

Rickets in Children Below 2 Years

Abdul-Kareem Mohammed Ali*, Haider Nadhim Abd**,
Safa abd Alilah Faraj***

ABSTRACT:

BACKGROUND:

Although breast-feeding is highly appraised and widely practiced in Iraq, human milk supplies all necessary nutrients except a few including vitamin D. Despite abundance of sunshine, vitamin D deficiency rickets is not rare in Iraq.

OBJECTIVE:

We carried out this study with an objective to determine presence, presentation and predisposing factors of rickets in pediatric patients attending Al-Kadymia Teaching Hospital-Baghdad.

METHODS:

This study was conducted in Department of pediatrics, AL-Kahdymia Teaching Hospital over one year period from first of October 2008 to first of October 2009. Children from newborns to twenty fourth months of age presenting with signs and symptoms of rickets were included and information regarding signs, symptoms predisposing factors (crowded housing, isolated housing with deficient sun exposure, abundant sun but lack of awareness, malnutrition and antenatal factors) and investigations was recorded on a proforma. Diagnosis was based on clinical signs, radiological changes on x-ray of wrist joint and biochemical disturbances in serum levels of alkaline phosphatase, calcium and inorganic phosphorus.

RESULTS:

Sixty children with rickets reported during the study period. Overall, 40 infants (66.6%) were exclusively on breast feeding. The main clinical presentation was in the form of recurrent lower respiratory tract infection 30 infants (50%), recurrent diarrhea & delayed milestones 20 (33.3%) and seizure 6 patients (10%). Skeletal changes on clinical examination were present in 30 (50%). Radiological signs of rickets were present in 50 (83.3%). Symptoms and signs reverted to normal in all cases after vitamin D supplementation.

CONCLUSION:

Nutritional rickets is still prevalent in Iraq, presenting with variable signs and symptoms, predisposing the childhood population to different illnesses and skeletal deformities. In the presence of abundant sunshine, lack of awareness of exposure to sun, may be the important predisposing factors for development of nutritional rickets.

KEY WORDS: rickets, vitamin D deficiency, breast-fed.

INTRODUCTION:

Nutritional rickets is a disorder of growing children due to defective mineralization of newly formed bone matrix because of vitamin D deficiency. An English Physician Dr. Daniel Whistler first describe rickets in 1645⁽¹⁾ In 1861, Trousseau of France linked rickets with lack of sun exposure and faulty diet⁽²⁾ At the start of 20th century, McCollum discovered vitamin D by the technique of biological analysis of the food.³ The main source of

vitamin D is cutaneous synthesis when 7-dehydrocholesterol in the skin is converted to cholecalciferol (vitamin-D3) by the sun ultraviolet B radiations. A number of factors can impair cutaneous synthesis of vitamin D including decreased sun exposure⁽³⁾ increased skin pigmentation^(3,4) and atmospheric pollution⁽⁵⁾. Small amount of vitamin D is also derived from the diet⁽⁶⁾. High intake of the fibers and phytate also decrease intestinal absorption of vitamin D and calcium⁽⁷⁾. Rickets may be subclinical⁽⁸⁾ or present with the clinical signs and symptoms, for example, bowed legs, rachitic rosary, frontal bossing of the skull, widened wrist and ankle joints, poor growth, delayed motor development⁽⁹⁾, recurrent lower

*Dept. of Pediatric / College of Medicine /
University of AL-Nahrain.

**Dept. of Pediatric / Collage of Medicine /
University of Almustansiyah.

***Children Welfare Teaching Hospital.

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respiratory infections, chronic diarrhea and fits⁽¹⁰⁾. Radiological findings in rickets include metaphyseal flaring, irregularity and widening of epiphysis.⁽¹¹⁾

MATERIAL AND METHODS:

The study was carried out in the Department of Pediatrics, AL-Kadhymia Teaching Hospital over a one year period from 1st of October 2008 to 1st of October 2009. All infants and children (indoor and outdoor) presenting with signs and symptoms suggestive of rickets were enrolled in study and information was recorded on a proforma prepared for this purpose. Detailed history from the mother was taken regarding sun exposure, weaning, housing, developmental history, and repeated illnesses in the form of respiratory infections and diarrhea. History about vitamin D prophylaxis was also taken. Children with hepatic and renal diseases or on anticonvulsant medicines were excluded from the study. Radiographs of the wrist, serum alkaline phosphatase, serum calcium, and serum inorganic phosphorus were the initial investigations at the time of enrollment. Other investigations include full blood count, liver function test, and renal function test.

RESULTS:

During the study period, 60 children with rickets were included which include 40 (66.6%) male

and 20 (33.3%) females. Numbers of cases under twelve months of age were 50 (83.3%) while the distribution of the rest is shown in Table 1. Overall, 40 infants (66.6%) were exclusively on breast feeding (30 male, 10 females) with no supplementation. All patients had no significant history of direct sun exposure, as shown in Table 2. The most frequent clinical presentation was recurrent lower respiratory tract infection reported in 30 infants (50%), followed by recurrent diarrhea & delayed milestones in 20 infants (33.3%), hypocalcaemic seizure in 6 patients (10%), hypotonia in 4 infants (6.6%), as shown in Table 3.

The most frequent clinical signs of rickets in this study were wide wrist 20 (33.3%), wide anterior fontanel 20 (33.3%), rachitic rosary 10 (16.6%), craniotables 4 (6.6%), bow legs 4 (6.6%) and frontal bossing 2 (3.3%) as shown in Table 4.

In 50 (83.3%) children, radiological evidence of rickets (metaphyseal splaying / fraying, cupping at the lower ends of radius and ulna, and decreased bone density) was present. X-ray wrist showed delayed bone age in 4 (6.6%) cases, absent ossification centers in 6 (10) infants more than six months old as shown in Table 5.

Table 1: Age & sex distribution among the infants with nutritional rickets.

Age in months	Sex		No.	Percentage%
	Male	Female		
0 - 6	34	6	40	66.6
6 - 12	2	8	10	16.6
12- 18	4	6	10	16.6
18 - 24	-	-		
Total	40	20	60	100

No.: number

Table 2: Type of feeding among the infants with nutritional rickets.

Type of feeding	No. Male	No. female	Total No.	Percentage %
Breast	30	10	40	66.6
Bottle	10	10	20	33.3

No.: number

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Table 3: Clinical presentation among the infants with nutritional rickets.

Symptoms	Male	Female	Total No.	Percentage%
Recurrent lower respiratory tract infection	22	8	30	50
Recurrent diarrhea	8	12	20	33.3
Delayed milestone	10	10	20	33.3
Seizure	4	2	6	10
Hypotonia	2	2	4	6.6

No.: number

Table 4: Clinical sign of rickets among the infants with nutritional rickets.

Clinical sign	Male	Female	Total No.	Percentage%
Wide wrist	10	10	20	33.3
Wide anterior fontanel	14	6	20	33.3
Rachitic rosary	6	4	10	16.6
Frontal bossing	-	2	2	3.3
Craniotapes	2	2	4	6.6
Bow legs	2	2	4	6.6

No.: number

Table 5: Radiological findings on x-ray wrist.

Radiological signs	No.	%
Cupping	20	33.3
Metaphyseal splaying / fraying	30	50
Delayed bone age	4	6.6
Absent ossification centers	6	10

No. : number, %: percentage

DISCUSSION:

In spite of the large amount of sunlights, rickets remains to be a common disease in children in Iraq, and nutritional rickets is still prevalent. With the primary etiology being vitamin D deficiency, all of our patients were below the age of 2 years. Male infants outnumbered the females 3 : 1. There is no apparent explanation for this finding but this has been also observed in several reports. ^(12,13,14,15), but may be due to small sample size.

The prolongation of exclusive breast-feeding until the age of one year without vitamin D supplement is an important factor leading to the development of rickets in the rapid growth period of infancy; in addition, none of our infants were exposed to direct sunlight. None of the lactating mothers received any form of vitamin D supplementation during their lactation. Recurrent lower respiratory

tract infection was the most common clinical presentation of patients surveyed for nutritional rickets in our patients 30 cases (50%), while in other study hypocalcaemic seizures were the most common clinical presentation¹⁶. The chest infection could be due to the fact that phygoctosis is impaired in this condition¹⁷.

High frequency of pneumonia has been reported in multiple national and international articles. ^{10,18,19}. In fact T and B lymphocytes have receptors for 1,25(OH)₂ D. Vitamin D deficiency may predispose to different bacterial infections including pneumonia²⁰. 1,25(OH)₂ D₃ plays important role in immune modulation²¹. Yener et al have reported more episodes of bacterial infections in children with vitamin D deficiency as compared to healthy children²¹.

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The second most common clinical presentation was frequent diarrhea seen in 20 infants (33.3%). Among the 40 (66.6%) exclusively breast-fed infants, 4 (10%) infants presented with frequent diarrhea compared to 16 of 20 (80%) formula-fed infants, indicating the value of breast milk in reducing the incidence of infectious diarrhea²². Diarrhea is common in developing countries like Iraq due to poor hygiene, non-availability of clean water for all and malnutrition. In present study, symptoms improved with vitamin D supplementation. Hameed et al¹⁰, Jamal et al⁵ and Khattak et al¹⁷ had also reported association of rickets with recurrent or chronic diarrhea. Non-febrile fits were present in 6 (10%) cases. In present study, all children presenting with fits were less than 24 months. Hypocalcaemia is more common in initial stages of nutritional rickets, especially during rapid growth period⁹. Hameed et al have reported 10% of children with non-febrile fits suffering from nutritional rickets¹⁰.

In different studies, multistory buildings, heavy atmospheric pollution of metropolis obstructing sunrays have been mentioned as a risk factor for vitamin D deficiency rickets^{5,10}. Dark skin complexions may be the predisposing factor in present study (80% children had dark complexions). Most cases of nutritional rickets in United Kingdom have been reported in children of Black or Asian origin²³. Children with dark skin are as much capable of synthesizing vitamin D, but to do so required greater exposure to the ultraviolet rays²⁴. In 6 (20%) children, skin complexions were fair. Heavy clothing obstructing the ultraviolet rays is also a risk factor¹⁰.

In this study, 40 (66.6%) infants were below 6 months of age, while 10 (16.6%) children were below 12 months. Poor maternal vitamin D status during pregnancy, in addition to other factors, may be important risk factor in these babies²⁵. Thick dark veil and habit of indoor staying contributes to vitamin D deficiency in pregnant and lactating mothers¹⁰.

The clinical signs of the rickets (widened wrist, rickety rosary of costochondral junctions, and bowing of the legs) were present in 34 (56.6%) children, while Hameed et al have reported these clinical signs in (70%) of children with nutritional rickets¹⁰.

In present study, 50 (83.3%) children had radiological findings of rickets, while these findings were detected in 73.84%, 38.09%, 23, and 100% in different studies^(10,12,14).

In 4 (6.6%) children, bone age was delayed, while no ossification center was present in wrist joint x-ray in 6 (10%) children (age more than six months). Glerup et al have reported delayed bone age in (11.76%) of the children with nutritional rickets²⁶.

CONCLUSION:

Nutritional rickets is still prevalent in Iraq with the primary etiology in our cases being vitamin D deficiency.

Recommendations:

It is recommended that every infant who is exclusively breast-fed has a routine supplement of vitamin D in the range of 400 IU/day (alone or as apart of multivitamin), started usually after 4 months of age. This dose is very safe, yet sufficient to prevent rickets. We hope that our recommendation will be supported by formal policy with sunshine exposure for infants and young children encouraged.

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