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Prevalence of Rickets regarding to maturity in children less than 3years old attending Tikrit Teaching Hospital

Abdalkadir I. Abdulla *(1)

Luay F. Jumaah (1)

Hind M. Ibrahim (1)

(1) Department of Pediatric
College of Medicine
Tikrit University
Salahaldeen
Iraq

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ABSTRACT:

Background Rickets is a condition associated with bone-deformity due to inadequate mineralization in growing bones. rickets of prematurity is a well-known condition that predisposes to pathological fractures in .

This study aims at identifying the prevalence of rickets in preterm and term babies ,study the risk factor of the disease as age ,sex type of feeding and biochemical and radiological changes.

Patients & Methods: A case control study done on 200 case with different ages from 1moth to 3 years were taken 50 cases of them were preterm babies and 150 were term babies. Patients were studied by history (sex ,age, type of feeding ,residence and clinical feature)and investigation (serum Ca ,ph and alkaline phosphatase) and diagnosis depend on radiological feature.

The Results: About 19 cases (38%) of preterm babies were diagnosed as rickets of prematurity ,15 cases(10%)were ricketic in term babies . Residence were not risk factor in preterm but risk factor in term babies . Breast feeding was risk factor in both term and preterm babies . Most common age was between 2 and 12 months in preterm babies . Serum level of calcium was normal in the majority of the cases in both term and preterm babies , serum phosphorus level was low in most of the cases specially in preterm babies .Alkaline phosphatase elevated in 90% of cases diagnosed as rickets .

Conclusions: The rickets is an important disease to be studied in this country account about nearly half of cases of preterm babies and about 10% of term babies .Breast feeding is a risk factor of the disease .Alkaline phosphatase activity and radiological feature are important for screening

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*Corresponding author E mail : Drabdalkadir@yahoo.com

Introduction

Rickets is a disease of growing bone, occurs in children only before fusion of the epiphyses, and is due to unmineralized matrix at the growth plates.Rickets may be seen in young children 6 to 24 months old,Rickets may be caused by vitamin_D disorder, calcium deficiency, phosphorus deficiency, renal loss or distal renal tubular acidosis [1] .

Wrist X-ray show thickening of growth plate,fraying,cupping and widening of distal end of metaphysis.Laboratory tests show normal to low serum calcium,low serum phosphorus, alkaline phosphatase;increased in all type of rickets,elevated parathyroid hormone in nutritional vit-D deficiency,low serum 25_OH vitamin D [2] .

Prematurity is a liveborn infants delivered before 37 completed weeks from first day of the last menstrual period.causes of preterm birth may be due to fetal causes(fetal distress, multiple gestation),Placental causes(placental dysfunction, placenta previa),uterine causes (bicornuate uterus, incompetent cervix),maternal causes (preeclampsia, chronic medical illness, infection) [3] .

Rickets of prematurity occurs as early as 1-4 mo after birth. Most infants have no clinical manifestations, and the diagnosis is based on radiographic & laboratory findings, although some can have non-traumatic fractures, but most are not suspected clinically [4] .

AIM

To decrease morbidity amoung premature infant by early detection of rickets.

Patients AND Methods

This study was carried in pediatric department (ward and outpatient clinic) in Tikrit teaching hospital(Tikrit city) which located 200 Km north of Baghdad city,Iraq.

Hospital based cross sectional case control was done on 200 children less 3 years,those whom attending Tikrit teaching hospital during the period from the 1st of june 2013 till the 31th of January 2014 over a period of 8 months selected rundomly.

A specialy designed interview sheet was used to collect the informations from fathers,mothers,grandmothers,or any other care giver. The sheet includes sociodemographic informations of the study sample as name, age, sex, address, and socioeconomic state.

Physical examination were performed including all signs of rickets.

All cases investigated with serum calcium, serum phosphorus, and serum alkaline phosphatase. [70].

Wrist X-ray was don using X-ray device .

Patient were divided according to maturity into full term(>37 completed weeks of gestation) and preterm(<37 completed weeks of gestation),200 cases were studied ,of them 150 case full term and 50 case preterm , 19 cases were diagnosed as rickets in preterm and 15 cases in term children.

Results

The total number of sample was 200 cases.

The total number of children with rickets was 34 cases.

Total number of preterm 50 case,19 case has rickets.

Total number of term 150cases,15 cases has rickets.

Prevalence of rickets

The prevalence of rickets among term children less than 3 years old,15 cases (10%) .

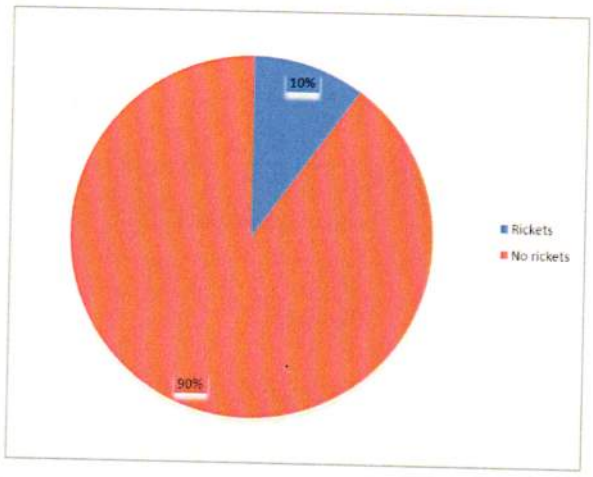

Figure 1 prevalence of rickets in term children

The prevalence of rickets among preterm children less than 3 years old,10 cases (38%) .

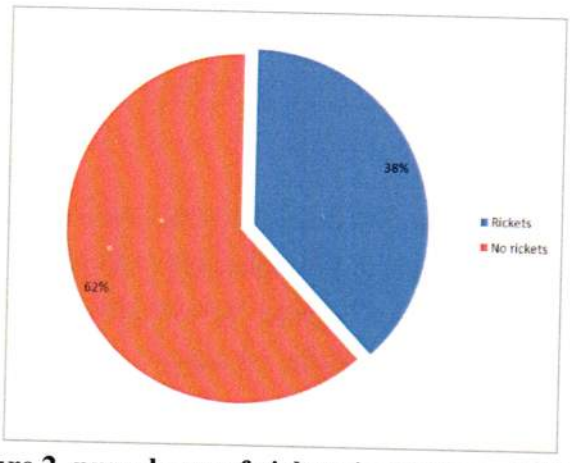

Figure 2 prevalence of rickets in preterm children

Gender and rickets prevalence rate:

Most of the cases of rickets in preterm were male,10 cases (52.6%). In term most cases were also male(60%) .

Age and rickets.

Most of the cases in preterm were between 2 months and 1 years old,16 cases (84.2%),while in term almost equal.

Feeding and rickets

Most off the cases were breast fed, 15 cases (78.9%) ,also in term most cases were breast fed,10 cases(67.7%) .

Residence and rickets

Most cases of rickets in preterm were urban 11 cases,(57.8%).in preterm also most cases urban 11 cases,(73.3%).

Clinical feature:

The most clinical feature in the sample are delayed dentation found in 30 cases .

Table 5 :Clinical feature in rickets

Clinical feature	Preterm denominator =19		Term denominator=15		Total denominator=34	
	No	Percent	No	Percent	No	Percent
Delayed dentation	19	100.0	10	66.7	30	88.2
Weak muscle	19	100.0	9	60.0	28	82.4
Wide wrist	15	78.9	13	86.7	28	82.4
Leg bowing	1	5.3	3	20.0	4	11.8
Wide fontanell	3	15.8	1	6.7	4	11.8
Frontal bossing	2	10.5	2	13.3	4	11.8

Biochemical changes

In preterm the serum level of calcium was low in 2 cases, serum phosphate was low in 16 cases, serum alkaline phosphatase was high in 18 cases. In term the serum level of calcium was low in 1 cases, serum phosphate was in 10 cases, serum alkaline phosphatase was high in 14 case.

Discussion

Prevalence of rickets

In this study ,the prevalence of rickets was 19 case (38%) of preterm babies ,15 (10%) of full term babies .other study in Iran (28) showed 23% of premature babies develop rickets and in a study in Nairoby (29) 58.8 % of premature babies develop rickets and in Korea (31) was 44%. In studies on term babies,similar results were obtained in Bangladesh(55 . (

Age and rickets:

In this study , the most age onset of presentation of rickets in prematurity was between 2 to 12 months , in term babies the result was nearly equal in ages below one year and from one to three years .

Gender and rickets:

Regarding gender variation ,in this study male slightly more than female .

Residence and rickets:

In this study ,there was no significant difference between rural and urban areas as a risk factor for rickets of prematurity.

Clinical feature of rickets:

In this study, the most common presentation was delayed dentations followed by muscle weakness and widening of the wrists .similar results were obtained in a study in USA (34) ,however; other studies showed that enlarged fontanelles are the main presenting feature (35,36 . (

Types of feeding and rickets:

Regarding type of feeding ,in this study breast feeding babies are more frequently to develop rickets of both preterm and term babies than of that with bottle feeding .Another studies in UK (41) and India (42) for preterms showed the same results ,studies in term babies in USA (60) and Canada (60) showed that rickets was more common in breast fed infants .

Biochemical results:

Regarding biochemical results ,serum level of calcium was normal in the majority of the cases in both term and preterm's babies , serum phosphorus level was low in most of the cases specially in preterm babies and serum alkaline phosphatase level was significantly high and can be regarded as a good marker of the disease Nearly similar results were obtained in Hong Kong (47) and Italy (53) . Infants with rickets will demonstrate a normal serum calcium and a low or low normal serum phosphorus level (60 . (

Radiological changes:

All the patients included in this study had some degree of radiological changes suggestion of rickets. Another studies in Karachi (50) and U.K (35) demonstrate the same result.

CONCLUSION

1. Prevalence of rickets of prematurity in this study was high 39% and for term babies was 10%.
2. The most age of prevalence was between 2 and 12 months for both preterm and term babies .
3. Gender variation was not significant in this study.
4. Urban areas were a risk factor for rickets in term babies and not in preterm babies.
5. Breast feeding was a risk factor for the disease
6. Delay dentations ,muscle weakness and widening of wrist were the most clinical manifestation in this study.
7. Increased serum alkaline phosphatase activity is an important test in diagnosis of rickets and found in 90% of this study .

RECOMMENDATIONS

To ministry of health:

→ Screening test for preterm babies by radiological and biochemical tests for early diagnosis and management of rickets of prematurity.

→ Educational sessions in health centers for benefit of sunlight exposure.

To the physician:

In breast milk Babies supplanted vitamin D in term babies , and vitamin D ,calicium and phosphate for preterm babies is mandatory.

References

1. Kliegman RM, Behrman RE, Jenson HB, et al: Nelson Textbook of Pediatrics, 18th ed, Philadelphia.*WB Saunders* 2007;48:253-263

2. Oginni et al., 2003. Oginni LM, Sharp CA, Badru OS, et al: Radiological and biochemical resolution of nutritional rickets with calcium. *Arch Dis Child* 2003; 88:812-817.

3. Backstrom et al., 1996. Backstrom MC, Kuusela AL, Maki R: Metabolic bone disease of prematurity. *Ann Med* 1996; 28:275-282.

4. Ryan, 1996. Ryan S: Nutritional aspects of metabolic bone disease in the newborn. *Arch Dis Child* 1996; 74:F145-F148.

5. Rauch and Schoenau, 2002. Rauch F, Schoenau E: Skeletal development in premature infants: A review of bone physiology beyond nutritional aspects. *Arch Dis Child Fetal Neonatal Ed* 2002; 86:F82-F85.

6. Ladhani et al., 2004. Ladhani S, Srinivasa L, Buchanan C, et al: Presentation of vitamin D deficiency. *Arch Dis Child* 2004; 89:781-784.

7. Lanon, 2006. Lanon AJ: Bone health in children. *BMJ* 2006; 333:763-764.

8. Barrueto et al., 2005. Barrueto Jr F, Wang-Flores HH, Howland MA, et al: Acute vitamin D intoxication in a child. *Pediatrics* 2005; 116:e453 -e456.

9. Pettifor, 2004. Pettifor JM: Nutritional rickets : Deficiency of vitamin D, calcium, or both?. *Am J Clin Nutr* 2004; 80(suppl):1725S-1729S.

10. Gartner et al., 2003. Gartner LM, Greer FR, Section on Breastfeeding , Committee on Nutrition , American Academy of Pediatrics : Prevention of rickets and vitamin D deficiency: New guidelines for vitamin D intake. *Pediatrics* 2003; 111:908 -910.

11. Kleinman RE, editor: Pediatric Nutrition Handbook, 6th ed, Washington, DC, *American Academy of Pediatrics* 2000; p122-140.

12. United States Renal Data System, 2004: *Atlas of End Stage Renal Disease in the United States. 16th Annual Report 2004. Pediatric ESRD*. Bethesda, MD, National Institutes of Health-National Institute of Diabetes & Digestive & Kidney Diseases—Division of Kidney, Urologic & Hematologic Diseases, 2004, p 154–166.

13. Krebs NF, Hambidge KM, Trace elements. In Duggan C, Watkins JB, Walker WA, editors: Nutrition in Pediatrics: Basic Science and Clinical Applications, 4th ed, Hamilton, Ontario, 2008, *BC Decker*, pp 67-82.

14. Yamamoto et al., 2005. Yamamoto T, Imanishi Y, Kinoshita E, et al: The role of fibroblast growth factor 23 for hypophosphatemia and abnormal regulation of vitamin D metabolism in patients with McCune-Albright syndrome. *J Bone Miner Metab* 2005; 23:231-237.

15. Hsu et al., 2005. Hsu SY, Tsai IJ, Tsau YK: Comparison of growth in primary Fanconi syndrome and proximal renal tubular acidosis. *Pediatr Nephrol* 2005; 20:460.

16. Chan et al., 2001. Chan JCM, Scheinman JI, Roth KS: Renal tubular acidosis. *Pediatr Rev* 2001; 22:277-286.

17. Rauch F, Schoenau E, "Skeletal development in premature infants: a review of bone physiology

beyond nutritional aspects." *Arch Dis Child Fetal Neonatal Ed,* 86(2):F82-5. 2002.

18. McGuire et al., 2004. McGuire W, McEwan P, Fowlie PW: Care in the early newborn period. *Br Med J* 2004; 329:1087-1089.

19. Shankaran et al., 2004. Shankaran S, Johnson Y, Langer JC, et al: Outcome of extremely low birth weight infants at highest risk: Gestational age <24 weeks, birth weight <750 g, and 1 minute Apgar <3. *Am J Obstet Gynecol* 2004; 191:1084-1091.

20. Wilson-Costello et al., 2005. Wilson-Costello D, Friedman H, Minich N, et al: Improved survival rates with increased neurodevelopmental disability for extremely low birth weight in infants in the 990s. *Pediatrics* 2005; 115:997-1003.

21. Clandinin et al., 2005. Clandinin MT, van Aerde JE, Merkel KL, et al: Growth and development of preterm infants fed infant formulas containing docosahexaenoic acid and arachidonic acid. *J Pediatr* 2005; 146:461-468. *

22. McGuire et al., 2004. McGuire W, Henderson G, Fowlie PW: Feeding the preterm infant. *Br Med J* 2004; 329:1227-1230.

23. Mucklow ES, Kumar RP. Fracture of long bones in neonatal intensive care units. Matern Child Hlth 1992; 17:126.

24. Phillips RR, Lee HS. Fractures of long bones occurring in neonatal intensive therapy units. BMJ 1998; 301:225-226.

25. Moyer-Mileur. Physical activity and diet: key components for improved bone mass in premature, very low birth weight infants. Pediatric Research 1999;45:287.

26. Ziegler EE, O'Donnell AM, Nelson SE et al. Body composition of the reference fetus. Growth 1996; 40: 329–41.

27. Bishop N. Bone disease in preterm infants. *Arch Dis Child* 2000; 64:1403–9.

28. P Alizade F Naderi; A Randomized Clinical Trial of Prophylactic Effects of Vitamin D on Different Indices of Osteopenia of Prematurity. Iranian J Publ Health, 2006, Vol. 35, No. 3, pp.58-63

29. Oyatsi P, Musoke RN, Wasunna AO (1999). Incidence of rickets of prematurity at Ken- yatta National Hospital, Nairobi. East Afr Med J, 76: 63-6.

30. James JR, Congdon PJ, Truscott J, et al. (1996). Osteopenia of prematurity. *Arch Dis Child*, 61: 871-76.

31. Soon Min Lee, Ran Namgung, High Incidence of Rickets in Extremely Low Birth Weight Infants with Severe Parenteral Nutrition-Associated Cholestasis and Bronchopulmonary Dysplasia. J Korean Med Sci 2012; 27: 1552-1555.

32. Alessandro Rubinacci, Guido E Moro; Quantitative ultrasound for the assessment of osteopenia in preterm infants. European Journal of Endocrinology (2003) 149 :307–315.

33. Shaw JCL.Evidence of defective skeletal mineralization in low birth weight infants. pediatrics1997;57:16-25.

34. Daiva Gorczyca1,*, Hanna Cebula2; Osteopenia of Prematurity in an Extremely Low-Birth-Weight Infant. American Journal of Medical Case Reports, 2013, Vol. 1, No. 1, 12-15.

35. Harrison CM, Johnson K, McKechnie E, "Osteopenia of prematurity: a national survey and review of practice." *Acta Paediatr* , 97 (4). 407-413. Apr.2008.

36. Rauch F, Schoenau E, "Skeletal development in premature infants: a review of bone physiology beyond nutritional aspects." *Arch Dis Child Fetal Neonatal Ed,* 86(2):F82-5. 2002.

37. Crofton PM, Shrivastava A, Wade JC, et al. Bone and collagen markers in preterm infants: relationship with growth and bone mineral content over the first 10 weeks of life. *Pediatr Res.*1999;46:581.

38. Fewtrell MS, Cole TJ, Bishop NJ, Lucas A. Neonatal factors predicting childhood height in preterm infants: evidence for apersisting effect of early metabolic bone disease? *J Pediatr.*2000;137:668–673

39. Miller ME, "The bone disease of preterm birth: a biomechanical perspective." *Pediatr Res,* 53 (1). 10-15. Jan.2003.

40. Pieltain C, de Halleux V, Senterre T, Rigo J, "Prematurity and bone health." *World Rev Nutr Diet,* 106. 181-188. Feb. 2013. 4.

41. Macpherson et al. Prevention and reduction of iatrogenic disorders in the newborn. in Guthrie (ed) Neonatal Intensive Care Churchill-Livingstone, 1999, pp. 271-312.

42. Balasubramanian & R. Ganesh; Vitamin D deficiency in exclusively breast-fed infants. Indian J Med Res 127, March 2008, pp 250-255.

43. Anast. Disorders of calcium and phosphorus metabolism. in Tausch, Ballard and Avery Shaffer and Avery's Diseases of the Newborn 6th Edition 1991. pp 927-937.

44. Wahlig and Georgieff. The effects of illness on nutritional metabolism and nutritional management. Clinics in Perinatology 2001;22:77-96.

45. Adejuyigbe EA, Famurewa OC, Adegboyega T.Rickets of prematurity- a case report Niger Postgrad Med J. 2008 Dec;15(4):272-4.

46. Vachharajani AJ, Mathur AM, Rao R. Metabolic Bone Disease of Prematurity. NeoReviews 2009;10:e402-e11.

47. HS *LAM,* KW *SO,* PC *NG*; Osteopenia in Neonates: A Review; *HK J Paediatr (new series)* 2007;12:118-124.

48. Johnson CB. 1991. Neonatal rickets: Metabolic bone disease of prematurity. Nconataf Nmvmk 9(7): 13-17.

49. Kovar I, Mayne P, and Barltrop D. 1982. Plasma alkaline phosphatase activity: A screening test for rickets in preterm neonates. L.uncet l(8267): 308-310.

50. Jameel A, Khanani MR, Billo AG, Asghar A. Jafri Z. Rickets in a slum of Karachi. Pak. J, Med, Sci; 1996; 12:247-250

51. Rusk C. Rickets screening in the preterm infants. Neonate, Netw; 1998; 17(1):55-57.

52. Renton P. Radiology of rickets, osteomalacia and hyperparethyroidism. *Hosp, Med*; 1998; 59: 399-403.

53 Bozzetti V, Tagliabue P,"Metabolic Bone Disease in preterm newborn: an update on nutritional issues. *Ital J Pediatr* Jul.2009; 35. 20.

54. Thacher TD, Fischer PR, Strand MA, Pettifor JM. Nutritional rickets around the world: causes and future directions. *Ann Trop Paediatr* 2006; *26* : 1-16.

55. .Karim F, Chaudry AM, Gani MS. Rapid assessment of the prevalence of lower limb clinical rickets in Bangladesh. Public Health 2003; 117: 135-44.

56. Tezer H, S¸ıklar Z, Dallar Y, Dog˘ankoc¸ S¸ . Early and severe

presentation of vitamin D deficiency and nutritional rickets amonghospitalized infants and the effective factors. Turk J Pediatr2009; 51: 110–1.

57. 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.