

# MEASURED FREE 25-HYDROXYVITAMIN D IN HEALTHY CHILDREN AND RELATIONSHIP TO TOTAL 25-HYDROXYVITAMIN D , CALCULATED FREE 25-HYDROXYVITAMIN D AND VITAMIN D BINDING PROTEIN.



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## INTRODUCTION

- ❖ Vitamin D deficiency in children is still a global health problem.
- ❖ Measuring free 25-hydroxyvitamin D concentrations could provide a better estimate of the vitamin D status than total 25-hydroxyvitamin D (25(OH)D) levels.

## OBJECTIVES

- ❖ Measure the levels of free vitamin D (m-f25(OH)D) in a cohort of healthy children.
- ❖ To assess the relationship between measured and calculated free 25(OH)D (c-f25(OH)D), total 25(OH)D and other markers of phosphocalcic metabolism.
- ❖ Establish serum m-f25(OH)D concentrations corresponding to a total 25(OH)D > 20 ng/mL (vitamin D sufficiency status in children).

## MATERIAL AND METHODS

Prospective cohort study. (January and February 2017)

74 healthy children of a Mediterranean population

### Exclusion Criteria

25(OH)D < 12 ng/mL

Bone disease, chronic illness, any acute condition

→ 66 children

## DETERMINATIONS

ELISA → m-f25(OH)D and vitamin D binding protein (VDBP)

Bikle Formula → Free 25(OH)D was calculated

## RESULTS

2 groups according the sufficiency of 25(OH)D

DEMOGRAPHY	Total N=66	25(OH)D Sufficiency ≥20ng/mL N=44	25(OH)D Insufficiency <20ng/mL N=22	Significance P Value
Gender (male) N(%)	30 (45%)	21(45%)	9(40%)	N.S
Age (years)	8.9±4.15	8.2±4.2	10.6±3.7	0.027
SDS-BMI (Fisher exact test)	-0.056±0.97	-0.11±0.9	0.06±1.1	N.S
Pubertal stage (% prepubertal)	44(66%)	30(68%)	14(63%)	N.S
Race (% caucasian)	59(89%)	41(93%)	18(81%)	N.S

No significant differences in sex, race, BMI and pubertal stage between Vitamin D sufficient and insufficient groups.

The insufficient group showed significantly lower measured and calculated f(OH)D and higher PTH.

No significant differences in VDBP, Calcium, Phosphate and Alkaline phosphatase.

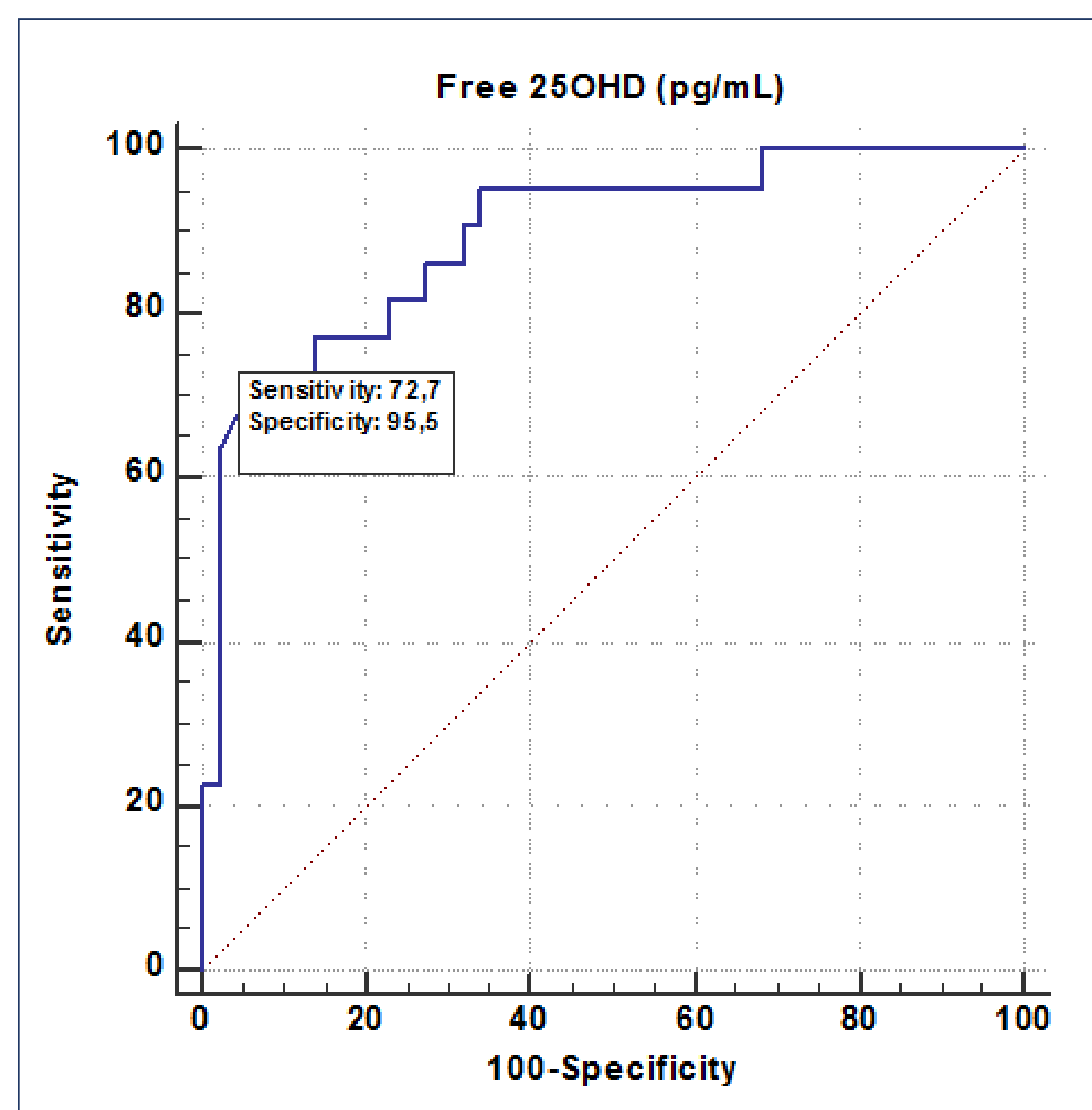
BIOCHEMICAL AND HORMONAL DETERMINATIONS	Total N=66	25OHD Sufficiency ≥20 ng/ml N=44	25OHD Insufficiency <20 ng/ml N=22	Significance P value
Total 25(OH)D (ng/mL)	22.65(17.4-26.47)	24.3(22.3-28.5)	16.1(13.9-17.7)	<0.001
Measured-f25(OH)D (pg/mL)	4.81(3.87-5.88)	5.47(4.63-6.25)	3.58(3.0-4.32)	<0.001
Calculated-f25(OH)D (pg/mL)	3.6(2.8-4)	4.0(3.6-4.4)	2.8(2-2.8)	<0.001
Free 25OHD (%) *	0.022± 0.004	0.023± 0.004	0.022±0.004	N.S.
VDBP (mg/L)	504(449.6-547)	503(443-547)	504(455-550)	N.S.
iPTH (pg/mL)	45.9± 16.8	41.9±16.5	53.9±14.8	0.005
Calcium (mg/dL)	9.87±0.35	9.87±0.357	9.85±0.37	N.S.
Phosphate (mg/dL)	4.87±0.52	4.88±0.52	4.8±0.52	N.S.
Alkaline phosphatase (U/L)	258(200-336)	235(192-305)	334(22-358)	N.S
*free25(OH)D/total24(OH)D				

Correlation coefficient p-value	Alkaline phosphatase (U/L)	Age (years)	25OHD Total (ng/mL)	PTH (pg/mL)	Calcium (mg/dL)	Calculated-f25(OH)D (pg/mL)
Measured-f25(OH)D (pg/mL)	-0.28 0.026	-0.289 0.018	0.804 <0.001	-0.374 0.002	0.26 0.035	0.553 0.016
Total 25OHD (ng/mL)	-0.281 0.026	-0.287 0.020	-	-0.331 0.005	0.122 N.S.	0.751 <0.001
Calculated-f25(OH)D	-	-0.379 0.004	0.751 <0.001	-0.171 N.S.	0.083 N.S.	-

Measured f25(OH)D is the only one that correlates with serum calcium. Measured free and total 25(OH)D directly correlates with c-f25(OH)D and inversely with iPTH, alkaline phosphatase and age. Calculated f25(OH)D only correlates with the parameters of the Bikle formula.

Multiple regression showed that m-f25(OH)D variations were independently explained by calcium (β:0.156, p:0.026) and total 25(OH)D (β:0.043, p<0.001).

The Roc Curve allowed to estimate the value of m-f25(OH)D corresponding to total 25(OH)D sufficiency (≥20ng/mL). The optimal cut-off was ≥3.9 pg/ml.



(Area Under Curve (AUC): 0.897 (95% confidence interval (CI): (0.798-0.958); p<0.001  
Sensitivity:72.7% (95%CI: 49.8-89.3)  
Specificity:95.4% (95%CI: 84.5-99.4)

## CONCLUSIONS

- ❖ Directly measured free vitamin D correlated better with markers of phosphocalcic metabolism than total 25(OH)D and c-f25(OH)D in a population of healthy children.
- ❖ In our group 3.9ng/mL is the level of free measured vitamin D which indicates sufficiency of total vitD.

Misra M, et al. Vitamin D deficiency in children and its management: review of current knowledge and recommendations. *Pediatrics*. 2008 ;122:398-417/Munns CF et al. Global Consensus Recommendations on Prevention and Management of Nutritional Rickets. *Horm Res Paediatr*. 2016;85:83-106/Powe CE et al. Vitamin D-binding protein and vitamin D status of black Americans and white Americans. *N Engl J Med*. 2013;369:1991-2000. Schwartz JB et al. A comparison of measured and calculated free 25(OH) vitamin D levels in clinical populations. *J Clin Endocrinol Metab*. 2014;99:1631-7.



Bone, growth plate and mineral metabolism

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Poster presented at:

