

Relationship between Nutritional Rickets and Anaemia in Children of Faisalabad

JAWAD NAWAZ¹, MUHAMMAD USMAN CHOUDHARY², WAJEEHA KHALID³, SADAF SHAM⁴

ABSTRACT

Aim: To compare the frequency of anemia in children having nutritional rickets with healthy children.

Methods: This case control study carried out in Allied hospital for the duration of 6 months from 1st July 2016 to 31st December 2016. 80 children (40 in each group) presenting in the Pediatric outdoor of Allied Hospital, Faisalabad who meet the inclusion criteria were enrolled into this study. Detailed history of each patient of cases with nutritional rickets and from control who are healthy children. 3ml of blood was sent to the hospital pathology laboratory for assessment of anemia and nutritional rickets. X-ray wrist to radiology department of Allied Hospital, Faisalabad for nutritional rickets as per operational definition.

Results: The mean age was calculated as 7.3±2.73 years in cases and 7.38±2.60 years in controls, 21(52.5%) in cases and 13(32.5%) in controls were male while 19(47.5%) in cases and 27(67.5%) in controls were females, mean Hb level in cases was calculated as 94±1.53 while 11.08±1.89 in controls, p value was calculated as 0.0001 showing a significant difference. Comparison of anemia in children having nutritional rickets with healthy children was done, it shows that 33(82.5%) in cases and 15(37.5%) in controls were anemic whereas 7(17.5%) in cases and 25(62.5%) in controls had no anemia, p value was calculated as 0.000, O.R was 7.85.

Conclusion: Frequency of anemia in children having nutritional rickets is significantly higher when compared with healthy children. However, early screening and management of anemia in nutritional rickets is recommended.

Keywords: Nutritional Rickets, Anemia, Associations, Children

INTRODUCTION

Anaemia is defined as decrease in haemoglobin concentration or red blood cell volume below reference values occurring in healthy persons. Clinical presentation of anaemia are pallor, sleepiness, irritability and decrease exercise tolerance. Clinical findings usually become apparent when haemoglobin level falls below 7-8g/dl¹.

Nutritional rickets is a metabolic disease involving bones prior to closure of growth plates characterized by deficiency of calcium and phosphorus secondary to vitamin D deficiency. It is a manifestation of generalized nutritional deficiency and is associated with decrease mineralization of bone leading to deformation of epiphyseal plate and disturbed growth. It is an acquired disorder of skeletal growth and prompt recognition and treatment can avoid grave circumstances of shunted and abnormal skeletal growth².

Vitamin D deficiency contributes to a number of health problems including but not limited to osteomalacia (adults), rickets (children), pneumonia and cardiovascular disease^{3,4,5}.

Frequency of anaemia was observed to be significantly higher in children diagnosed of nutritional rickets (71.4% vs 41.9%; p<0.01) as compared to controls. In the light of this observation, children with nutritional rickets should also be screened and treated for anaemia when present.⁶

PATIENTS AND METHODS

We designed it as a case control study in Department of Paediatric Medicine, Allied Hospital, Faisalabad from 1st July 2016 to 31st December 2016. By using WHO sample

^{1,2,3}Medical Outdoor, Children's Hospital, Jhang Road Faisalabad,

⁴Paediatric Department, Allied Hospital Faisalabad

Correspondence to Dr. Jawad Nawaz

Email: mianjnawaz@gmail.com

size calculator for 2 proportion and setting power of study to 80%, sample size was calculated to be Sample size 80 (40 in each group). Inclusion criteria were children with both genders, aged between 2-12 years, with cases having nutritional rickets and controls were healthy children. Exclusion criteria were children who have received Phenytoin treatment for ≥4 weeks in the preceding 6 months period. Or children with disturbed hepatic (serum ALT ≥40U/L, AST ≥75U/L, total bilirubin ≥1.2 mg/dl) or renal (blood urea ≥40 mg/dl, creatinine ≥1.2mg/dl) function. Eighty children (40 in each group) presenting in the Paediatric outdoor of Allied Hospital, Faisalabad who meet the inclusion criteria were enrolled into this study. Detailed history of each patient of cases with nutritional rickets and from control who are healthy children were obtained. 3 ml of blood was sent to the hospital pathology laboratory for assessment of anaemia and nutritional rickets. X-ray wrist to radiology department of Allied Hospital, Faisalabad for nutritional rickets as per operational definition. The data was entered and analyzed by SPSS-21. Numerical variables; age and haemoglobin level was presented by mean±SD. Categorical variables i-e gender and anaemia was presented by frequency and percentage. Frequency of anaemia was compared by using Chi-square test by taking p≤0.05 as significant. Odds ratio was calculated.

RESULTS

It showed that 17(42.5%) in Cases and 15(37.5%) in controls were between 2-6 years of age while 23(57.5%) in cases and 25(62.5%) in controls were between 7-12 years of age, mean±SD was 7.3±2.73 in cases and 7.38±2.60 years in controls (Table 1).

Patients were distributed according to gender, it shows that 21(52.5%) in cases and 13(32.5%) in controls were male while 19(47.5%) in cases and 27(67.5%) in controls were females (Table 2).

Mean haemoglobin level in cases was calculated as 94 ± 1.53 while 11.08 ± 1.89 in controls, p value was calculated as 0.0001 showing a significant difference (Table 3).

Comparison of anaemia in children having nutritional rickets with healthy children was done, it shows that 82.5% (n=33) in cases and 15(37.5%) in controls were anaemic whereas 17.5% (n=7) in cases and 62.5% (n=25) in controls had no anaemia, p value was calculated as 0.000, OR was 7.85, it shows a significant difference between the two groups (Table 4). The data was stratified for age and gender shown in Tables 5-6.

Table 1: Frequency of age (n = 80)

Age (years)	Cases		Control	
	No.	%	No.	%
2 – 6	17	42.5	15	37.5
7 – 12	23	57.5	25	62.5

Table 2: Frequency of genders (n=80)

Gender	Cases		Control	
	No.	%	No.	%
Male	21	52.5	13	32.5
Female	19	47.5	27	67.5

Table 3: Comparison of mean haemoglobin levels in both groups (n=80)

Haemoglobin	Cases (n=40)	Control (n=40)
		9.4 ± 1.53
P value	0.0001	

Table 4: Comparison of anaemia in children having nutritional rickets with healthy children (n=80)

Anaemia	Cases		Control	
	No.	%	No.	%
Yes	33	82.5	15	37.5
No	7	17.5	25	62.5

P value 0.000 OR = 7.85

Table 5: Stratification of anaemia according to age

Age (years)	Group	Anaemia		P value	OR
		Yes	No		
2 - 6	Cases	11	6	0.003	11.91
	Controls	2	13		
7 – 12	Cases	22	1	0.0007	20.31
	Controls	13	12		

Table 6: Stratification of anaemia according to gender

Gender	Group	Anaemia		P value	OR
		Yes	No		
Male	Cases	17	4	0.003	9.56
	Controls	4	9		
Female	Cases	11	8	0.25	2.00
	Controls	11	16		

DISCUSSION

Dietary rickets is an illness that distresses youngsters and youths amid times of fast development. It stays predominant in creating areas of the world and rank among the most widely recognized maladies in kids. A huge relationship between nourishing rickets and sickness has been accounted for all through the world.

In our study, mean age was calculated as 7.3 ± 2.73 in cases and 7.38 ± 2.60 years in controls, 21(52.5%) in cases

and 13(32.5%) in controls were male while 19(47.5%) in cases and 27(67.5%) in controls were females, mean Hb level in cases was calculated as 94 ± 1.53 while 11.08 ± 1.89 in controls, p value was calculated as 0.0001 showing a significant difference. Comparison of anaemia in children having nutritional rickets with healthy children was done, it shows that 33(82.5%) in cases and 15(37.5%) in controls were anaemic whereas 7(17.5%) in cases and 25(62.5%) in controls had no anaemia, p value was calculated as 0.000, OR was 7.85, it shows a significant difference between the two groups.

We compared our results with Tezer et al⁶ who observed that the frequency of anaemia was significantly higher in children diagnosed of nutritional rickets (71.4% vs. 41.9%; $p < 0.01$) as compared to controls. In the light of observation made by Tezer et al⁶ children with nutritional rickets should also be screened and treated for anaemia when present. Another study revealed that the prevalence of iron deficiency is 11.6% in people with insufficient vitamin D levels while 7.2% in subject with ordinary vitamin D level, in this way affirming the relationship of pallor and vitamin D featuring a connection between's dietary rickets and weakness⁷.

The predominance of weakness in vitamin D insufficient individuals has been recorded around the world. Nutritional rickets in anaemic people including children and adults has been reported in South East Asia. Low serum vitamin D level is an important international public health problem⁸. Studies show a high percentage of vitamin D deficiency in Kuwait, Norway (Oberg et al, 2014), India to name a few⁹. Factors like seasonal change, latitude, fitness, adiposity; sleep time and vitamin D supplement allow additionally add to nourishing rickets. As per an ongoing report 59% of Indian ladies are pallid where 7 out of 10 ladies had vitamin D lack, with the eastern district having an altogether higher pervasiveness at 72.12% than whatever remains of the nation though 45% of ladies are accounted for to be sickly in western India.

Prevalence of anaemia was higher in northern and southern India and vitamin D deficiency was observed to be the most elevated among the ladies in southern and eastern piece of the nation. Restorative screening ought to be underlined so as to early discovery of these conditions Though work relating Anemia and nourishing rickets began in the year 1992, there was very little information to substantiate their relationship until 2010. From that point forward there has been a positive upsurge of research take a shot at this field the world over concentrating on an extremely prime underlying driver of the two ailments. A large portion of the work is as yet gathered in European nations.

Anaemia with nutritional rickets is frequently a shrouded insufficiency, with a couple of plain side effects. Nutritional rickets receptor quality is considered as one of the applicant qualities for frailty¹⁰. Vitamin D has all the earmarks of being related with frailty, one plausibility is that vitamin D balances the level of foundational cytokine generation in this manner diminishing the incendiary milieu that prompts weakness of interminable issue^{11,12}. It has been recorded both in vitro and in vivo ponders that the dynamic type of vitamin D, calcitriol is engaged with haematopoiesis and diminishment of cytokine production¹³.

Vitamin D atom applies its activity through vitamin D receptors.

However, the results of our study justifying the hypothesis that “anaemia is more common in children with nutritional rickets than the healthy children”.

In absence of local studies addressing this issue, our results should be considered as primary and some other multicenter trials are required to validate our findings.

CONCLUSION

We concluded that the frequency of anaemia in children having nutritional rickets is significantly higher when compared with healthy children. However, early screening and management for anaemia in nutritional rickets is recommended.

REFERENCES

1. Kliegman R. Nelson textbook of pediatrics. Philadelphia: Elsevier/Saunders; 2011.
2. Ozkan B. Nutritional rickets in Turkey. *Eurasian J Med* 2010; 42(2):86-91.
3. Riaz H, Finlayson AE, Bashir S, Hussain S, Mahmood S, Malik F, Godman B. Prevalence of Vitamin D deficiency in Pakistan and implications for the future. *Expert Rev Clin Pharmacol* 2016; 9(2): 329-38.
4. Pletz MW, Terkamp C, Schumacher U, Rohde G, Schutte H, Welte T, Bals R, Group CA-S. Vitamin D deficiency in community-acquired pneumonia: low levels of 1,25(OH)₂ D are associated with disease severity. *Respir Res* 2014, 15:53.
5. Al Mheid I, Patel RS, Tangpricha V, Quyyumi AA. Vitamin D and cardiovascular disease: is the evidence solid? *Eur Heart J* 2013; 34(48):3691-8.
6. Tezer H, Siklar Z, Dallar Y, Dogankoc S. Early and severe presentation of vitamin D deficiency and nutritional rickets among hospitalized infants and the effective factors. *Turk J Pediatr* 2009; 51(2):110-15.
7. Kendrick J, Targher G, Smits G, Chonchol M. 25-Hydroxyvitamin D deficiency and inflammation and their association with hemoglobin levels in chronic kidney disease. *Am J Nephrol* 2009, 30(1):64-72.
8. Palacios C, Gonzalez L. Is vitamin D deficiency a major global public health problem? *J Steroid Biochem Mol Biol* 2014; 144 Pt A:138-45.
9. Oberg J, Jorde R, Almas B, Emaus N, Grimnes G. Vitamin D deficiency and lifestyle risk factors in a Norwegian adolescent population. *Scand J Public Health* 2014, 42(7):593-602.
10. Fattizzo B, Zaninoni A, Giannotta JA, Binda F, Cortelezzi A, Barcellini W. Reduced 25-OH vitamin D in patients with autoimmune cytopenias, clinical correlations and literature review. *Autoimmun Rev* 2016; 15(7):770-75.
11. Santoro D, Caccamo D, Lucisano S, Buemi M, Sebekova K, Teta D, De Nicola L. Interplay of vitamin D, erythropoiesis, and the renin-angiotensin system. *Biomed Res Int* 2015; 2015:145828.
12. Goncalves de Carvalho CM, Ribeiro SM. Aging, low-grade systemic inflammation and vitamin D: a mini-review. *Eur J Clin Nutr* 2017; 71(4):434-40.
13. Motlagh BM, Ahangaran NA, Froushani SM. Calcitriol modulates the effects of bone marrow-derived mesenchymal stem cells on macrophage functions. *Iran J Basic Med Sci* 2015; 18(7): 672-6.