DOI: https://doi.org/10.53350/pjmhs22163182

ORIGINAL ARTICLE

Frequency of Rickets in Children with Lower Respiratory Tract Infections Under Five Years of Age

ARSHAD KARIM[1], ZAHID ULLAH[2], NASIR AYAZ[3]
[1]*Consultant Pediatrician, DHQ Hospital Charsadda*
[2]*District Children Specialist, Women and Children Hospital Karak*
[3]*Senior Registrar Muhammad Teaching Hospital, Peshawar*
Correspondence to Dr. Arshad Karim

ABSTRACT

Background: Rickets is a disease of growing bones which is secondary to the defect in mineralization at growth plate matrix. Vitamin D deficiency remains the most common cause of rickets globally. Vitamin D is usually obtained from exposure to sunlight and from diet like fish liver oil and egg yolk. Solar ultra violet B radiations penetrate the skin and initiate the process of vitamin D formation.
Aim: To determine the frequency of nutritional rickets in children with lower respiratory tract infections under five years of age.
Methods: It was a cross sectional study conducted in Pediatric Department, Lady Reading Hospital, Peshawar. In this study a total of 151 patients were observed. Children were assessed by researcher by detailed history from the parents followed by detailed clinical examination for the confirmation of lower respiratory tract infections. Blood sample was taken for the children and were send to hospital laboratory for investigation of serum calcium, phosphorus and alkaline phosphatase level. All the laboratory investigations were done by single expert pathologist having minimum of five years of experience and all the radiological findings must be reported by single expert radiologist having minimum of five years of experience.
Results: In this study 62% children were in age ranged 1-3 years and 38% children were in age range 4-5 years. Mean age was 2 years with SD ± 2.16. Fifty eight percent children were male and 42% children were females. More over 65% children had low serum calcium level < 2.12 mmol, 58% children had low serum phosphorus level < 0.87 mmol and 60% children had serum alkaline phosphatase > 280 units per liter on the bases of which the frequency of nutritional rickets among 151 children was 60% in our study.
Conclusion: Our study concludes that the frequency of nutritional rickets was 60% in children with lower respiratory tract infections under five years of age.
Keywords: nutritional rickets, children, lower respiratory tract infections.

INTRODUCTION

Rickets is a bone disease caused by a defect in mineralization at the growth plate matrix. Riketts are most commonly caused by vitamin D deficiency[1]. Fish liver oil and egg yolk are good sources of vitamin D. UVB solar radiations penetrate the skin and start the vitamin D production process[2]. Vitamin D aids in intestinal calcium absorption. In the presence of vitamin D, intestinal calcium absorption can reach 80%. In addition to the above symptoms, rickets can cause leg deformities such as bowing legs, kyphosis, and narrowed pelvis[2].

Vitamin D deficiency rickets has been linked to lower respiratory tract infections. The diaphragm pulls the softened ribs during inspiration, causing Harrison grove. Insufficiency of oxygen causes atelectasis and pneumonia. Vitamin D deficiency causes nutritional rickets and is linked to an increased incidence of lower respiratory tract infections. Immune system function of vitamin D [3].

Pneumonia and bronchiolitis are the main causes of illness and mortality in children under five. According to recent estimates, pneumonia causes 20% of mortality in the over-65 age group, or 3 million deaths each year. According to research, pneumonia accounts for 20-30% of paediatric hospital hospitalizations. Acute malnutrition, absence of breast feeding, and rickets are connected with higher mortality. Nutritional rickets were found in 74% of children with severe pneumonia. Clinical vitamin D insufficiency was linked to a 13-fold increased risk of pneumonia[4].

The aim of this study is to find out the frequency of rickets in patients presenting with pneumonia in our set up. Pneumonia being one of the major killers among children is important to be studied in synergy with rickets as the combination is understandably fraught with more sinisterus outcomes. The results will add to the existing body of knowledge and would be useful for practitioners as well as planners and policy makers of health to devise meaningful interventions both at clinical and community levels[5].

Received on 14-09-2021
Accepted on 17-02-2022

MATERIALS AND METHODS

Permission from hospital ethical committee was taken before start of study. All new cases with lower respiratory tract infections (as per operational definitions above) were enrolled in study. Informed written consent was taken from parents. Children were assessed by researcher by detailed history from the parents followed by detailed clinical examination for the confirmation of lower respiratory tract infections. Blood sample was taken for the children and were send to hospital laboratory for investigation of serum calcium, phosphorus and alkaline phosphatase level. All the laboratory investigations were done by single expert pathologist having minimum of five years of experience and all the radiological findings must be reported by single expert radiologist having minimum of five years of experience. Diagnosis of Nutritional rickets was done on the bases of all the factors mentioned in the operational definition.

All the above mentioned information including name, age, gender and address were recorded in a pre designed proforma. Strictly exclusion criteria had followed to control confounders and bias in the study results. Data was analyzed using SPSS version 10. Quantitative variables like age, weight, duration of sun exposure and laboratory findings like (serum calcium, serum phosphorus and serum alkaline phosphatase) was described in terms of means±standard deviation. Categorical data like gender, radiological findings like (open fontanelle, frontal bossing, splaying, rachitic rosary, bow legs) and nutritional rickets was described in terms of frequency and percentages. Nutritional rickets was stratified among age, weight, gender, duration of sun exposure to see the effect modifications. Post stratification chi square test was applied in which P value ≤0.05 was considered as significant value. All results were presented as tables and diagrams.

RESULTS

In this study age distribution among 151 children was analyzed as 94(62%) children were in age ranged 1-3 years while 57(38%) children were in age range 4-5 years. Mean age was 2 years with SD±2.16. Gender distribution among 151 children was analyzed as

88(58%) children were male while 63(42%) children were females. Weight distribution among 151 children was analyzed as 68(45%) children had weight ≤12Kg while 83(55%) children had weight >12Kg. Mean weight was 12Kg with SD±5.713. Duration of sun exposure among 151 children was analyzed as 62(41%) children had duration of sun exposure ≤30 minutes while 89(59%) children had duration of sun exposure >30 minutes. Mean duration of sun exposure 25 minutes with SD± 8.21. Radiological findings among 151 children was analyzed as 59(39%) children had open fontanelle, 91(60%) children had frontal Bossing, 110(73%) children had splaying, 118(78%) children had rachitic rosary, 113(75%) children had bow legs.

Observation of 151 children was analyzed as 53(35%) children had normal serum calcium > 2.12 mmol while 98(65%) children had low serum calcium level < 2.12 mmol. Sixty three (42%) children had normal serum Phosphorus > 0.87 mmol while 88(58%) children had low serum phosphorus level < 0.87mmol, Sixty (40%) children had normal serum alkaline phosphatase <280 units per liter while 91(60%) children had serum alkaline phosphatase >280 units per liter. Frequency of nutritional rickets among 151 children was analyzed as 91(60%) children had rickets while 60(40%) children didn't had rickets. Stratification of nutritional rickets with respect to age, gender, weight and duration of sun exposure.

Table 1:

Observation		Frequency	%age	Mean SD
Serum Calcium	**Normal**	53	35%	1 mmol± 1.731
	< 2.12 mmol	98	65%	
Total		151	100%	
Serum Phosphorus	**Normal**	63	42%	0.76mmol ±1.12
	< 0.87 mmol	88	58%	
Total		151	100%	
Serum Alkaline Phosphatase	280 Units/ liter	60	40%	294 units per L±8.374
	>280 Units/ liter	91	60%	

Table 2: Stratification of nutritional rickets w.r.t age distribution (n=151)

Nutritional rickets	1-3 years	4-5 years	Total
Yes	56	35	91
No	38	22	60
Total	94	57	151

Chi square test was applied in which P value was 0.8238

Table 3: Stratification of nutritional rickets w.r.t gender (n=151)

Nutritional rickets	Male	Female	Total
Yes	53	38	91
No	35	25	60
Total	88	63	151

Chi square test was applied in which P value was 0.9910

Table 4. Stratification of nutritional rickets w.r.t weight (n=151)

Nutritional rickets	≤12 Kg	>12 Kg	Total
Yes	41	50	91
No	27	33	60
Total	68	83	151

Chi square test was applied in which P value was 0.9947

Table 5: stratification of nutritional rickets w.r.t duration of sun exposure (n=151)

Nutritional rickets	≤30 minutes	>30 minutes	Total
Yes	37	54	91
No	25	35	60
Total	62	89	151

Chi square test was applied in which P value was 0.9020

DISCUSSIONS

Our study shows that 62% children were in age ranged 1-3 years and 38% children were in age range 4-5 years. Mean age was 2 years with SD±2.16. Fifty eight percent children were male and 42% children were females. More over 65% children had low serum calcium level < 2.12 mmol, 58% children had low serum phosphorus level <0.87 mmol and 60% children had serum alkaline phosphatase >280 units per liter on the bases of which the frequency of nutritional rickets among 151 children was 60% in our study. Similar findings were observed in other studies.

In a study conducted in slum areas of Karachi 99% of the children with nutritional rickets were malnourished[6]. In another study 24(40%) children were underweight according to Gomez classification of malnutrition. Malnutrition has been reported in literature as a contributing factor for nutritional rickets[7].

In one study 14(23.33%) children were below 6 months of age while 38(68.33%) children were below 13 months. Poor maternal vitamin D status during pregnancy, in addition to other factors, may be important risk factor in these babies[8]. Thick dark veils and habit of indoor staying contributes to vitamin D deficiency in pregnant and lactating mothers[9].

In a study carried out by Siddiqui et al[10] there was high male predominance with male to female ratio of 3.71:1(78% vs 21%). In another study from Turkey male to female ratio was 2.9:1.15 Same results were reported in a study from Peshawar by Khattak et al[11] with male to female ratio of 1.77:1.9 While in a very large study from Denmark, Beck-Nielson et al observed no difference in gender distribution[12].

In Karachi city there is an increased trend of living in multistoried apartments where there is no or minimal sunlight exposure. Other possible reasons could be living indoors due to hot climate and wearing fully covered clothes with most of the women covering their head and few their faces as well[13]. There is also a trend of keeping children inside fully wrapped in covers. Darker skin pigmentation and air pollution are other contributing factors to reduced sunlight exposure in our set up despite ample sunlight. There was an increased incidence of rickets in patients admitted with severe pneumonia i-e 74% (101/137) in this study[14]. A similar study from Jordan has shown 85% patients having rickets presented with respiratory tract infections.[15] While in other studies chest infections were the second most common presentation.

CONCLUSION

Our study concludes that the frequency of nutritional rickets was 60% in children with lower respiratory tract infections under five years of age.

Conflict of interest: Nil

REFERENCES

1. Greenbaum LA. Rickets and hypervitamonosis D. In: Kliegman RM, Stanton BF, Schor NF, St.Geme III JW, Behman RE, editors. Nelson text book of pediatrics,19th Ed. Philadelphia: Saunders Elsevier, 2011:200-9.
2. Hollick MF. Vitamin D deficiency. N Eng J Med 2007;357:266 -81.
3. Özkan B. Nutritional rickets. J Clin Res Pediatr 2010;2:137- 43.
4. Roth DE, Caulfield LE, Ezzati M, Black RE. Acute lower respiratory tract infections in childhood: opportunities for reducing the global burden through nutritional interventions. Bull World Health Org 2008;86:321-416.
5. Mansbach JM, Camargo CA jr. Bronchiolitis: lingering questions about its definition and the potential role of vitamin D. Pediatrics 2008;122:177-9.
6. Hameed A, Ahmad S, Rehman S, Urakzai AA, Gandapoor AJ.A study of rickets-Morbidity and aetiology of a Low Profile Disorder. J Post Med Inst 1998;12(2):14-21
7. Salimpur R. Rickets in Tehran. Study of 200 cases. Arch Dis Child 1975; 500:63-6
8. Serenius F, Elidrissy AT, Dandona P. VitaminD nutrition in pregnant women at term and in new born babies in Saudi Arabia. J Clin Pathol 1984;37(4): 444-7.
9. Siddiqui TS, Rai MI. Presentation and predisposing factors of nutritional rickets in children of Hazara division. J Ayub Med Coll Abbotabad 2005; 17: 29-32.
10. Khattak AA, Rehman G, Shah FU, Khan MK. Study of Rickets in admitted patients at Lady Reading Hospital, Peshawar. J Postgrad Med Inst. 2004; 18: 52-8.
11. Ladhani S, Srinivasan L, Buchanan C, Allgrove J. Presentation of vitamin D deficiency. Archives of disease in childhood 2004; 89:781-84
12. Dawodu A, Wagner CL. Vitamin D Mother-child vitamin D deficiency: an international perspective. Arch Dis Child 2007; 92: 737-40.
13. Ozkan B, Doneray H, Karacan M, Vancelik S, Yildirim ZK, Ozkan A, et al. Prevalance of vitamin D deficiency rickets in the eastern part of Turkey. Eur J Pediatr 2009; 168: 95-100.
14. Beck-Nielsen SS, Jensen TK, Gram J, Brixen K, Brock-Jacobsen B.Nutritional rickets in Denmark: a retrospective review of children's medical records from 1985 to 2005. Eur J Pediatr 2009; 168: 941-9.
    Weiseberg P, Scanlon KS, Li R, Cogswell ME. Nutritional rickets among children in United States: review of cases reported between 1986 and 2003. Am J Clin Nutr 2004; 80: S1697-1705.