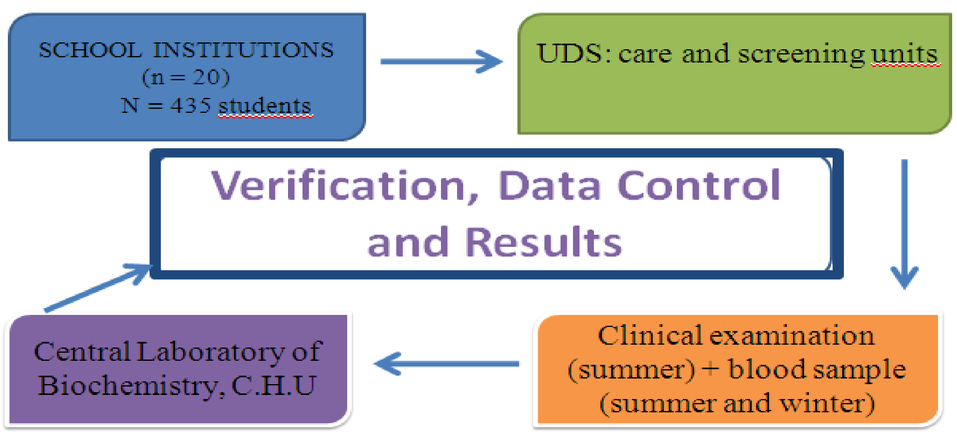
**SECONDARY OBJECTIVES**

✓ Determine the status of vitamin D among school children between 5-15ans

✓ Identify potential factors for hypovitaminosis D.

## Materials and Methods

**Type of study**:
prospective and cross-sectional study




## Results

**25OHD levels in september and March in function the various determinants**

| Variable | September | | | | March | | | |
|---|---|---|---|---|---|---|---|---|
| | *N* | Median (IQR) 25OHD (nmol/L) | Percent with 25OHD <50 nM | *p* value | *N* | Median (IQR) 25OHD (nmol/L) | Percent with 25OHD <50 nM | *p* value |
| Gender | | | | | | | | |
| Boys | 203 | 74.1 (65.1–85.4) | 23.2 | <0.001 | 191 | 55.8 (44.4–75.7) | 33.5 | <0.001 |
| Girls | 232 | 60.2 (45.2–77.0) | 35.8 | | 217 | 52.4 (30.6–75.4) | 48.4 | |
| Age (years) | | | | | | | | |
| 5–6.99 | 54 | 79.3 (76.7–85.7) | 0.0 | <0.001 | 53 | 75.7 (62.2–76.8) | 3.8 | <0.001 |
| 7–8.99 | 88 | 77.0 (64.5–83.9) | 15.9 | | 88 | 64.6 (49.0–76.4) | 26.1 | |
| 9–10.99 | 87 | 72.2 (60.9–79.7) | 13.8 | | 86 | 54.4 (48.9–75.3) | 26.7 | |
| 11–12.99 | 92 | 59.2 (46.1–74.9) | 42.4 | | 75 | 43.1 (31.2–58.2) | 65.3 | |
| 13–15 | 114 | 48.0 (31.9–76.1) | 57.0 | | 106 | 31.0 (22.5–58.9) | 67.9 | |
| BMI | | | | | | | | |
| Normal | 403 | 73.4 (53.7–80.0) | 24.3 | <0.001 | 377 | 54.9 (42.8–75.7) | 36.6 | <0.001 |
| Overweight | 23 | 43.4 (27.1–46.2) | 100 | | 22 | 25.2 (18.5–31.1) | 100 | |
| Obesity | 9 | 24.2 (21.6–43.8) | 100 | | 9 | 18.5 (17.3–24.4) | 100 | |
| Skin type (Fitzpatrick) | | | | | | | | |
| I–III | 185 | 78.2 (72.8–84.7) | 16.2 | <0.001 | 171 | 75.3 (51.7–76.8) | 20.5 | <0.001 |
| IV | 161 | 61.7 (47.0–74.2) | 34.8 | | 153 | 49.4 (36.4–59.9) | 51.6 | |
| V–VI | 89 | 52.8 (43.4–71.3) | 49.4 | | 84 | 42.9 (26.8–52.8) | 65.5 | |
| Pubertal stage | | | | | | | | |
| 1 | 206 | 77.0 (70.7–83.6) | 10.7 | <0.001 | 205 | 75.0 (51.6–76.4) | 18.1 | <0.001 |
| 2 | 69 | 61.1 (46.6–75.4) | 37.7 | | 61 | 46.3 (35.9–56.5) | 39.0 | |
| 3 | 58 | 57.5 (46.5–74.4) | 41.4 | | 45 | 42.1 (31.1–59.6) | 64.4 | |
| 4 | 45 | 48.3 (37.7–77.2) | 51.1 | | 41 | 28.4 (24.3–73.0) | 65.9 | |
| 5 | 57 | 46.8 (25.6–67.1) | 61.4 | | 56 | 30.7 (20.7–50.9) | 71.4 | |
| Daily sun exposure | | | | | | | | |
| <30 min | 52 | 41.4 (30.7–45.2) | 92.3 | <0.001 | 48 | 26.8 (21.4–35.6) | 97.9 | <0.001 |
| 30–60 min | 124 | 63.6 (54.7–72.2) | 21.8 | | 112 | 49.1 (42.1–53.5) | 51.8 | |
| >60 min | 259 | 77.9 (61.9–84.4) | 21.2 | | 248 | 75.2 (49.7–76.7) | 25.9 | |
| Sport outside school | | | | | | | | |
| Yes | 177 | 76.7 (59.1–82.7) | 23.2 | <0.001 | 164 | 66.4 (49.4–76.1) | 25.6 | <0.001 |
| No | 258 | 64.6 (46.8–77.1) | 35.5 | | 244 | 49.0 (35.2–75.1) | 52.1 | |
| Socioeconomic status | | | | | | | | |
| Poor | 29 | 43.4 (22.7–63.9) | 65.5 | <0.001 | 29 | 24.9 (18.1–47.7) | 75.9 | <0.001 |
| Moderate | 110 | 46.4 (34.5–49.1) | 72.4 | | 103 | 34.4 (25.4–44.1) | 85.4 | |
| Good | 235 | 75.6 (64.7–81.6) | 11.8 | | 220 | 60.8 (49.1–76.0) | 26.9 | |
| Fair | 61 | 78.3 (76.3–84.7) | 0.0 | | 56 | 75.3 (57.0–76.8) | 0.0 | |
| Daily calcium intake | | | | | | | | |
| <500 mg | 44 | 33.7 (23.9–45.8) | 86.3 | <0.001 | 39 | 23.7 (16.5–31.0) | 92.3 | <0.001 |
| 500–850 mg | 323 | 71.3 (49.3–79.4) | 26.6 | | 307 | 51.9 (41.4–75.3) | 40.7 | |
| 851–1,200 mg | 58 | 79.9 (74.0–85.2) | 8.6 | | 53 | 75.8 (68.5–77.0) | 13.2 | |
| >1,200 mg | 10 | 80.8 (76.7–87.5) | 10.0 | | 9 | 76.1 (75.4–79.4) | 11.1 | |
| Daily vitamin D intake | | | | | | | | |
| <2.5 µg | 57 | 42.9 (24.1–48.6) | 80.7 | <0.001 | 56 | 26.1 (19.0–40.3) | 89.3 | <0.001 |
| 2.5–5 µg | 372 | 74.1 (55.4–80.4) | 22.6 | | 346 | 55.9 (44.5–75.8) | 34.3 | |
| >5 µg | 6 | 87.8 (85.1–89.4) | 0.0 | | 6 | 77.1 (76.3–78.8) | 0.0 | |

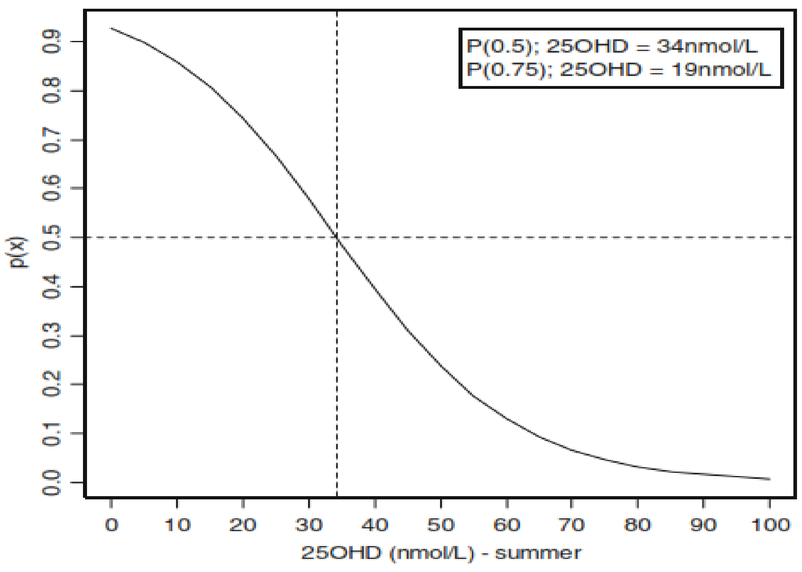



**Fig. 2** Probability of the presence of leg deformity as a function of September 25OHD concentration evaluated by logistic regression in 435 children. The 25OHD concentration corresponding to a probability of 0.5 and 0.75 are 34 and 19 nmol/L, respectively

| | September | | | March | | |
|---|---|---|---|---|---|---|
| | *N* | OR (IC95) | *p* value | *N* | OR (IC95) | *p* value |
| Age (years) | | | | | | |
| 5–9.99 | 229 | 1 | <0.001 | 227 | 1 | <0.001 |
| 10–15 | 206 | 8.5 (4.6–15.7) | | 181 | 9.1 (4.8–17.3) | |
| Skin type (Fitzpatrick) | | | | | | |
| I–III | 185 | 1 | <0.001 | 171 | 1 | <0.001 |
| IV–VI | 250 | 4.4 (2.3–8.3) | | 237 | 4.8 (2.5–9.1) | |
| Daily vitamin D intake | | | | | | |
| >3.5 µg | 215 | 1 | <0.001 | 201 | 1 | <0.001 |
| <3.5 µg | 220 | 2.8 (1.6–5.1) | | 207 | 3.3 (1.9–5.9) | |
| Daily calcium intake | | | | | | |
| >600 mg | 227 | 1 | <0.001 | 212 | 1 | 0.002 |
| <600 mg | 208 | 4.5 (2.5–8.1) | | 196 | 2.5 (1.4–4.5) | |
| Socioeconomic status | | | | | | |
| Good and fair | 296 | 1 | <0.001 | 276 | 1 | <0.001 |
| Poor and moderate | 139 | 3.2 (1.7–6.1) | | 132 | 4.2 (2.1–8.4) | |
| Daily sun exposure | | | | | | |
| >60 min | 259 | 1 | 0.14 | 248 | 1 | <0.001 |
| <60 min | 176 | 1.8 (0.8–3.8) | | 160 | 4.9 (2.7–8.9) | |

Determinants of vitamin D insufficiency (< 50 nmol/l) that remained significant in multivariate analysis

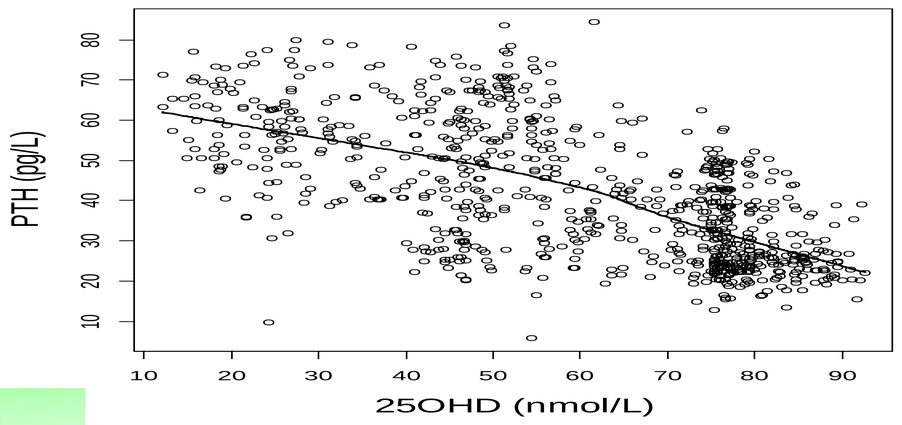



**Fig. 1** Relationship between serum levels of 25OHD and PTH after grouping the data of the September and the March visit ($n$=843). *Solid line* the LOESS curve. The Pearson correlation coefficient is $R$=−0.43 ($p$<0.001)

## Discussion- conclusion

▪About one in six participants (72 cases / 435) had leg deformity.
▪This proportion is significantly higher than that observed among children in Western Europe. However, it is similar to that observed in a Caucasian population of children (7 to 16 years old) from Eastern Europe. All the children were seen by the same rheumatologist. As a result, the evaluation of the presence of genu valgum / varum was done in the same way for all students.
Although impossible to assert, it remains plausible that these deformities of the leg may be, at least in part, due to a significant deficiency of vitamin D and / or calcium at an earlier stage of life .

Interestingly, in those with leg deformation, several determinants of vitamin D deficiency (female gender, dark skin, and low calciumintake) were noted more frequently than in those without leg deformation. Furthermore, they had lower 25OHD concentrations and a higher PTH, while high alkaline phosphatase levels in six of them with normal transaminase activities were suggestive of either a high bone turnover or a certain degree of mineralization defect.