

# Vitamin D Deficiency Rickets Presenting as an Isolated Wrist Swelling in a Nigerian Infant: Case Report and Identification of Risk Factors

Ujuanbi Susan\*, Jaja Tamunopriye

Paediatric Endocrinology Unit, Department of Paediatrics, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria

## Email address

asokoedion@yahoo.com (U. Susan)

\*Corresponding author

## To cite this article

Ujuanbi Susan, JajaTamunopriye. Vitamin D Deficiency Rickets Presenting as an Isolated Wrist Swelling in a Nigerian Infant: Case Report and Identification of Risk Factors. *Medicine Journal*. Vol. 4, No. 2, 2017, pp. 6-9.

**Received:** April 28, 2017; **Accepted:** July 13, 2017; **Published:** December 20, 2017

## Abstract

Vitamin D deficiency rickets has multiple aetiologies in infants in the tropics and regions of abundant sunlight. The reduced intake of vitamin D from breastmilk in mothers with vitamin D deficiency and absence of Vitamin D supplementation are common causes. Reports have shown vitamin D deficiency to be a rare underlying cause of rickets in Nigerian children a region with abundant sunlight. Here is a rare presentation of progressive painless wrist swelling in an 11 months old infant with radiologic features and biochemical deficiency of Vitamin D in mother infant pair and marked reduction in sunlight exposure. Mother manifested features of possible osteomalacia in pregnancy, did not receive vitamin D supplements during pregnancy and after delivery, She also received little or no sunlight due to change in lifestyle as she stayed indoors with baby. This report therefore reveals risks factors for vitamin D deficiency in a region with abundant sunlight.

## Keywords

Vitamin D, Rickets, Risk Factors

## 1. Introduction

Rickets is the most common form of metabolic bone disease in children and a cause of considerable disability. [1] Although rickets is now considered rare in developed countries due to vitamin D supplementation in infants and children, [2, 3] it remains a problem in developing countries including those in sub-Saharan Africa. [4, 7] Worldwide, the commonest cause of rickets in children is vitamin D deficiency due to inadequate sunlight and poor nutritional intake. [2, 8] Vitamin D is critical for skeletal development and cellular function because of its effect on calcium homeostasis by promoting intestinal calcium absorption. Vitamin D deficiency causes impaired mineralization of growth plates which manifest as rickets in childhood with limb deformities, hypocalcaemic seizures, fractures, abnormal dentition and delayed developmental milestones. [9]

In many tropical countries of Africa and Asia where there is abundant sunlight as source of Vitamin D, calcium deficiency is reported to be more commonly due to inadequate dietary intake and vitamin D deficiency considered rare. Studies in the past on rickets in Nigerian children have shown that rickets is mainly due to calcium deficiency. [10-12] In a study by Thatcher et al on children with rickets done in Northern Nigeria, he found that children with rickets had a better response to treatment with calcium alone or with a combination with vitamin D than when treated with vitamin D alone showing calcium deficiency as the main underlying factor. [12] However, recently, in many tropical countries with high sunlight, vitamin D deficiency is being documented in large segment of the population especially in groups at risk of vitamin D deficiency such as pregnant women, women who are mandated to dressings or lifestyle that reduce adequate exposure to sunlight, breast fed infants and adolescents due to high growth rate and physiologic demand. [2, 9]

## 2. Aim

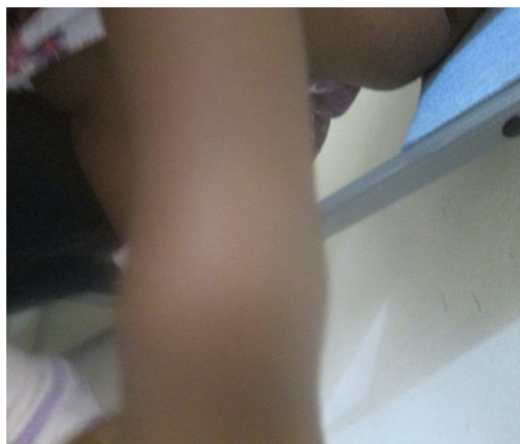
The aim of this report is to highlight nutritional vitamin D deficiency presenting as an isolated wrist swelling in a Nigerian child and to highlight risk factors for Vitamin D deficiency rickets and need for vitamin D supplementation in infants in tropical regions.

## 3. Case Report

L.E an 11months old female, who presented to the consultant paediatric clinic (CPC) of the University of Port Harcourt Teaching Hospital (UPTH) with complaints of painless swelling of both wrist of one month duration and fever of three days duration. She received only paracetamol before presentation. There was no history of swelling on other parts of the body and she was not a known sickler. Pregnancy period for the mother was complicated by severe waist pain which was relieved by taking of calcium tablets, there was no further evaluation and she did not receive vitamin D supplementation by drugs or diet. Baby was delivered at term and she cried well at birth with a birth weight of 3.1kg. She had neonatal jaundice noticed on the 3<sup>rd</sup> day of life that cleared about the 10<sup>th</sup> day of life. She was exclusively breastfed for 6 months after which, pap fortified with soya milk was added which was poorly tolerated. Her feeds were later changed to cereals at 8 months of life and breastfeeding was continued. Immunisation was adequate and motor milestones were within normal for age but she was yet to start walking. She was not on vitamin D supplementation. She was the 3<sup>rd</sup> of 3 children in a monogamous setting. Her mother was a 38 year old house wife with tertiary level of education while her father is 40 year old lawyer and their haemoglobin genotype was AA. Her mother lost her job three years ago during which time she had two pregnancies with index patient inclusive. She spent most times with baby and has since remained unemployed and spent most of her time indoors except on Sundays when she goes to church.

On examination at presentation, the child had isolated firm swelling of wrists (Figure 1) with widest circumferential diameter of the right wrist being 11.5cm and that of left wrist 12cm. No other bony abnormalities were present and the other systems were essentially normal. Her height and weight were also normal for her age and sex. A diagnosis of rickets possibly due to vitamin D deficiency was made. Investigation done for the child with results included; serum calcium-2.2mmol/l (normal), total protein-69g/l (normal), serum albumin-42g/l (normal), alkaline phosphatase-776iu/l (elevated), serum vitamin-D (25OH)-14.9ng/ml (deficiency range, optimal level should be >30ng/ml). [13] X-ray of both wrist showed cupping, splaying and thin metaphyseal heads of both radius and ulna (Figure 2). Her mother was also investigated and results showed normal serum calcium level but deficient vitamin D level (17.3ng/ml). Mother and child were given a single high dose of intramuscular vitamin D<sub>3</sub> and calcium tablets at appropriate doses. Further review of

the child after one month of treatment revealed remarkable clinical improvement with notable reduction in the wrist swellings. There was also significant improvement in the laboratory parameters with a markedly reduced alkaline phosphatase of 200iu/l. Repeat X-ray of the wrists (Figure 3) also showed evidence of healing and less florid signs of rickets. The child is still being followed up.



**Figure 1.** (Painless swelling of wrist).



**Figure 2.** (Initial X-ray of wrist showing features of rickets).



**Figure 3.** X-Ray 3 months after commencement of treatment showing evidence of healing.

## 4. Discussion

There is a growing report of high prevalence of vitamin D deficiency in regions of high sunlight. [19, 14] This report has particularly been expressed in women of child bearing age and in infants. The increased incidence in women and infants has also been attributed to several factors which include restricted sunlight exposure as was reported in our case. The mother assumed a lifestyle of staying indoors which went on for years during this period, she also had and nursed two babies of which the index case was the second.

Nutritional rickets in children is a common and crippling disease worldwide. [1] The increased prevalence is due to an increased bone growth causing increased requirement and utilization of Vitamin D, calcium and phosphate. In infants, the major source of vitamin D is from nutritional intake and exposure to sunlight. In most developing countries, the major nutrition for infants is breast milk. The vitamin D content of breast milk is however low and inadequate to supply vitamin D requirements, [12, 15] the low vitamin D content in breast milk is worsened in mothers who are vitamin D deficient putting the infants at an increased risk for development of vitamin D deficiency as was noted in this case. Although the breast milk content of vitamin D of the mother was not estimated, the history of inadequate exposure to sunlight, symptoms of osteomalacia in the mother with no report of Vitamin D supplementation during pregnancy and a report of confirmed low level of vitamin D in child and mother implies a possible low vitamin D level in the breast milk and a low intake of Vitamin D by the infants who had only breastmilk for the first six months of her life without supplementation.

Clinical presentation of rickets in children range from asymptomatic with just biochemical findings to varying degrees of bony abnormalities, delayed development, seizures and recurrent infections such as diarrhoea, respiratory distress and failure to thrive. [9] The skeletal changes caused by rickets usually are most pronounced at the knees, wrists, and anterior rib ends. In patients with advanced rickets, permanent skeletal deformities may occur with severe varus or valgus deformity. [9] Our patient presented with just an isolated wrist swelling which was painless and bilateral. That it occurred without other clinical features is considered unusual, as other signs which are often subtle (rachitic rosary, craniotables, enlarged anterior fontanelle, etc) were specifically and carefully looked for but not seen in this child. Biochemical evaluation however showed markedly low vitamin D level and X-ray of the wrist showed a classical feature of florid rickets with cupping and fraying. There was significant biochemical and radiologic response to treatment with vitamin D and calcium.

It is indisputable that breast milk is the ideal nutrition for infants, however, it only contains 15 - 50 IU/L of vitamin D which is inadequate for daily requirements of the infant. [16-18] Despite appropriate breastfeeding technique and the appropriate amount of breast milk our patient was at risk for vitamin D deficiency secondary to the lack of oral vitamin D supplementation and presence of vitamin D deficiency also in

her mother. A strategy to prevent vitamin D deficiency in infants is to maintain adequate Vitamin D level in mother during pregnancy and lactation and to give vitamin D supplementation in infants shortly after birth. In 2003, the American Academy of paediatrics recommended that all breastfed infants, unless weaned to at least 500ml per day of vitamin-D-fortified formula or milk, and all non-breastfed infants who are ingesting less than 500ml per day of vitamin-D-fortified formula or milk should be supplemented with 200IU of vitamin D per day. [19] This was however, recently reviewed with newer recommendation of 400IU per day. [17] This was based on the observation that human milk typically contains inadequate amounts of vitamin D to meet the needs of a growing infants and there was a rising prevalence of Vitamin D deficiency rickets in children. This policy has also been adopted by other western countries. In Nigeria and most tropical countries, risk factors the high fertility rate with reduced child spacing leading to high demand for Vitamin D and other nutrients in women of child bearing age. Also inspite of abundant sunshine, reports have shown increasing prevalence of vitamin D deficiency due to adoption of lifestyle which restricts inadequate exposure to sunlight in both adults and children and lack of policy on vitamin D supplementation in both children and adults.

## 5. Conclusion

Vitamin D deficiency in children is increasing in tropical countries due to lifestyle adjustments which have put both mothers and their babies at risk of rickets and osteomalacia. There is therefore need to recommend the policy of vitamin D supplementation in babies at risk and mothers to prevent the crippling effects of vitamin D deficiency.

## Conflict of Interest

The authors declare that they have no competing interest.

## References

- [1] Dimitri P, Bishop N. Rickets. *Paediatr Child Health* 2007; 17(7): 279-87.
- [2] Dawodu A, Wagner CL. Mother-child vitamin D deficiency: an international perspective. *Arch Dis Child* 2007; 92(9): 737-40.
- [3] Chehade H, Girardin E, Rosato L, Cachat F, Cotting J, Perez MH. Acute life threatening presentation of vitamin D deficiency ricket *J Clin Endocrinol Metab* 2011; 96 (9): 2681-3.
- [4] Marwaha RK, Tandon N, Devi Reddy HK, Aggarwal R, Singh R, Sawhney RC et al. Vitamin D and bone mineral density status healthy schoolchildren in northern India. *Am J Clin Nutr* 2005; 82(2):477-82.
- [5] Fraser DR. Vitamin D-deficiency in Asia. *J Steroid Biochem Mol Biol* 2004; 89-90 (1-5): 491-5.
- [6] Hag AI, Karrar ZA. Nutritional vitamin D deficiency rickets in Sudanese children. *Ann Trop Paediatr* 1995; 15:69-76.

- [7] Oginni LM, Worsfold M, Oyelami OA, Sharp CA, Powell DE, Davie MW. Etiology of rickets in Nigerian children. *J Pediatr* 1996;128:692-4.
- [8] Holick MF: Resurrection of vitamin D deficiency and rickets. *J Clin Invest* 2006; 116(8): 2062-72.
- [9] Akpede GO, Ekanem EE, Thatcher TD. Nutritional and non-nutritional rickets in the tropics and subtropics In: Azubuike JC, Nkanginieme KEO. Paediatrics and child health in a tropical region 2<sup>nd</sup> ed. Owerri: African Educational Services; 2007: 684-96.
- [10] Thatcher T, Glew RH, Isichei C, Lawson JO, Scariano JK, Hollis BW et al. Rickets in Nigerian children: response to calcium supplementation. *J Trop Pediatr* 1999; 45(4): 202-7.
- [11] Okonofua F, Gill DS, Alabi ZO, Thomas M, Bell JL, Dandona P. Rickets in Nigerian children: a consequence of calcium malnutrition. *Metabolism* 1991; 40: 209-13.
- [12] Thatcher TD, Fischer PR, Pettifor JM, Lawson JL, Isichei CO, James C et al. A comparison of calcium, vitamin D, or both for nutritional rickets in Nigerian children. *New Engl J Med* 1999; 341(8): 563-8.
- [13] Holick MF. Vitamin D status: measurement, interpretation and clinical application. *Ann Epidemiol* 2009; 19(2): 73-78.
- [14] Hameed A, Ahmad S, Rehman S, Urakzai AA, Gandapur AJ. A study of nutritional rickets-morbidity and aetiology of low profile disorder. *J Postgrad Med Inst* 1998; 12(2): 14-21.
- [15] Hollis BW, Wagner CL: Assessment of dietary vitamin D requirements during pregnancy and lactation. *Am J Clin Nutr* 2004; 79(5):717-726.
- [16] Dimitri P, Bishop N, Rickets: New insights into a re-emerging problem. *Curr Op in Ortho* 2007, 18:486-493.
- [17] Misra M, Pacaud D, Petryk A, Collett-Solberg PF, Kappy M. Vitamin D deficiency and its management: review of current knowledge and recommendations. *Pediatrics* 2008, 122: 398-417.
- [18] Ward LM, Gaboury I, Ladhni M, Zlotkin S. Vitamin D deficiency rickets among children in Canada. *CMAJ* 2007, 177:161-6.
- [19] Gartner LM, Morton J, Lawrence RA, Naylor AJ, O'Hare D, Schanler RJ et al. Breastfeeding and use of human milk. *Paediatrics* 2005; 115(2): 496-506.