

Research Article**Concomitant Hypoparathyroidism Can Mask Vitamin D Deficiency****Nasir A. M. Al-Jurayyan^{1*}, Hanan I.O. Al Omran², Abdulaziz N. A. Al Jurayyan³, Sharifah D.A. Al Issa⁴, Amir MI Babiker⁵**¹Professor and Head, Endocrine Division, Department of Pediatrics, College of Medicine, King Saud University, Riyadh, Saudi Arabia²Resident in Pediatrics, Department of Pediatrics, College of Medicine, Salman Bin Abdulaziz University³Orthopedic Department, College of Medicine, King Saud University, Riyadh, Saudi Arabia⁴Senior Registrar in Endocrinology, King Khalid University, King Saud University, Riyadh, Saudi Arabia⁵Assistant Professor and Consultant Endocrinologist, College of Medicine, King Saud University, Riyadh, Saudi Arabia***Corresponding author**

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Abstract: Nutritional vitamin D deficiency is biochemically characterized by normal or decreased serum calcium, reduced inorganic phosphate, increased alkaline phosphatase activity, and decreased serum 25 hydroxy Vitamin D. As sequelae, the levels of parathyroid hormone increased leading to increase bone activity (resorption), which is reflected by a high alkaline phosphatase activity. In this communication, we report on four patients, with low vitamin D levels, who have variable degrees of parathyroid hormone deficiency leading to a blunted response of alkaline phosphatase activity. Although rare, hypoparathyroidism can be a cause of low to normal alkaline phosphatase activity in patients who have rickets or osteomalacia.**Keywords:** Alkaline phosphatase activity, Hypoparathyroidism, Rickets, Osteomalacia.

INTRODUCTION

Nutritional Vitamin D deficiency rickets or osteomalacia is a bone metabolic disorder characterized by normal or decreased serum calcium (Ca) reduced inorganic phosphate (P) concentrations, as well as elevated serum alkaline phosphatase (ALP) activity, secondary hyperparathyroidism and decreased serum 25-hydroxy vitamin D (25-OH-Vit D) levels. Hence, the characteristic bone resorption [1-2]. In Saudi Arabia, Vitamin D deficiency remains to be a public health problem, despite the abundant sunshine across the country all year through [3-6].

We report on four patients of nutritional rickets / osteomalacia who were associated with hypoparathyroidism, and in them, the alkaline phosphate activity failed to increase.

MATERIALS AND METHODS

In this communication, our four patients with rickets / osteomalacia and concomitant hypoparathyroidism were selected from a retrospective cohort of children and adolescents aged 3 month to 18 years, who were seen and evaluated for possible rickets and osteomalacia at King Khalid University Hospital (KKUH) Pediatric Endocrine Clinic, (January 1990 and December 2014). KKUH is the main teaching hospital

of King Saud University, Riyadh, Saudi Arabia. The diagnosis of rickets and osteomalacia was based on clinical, biochemical (Bone profile commercial kits, 25 (OH) Vitamin and 1,25 (OH)₂ Vitamin D, if indicated), and radiological features. Parathyroid hormone assay (Radio-Immunoassay) was performed in several patients, including those with normal or low alkaline phosphatase. Patients with the diagnosis of infantile hypophosphatasia and Pseudohypoparathyroidism were excluded [7, 8]. Vitamin D deficiency is defined arbitrarily in the study as 25 OH vitamin of less than 50 nmol/L, and hypoparathyroidism when the PTH is below normal or within normal range in view of hypocalcemia.

RESULTS

During the period under review, January 1990 and December 2014, 178 children and adolescents aged 3 month to 18 years, were evaluated for possible rickets or osteomalacia. Four patients were proven to have other clinical disorders, two had metaphyseal dysplasia and one of hypophosphatasia and pseudohypoparathyroidism, for each, therefore, excluded from the study.

Hundred and three (59.2%) were females and seventy-one (40.8%) were males. All were Saudis from

the central region of Saudi Arabia. There were various etiologies of rickets or osteomalacia. Table 1, with nutritional deficiency was the commonest. Table 2 shows the biochemical data in 174 patients with rickets or osteomalacia, all patients had normal serum magnesium (Mg) and low levels of 25 hydroxy Vitamin

D ranging from less than 10 nmol/L to 45 nmol/L (normal; >50). Four patients had variable degrees of hypoparathyroidism and poor response of alkaline phosphatase activity, Table 3. Currently, they are on treatment for hypoparathyroidism.

Table 1: Etiology of rickets or osteomalacia in 174 patients

Diagnosis	No. of patient	%
Nutritional rickets	149	85.6%
Anti-convulsant medication induced	10	5.7%
Celiac diseases	6	3.5%
Vit. D. dependent rickets type 2	6	3.5%
Chronic renal failure	3	1.7%
Total	174	100%

Table 2: Biochemical data in 174 patients with osteomalacia or rickets

Ca Normal 2.2 – 2.6 mmol/L Mean (range)	P 1.4 – 2.1 mmol/L Mean (range)	ALP <600 U/L Mean (range)	PTH 5-15 pg/ml Mean (range)
2.1 mmol/L 1.4 – 2.3	1.2 mmol/L 0.8 – 2.6	1480 U/L 300 - 2950	260.61 g/ml 2.5 – 460

Ca - Calcium, P – Phosphate, ALP - Alkaline phosphatase activity, PTH - Parathyroid hormone

Table 3: Demographic and biochemical data in 4 patients with hypoparathyroidism

Serial No.	Age	Bone profile			Serum Mg N (0.8-1.5) mmol	Serum PTH N (5.15 pg/ml)
		Ca N (2.2-2.6) mmol/L	P N (1.4 – 2.1) mmol/L	ALP N (<600) U/L		
1	6m	1.7	2.2	450	1.3	2.5
2	3m	1.8	2.2	650	1.5	5
3	6y	2.1	2	350	1.5	7.5
4	10y	2.1	1.9	300	1.2	4.5

DISCUSSION

Vitamin D deficiency is a well-documented and becoming increasingly recognized among the healthy, community dwelling subjects [1, 3-6, 9]. Biochemically, and as a result of hypocalcemia, an increase in the parathyroid hormone to maintain calcium hemostasis at the expense of further increase in bone turnover and subsequent significant bone loss [10]. Secondary hyperparathyroidism in early stages of rickets can mimic Pseudohypoparathyroidism and may confuse the picture [11-17]. However, not all patients with Vitamin D deficiency manifest the biochemical or bone histomorphometric effects of PTH excess, i.e. they may have blunted PTH response [18-21]. The mechanism underlying this is unclear, but may be related to magnesium (Mg) deficiency. This is not the case in our study, as all of our four patients, with Vitamin D deficiency and low PTH, have normal serum magnesium.

A presumptive diagnosis of hypoparathyroidism is based on hypocalcemia, normal phosphate level or hyperphosphatemia, and normal renal function, low to normal PTH, and the absence of an obvious attentive diagnosis [22]. The serum PTH

concentration must be interpreted in conjunction with serum calcium concentration while the patient still has hypocalcemia and normal magnesium. Therefore, blood sample for PTH and serum calcium should be taken at the same time.

Hypoparathyroidism is the result of decreased secretion or activity of the hormone leading to hypocalcemia. Most patients hypoparathyroidism are discovered accidentally when a low levels of calcium is found on routine chemistry panel ordered for some other reasons. Failure of PTH to increase in our four patients, with vitamin D deficiency and normal Mg concentrations indicates other mechanisms.

CONCLUSION

In conclusion, the co-existence of vitamin D deficiency and hypoparathyroidism may occur. This leads to poor response of alkaline phosphatase activity, and might delay the diagnosis. Paediatricians should be familiar with such finding, and should perform PTH concentrated in rachitic children or adolescent with normal alkaline phosphatase activity.

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