International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 07-05-2020; Accepted: 16-05-2020; Published: 09-06-2020
www.medicalsciencejournal.com
Volume 6; Issue 6; 2020; Page No. 62-66

Pattern of rickets among suspected cases in Dhaka shishu (Children) hospital, Dhaka, Bangladesh

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Abstract

Background: Nutritional rickets, is a condition caused by vitamin D deficiency in growing children. It is one of the common form of growing bone disease resulting significant disability unless treated properly. Despite scope of adequate sunlight exposure, which is a source of vitamin D in young child in Bangladesh, increased trend of NR is observed. Considering this, the study was designed to observe the pattern of rickets among suspected cases in a tertiary care hospital of Bangladesh.

Aim of the study: The aim of this study was to dig out the pattern of rickets among suspected cases in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh.

Methods: The prospective observational study was conducted in in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh during the period from August 2015 to July 2017. Child aged 1-5 years attending in the mentioned with complaints bowing of leg and/or clinical symptoms consistent with rickets were approached. Suspected rickets cases were investigated further and total 100 cases were analyzed. Informed consent and ethical measures were ensured in each cases. Data analysis was done by SPSS 23.

Result: In analyzing the diagnostic findings of the participants we found the highest 79% participants were with nutritional rickets, 11% were with non-nutritional rickets and the rest10% were rickets-like diseases. Lastly in analyzing the spectrum of presentation of children with both the nutritional and non-nutritional rickets we found, 52.22% participants were with bow leg whereas 25.56% were with knock knee, 7.78% were with sabre tibia and 16.67% were with double malleolus. On the other hand, as upper limb deformities we found 27.78% with swelling and/or widening wrists, 11.11% with craniotabes and 12.22% with wide anterior. Besides these, as other deformities we found 26.67% with rib beading, 25.56% with pectus carinatum, 26.67% with delayed growth and 21.11% with delayed dentition.

Conclusion: Nutritional rickets is the commonest subtype of rickets in Bangladesh. Generally 'nutritional rickets' are found 80% to 90% among the patients with rickets. Sometimes physician may be misguided or be confused by the etiology of rickets like diseases.

Keywords: Nutritional rickets, Rickets, Bowing of leg, Child leg deformity

1. Introduction

Nutritional rickets (NR) is a disease that afflicts children and adolescents during times of rapid growth [1]. Vitamin D deficiency and/or nutritional rickets remain prevalent in developing regions of the world and rank among the 5 most common diseases in children [2, 3]. Prevalence of nutritional rickets in developed countries appears to be rising [3]. Suggested reasons in the literature for its reemergence include complacency in fortifying food, changing lifestyles where children spend most of their time indoors on various forms of technology and globalization which has resulted in immigration of different peoples to different geographic locations [3]. NR is distinct from other types of rickets in that it is merely caused by a simple deficiency in vitamins and nutrition and thus can be easily corrected if detected early [4]. A growing body of literature has highlighted that NR should be viewed as having a spectrum of pathogenetic mechanisms which lie between the following three milestones [3]. On one side of the spectrum are those with classic vitamin D deficiency, as studies have found among non-supplemented breastfed infants [5], while on the other side of the spectrum are those with pure calcium deficiency, yet with normal vitamin D stores as cases from Nigeria and Bangladesh have shown [6]; and in between these two are those with marginal to low vitamin D stores and a diet deficient in calcium or high in phytates which impair intestinal absorption of dietary calcium and may be the main cause of rickets globally [3]. For last two decades, rickets has become a health concern for Bangladesh and burden with about 8% of affected child [7]. Most children with rickets develop symptoms within the first 6-12 months of age but in tropical areas where sunlight is ample, like Asia and Africa, it classically manifests during the second or the third year of life [8]. Vitamin D deficiency seems to be the key component of causing nutritional rickets in many countries of the world [9, 10]. But inadequate calcium has also been demonstrated as the main etiological factor of children having rickets in several countries [11]. Inadequate ultraviolet light exposure,

due to avoidance of sun light for conservative maternal clothing culture (such as, veiling), long term breast feeding without taking vitamin D fortified food, reduced intake of milk and dairy products were hypothesized as a reason of this condition. All of these result in inadequate calcium causing impaired skeletal mineralization, which is the underlying pathology of nutritional rickets [12, 13]. Deficiency of both calcium (Ca) and vitamin D are prevalent in Bangladesh, which is mostly due to poor socioeconomic condition of the people. Along with other factors higher air pollution is seems to be contributing vitamin D deficiency in our country. lack of dietary calcium also is believed to be another causal factor of nutritional rickets in Bangladesh [14]. In past few decades, several study was reported about the devastating effect rickets on children [11, 12]. higher incidence of recurrent pneumonia in this group of children [15]. Which is a major cause of childhood mortality [16]. As a result, developing countries are facing of double burden of this disease itself and by its complicaitons [16-18]. Nevertheless, it is a matter of hope that confirm diagnosis of active rickets can be made easily with simple investigations such as radiograph and alkaline phosphatase besides clinical examination [19]. Several intervention was practiced to prevent this disease particularly NR. Vitamin D supplementation or by food fortification has proven its efficacy and safe to prevent this disease [18-20]. Moreover, it would be beneficial to prevent early than treatment in context of outcome and expense [21]. In context of fewer evidence in NR incidence and prevalence, the study was designed to assess the frequency of among suspected rickets cases in DSH, Bangladesh. The aim of this study was to dig out the pattern of rickets among suspected cases in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh.

2. Objectives

General Objective

- To dig out the pattern of rickets among suspected cases in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh

Specific Objective

- To assess the features of rickets among 1-5 years' children of Bangladesh

3. Methodology and Materials

The prospective observational study was conducted in in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh during the period from August 2015 to July 2017. Child aged 1-5 years attending in the mentioned with complaints bowing of leg and/or clinical symptoms consistent with rickets were approached. Suspected rickets cases were investigated further and total 100 cases were analyzed. Proper informed consent and ethical measures were ensured in each cases. Next, biochemical and radiological investigations were done to establish rickets among clinically suspected Childs. Then, serum 25-hydroxy vitamin D [25(OH) D] level was done to identify the stratification of rickets. The diagnosis was validated upon predefined diagnostic criteria; cases fulfilling both biochemical inclusion criteria and clinical signs/symptoms or radiological Signs of rickets were included. The diagnosis of rickets was made based on raised plasma alkaline phosphatase (ALP), raised serum parathyroid hormone (PTH), or low/normal serum calcium (Ca) in clinically and radiologically consistent cases [22]. Whereas, the diagnosis of nutritional rickets is made on the basis of history, physical examination, radiographs and biochemical testing particularly serum 25(OH) D [22]. The cut off value of Vitamin D deficiency was set as <30nmon/l. To evaluate the other causes of rickets were done according to the standard guideline [22]. To verify the diagnosis of rickets and its etiology (nutritional, hereditary rickets and secondary rickets), the entire medical record (s) were carefully reviewed by the investigator. Borderline result was considered criteria of exclusion and it was replaced by another consecutive purposive sampling. The child were divided into three subtypes: nutritional rickets (rickets with vitamin D deficiency), non-nutritional rickets (rickets not due to the deficiency of vitamin D or rickets due to other cause) and rickets like disease (clinically alike to rickets but not proved by investigations). In this study, ethical issues were maintained according to the Helsinki declaration and ensured that parents were not get any financial benefits from this study. Clinical presentation, biochemical and radiological reports were collected and kept recorded in separate case record form. Following, collection of all the required data, these were checked, and tabulated into the computer using the SPSS/PC software 23.

4. Result

In this study among 100 participants 64% were male and the rest 36% were female. So male were dominating in number. In analyzing age of the participants we found, the highest 41% participants were from 12-23 months age group. Then 29% were from 24-35 months age group, 20% were from 36-47 months age group, 8% were from 48-59 months age group and the rest 2% were from 60 months age group. The mean (±SD) age of the participants was 29.36±13.09 months. In analyzing the socio-economic status of the participants we found most of the cases were from urban families which was 52% and 48% were from rural areas. Besides these 32% parents were illiterate 30% parents (At least one: father/mother) were primary level educated, 26% were secondary to higher secondary level educated and 12% were graduate. On the other hand, 62% participants were found from lower class family according to their family income. Then 30% were from middle class and only 8% were from upper class families. In analyzing the diagnostic findings of the participants we found the highest 79% participants were with nutritional rickets, 11% were with non-nutritional rickets and the rest10% were rickets-like diseases. Lastly in analyzing the spectrum of presentation of children with both the nutritional and non-nutritional rickets we found, 52.22% participants were with bow leg whereas 25.56% were with knock knee, 7.78% were with sabre tibia and 16.67% were with double malleolus. On the other hand, as upper limb deformities we found 27.78% with swelling and/or widening wrists, 11.11% with craniotabes and 12.22% with wide anterior. Besides these, as other deformities we found 26.67% with rib beading, 25.56% with pectus carinatum, 26.67% with delayed growth and 21.11% with delayed dentition.

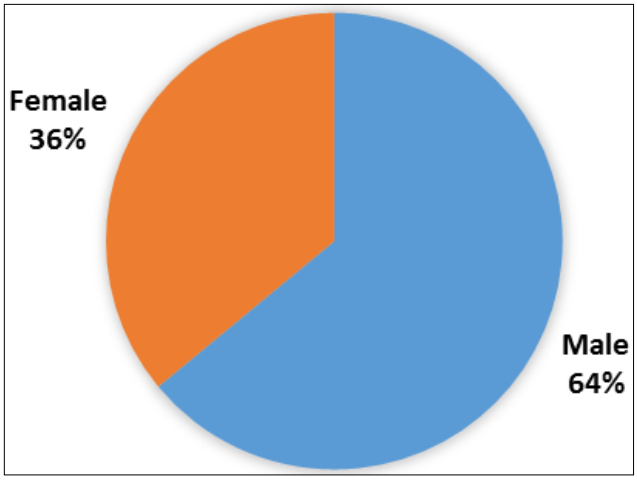

Fig 1: Gender distribution of participants (N=100)

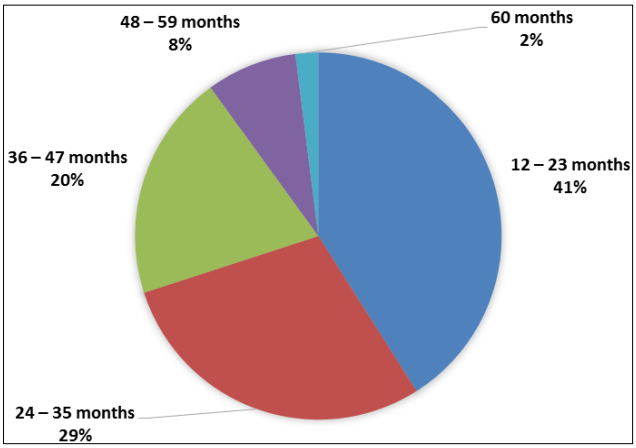

Fig 2: Age distribution participants (N=100)

Table 1: Socio-economic characteristics of children with suspected rickets (N=100)

Variables	n	%
Residence		
Urban	52	52
Rural	48	48
Education of parents		
Illiterate	32	32
Primary	30	30
SSC-HSC	26	26
Graduate	12	12
Economic status (Family)		
Lower	62	62
Middle	30	30
Upper	8	8

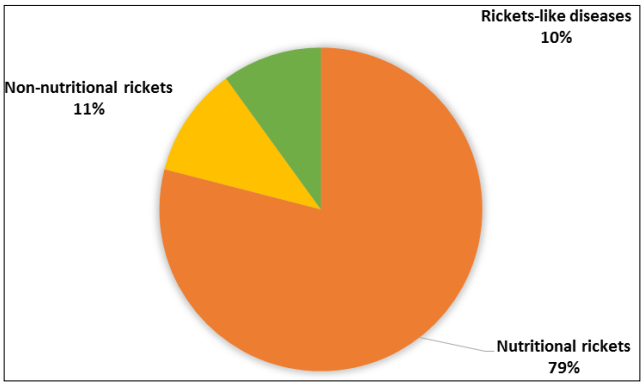

Fig 3: Diagnosis of suspected rickets children (N=100)

Table 2: Spectrum of presentation of children with rickets (N=90)

Presentation		n	%
Lower limb deformity	Bow Leg	47	52.22
	Knock knee	23	25.56
	Sabre Tibia	7	7.78
	Double Malleolus	15	16.67
Upper limb deformity	Swelling-widening wrist	25	27.78
	Craniotabes	10	11.11
	Wide Anterior	11	12.22
Other deformity	Rib beading	24	26.67
	Pectus Carinatum	23	25.56
	Delayed Growth	24	26.67
	Delayed Dentition	19	21.11

5. Discussion

The aim of this study was to dig out the pattern of rickets among suspected cases in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh. Nutritional rickets is acknowledged as a major public health concern globally [8]. Bangladesh contributes a major share of the global burden of nutritional rickets. A high prevalence of rickets was reported in Cox's bazaar and in other districts of Bangladesh [22]. The main reason for nutritional deficiency rickets in Bangladesh was suggested to be calcium deficiency rather than vitamin D deficiency in a previous study [14]. in our study, we included 100 suspected cases of rickets and found 79% cases of nutritional deficiency rickets. In all of them, 25-hydroxy vitamin D level was deficient. Reason for the difference between this study and the aforementioned study could be attributed to sample size and study design. Deficiency of Vitamin D in nutritional rickets needs to be addressed as several studies reported vitamin D deficiency of 28% to 40% in infants and younger children of Bangladesh depending on the age and weight of the children [13]. Also, vitamin D deficiency rickets has re-emerged in many affluent industrialized countries of the world. About 11% children had rickets due to other causes rather than vitamin D deficiency (non-nutritional rickets) in our study [24]. hydroxy vitamin D level was within normal range in this group of children and was significantly higher than nutritional deficiency rickets group (p value <0.001). Non-nutritional rickets group possibly consists of hypo-calcemic rickets, hypo-phosphatemic rickets and vitamin D resistance rickets in whom Vitamin D level tends to be high.[25] Respectively, 36%, 43% and 81% nutritional deficiency rickets children had calcium deficiency, phosphate deficiency and parathyroid-hormone excess in the circulation. In contrast, an Australian vitamin D deficiency rickets surveillance study found 12% cases of calcium deficiency, 7% cases of phosphate deficiency and 49% cases of parathyroid hormone excess among 398 children of vitamin D deficiency rickets [24]. This probably was due to concomitant calcium deficiency in our subjects which led to high parathyroid hormone and low phosphate level in the blood. Consistent with findings of other studies [15]. nutritional rickets were found more in younger age groups and in male children in this study. In analyzing the spectrum of presentation of children with both the nutritional and non-nutritional rickets we found, 52.22% participants were with bow leg whereas 25.56% were with knock knee, 7.78% were with sabre tibia and 16.67% were with double malleolus. On the other hand, as upper limb deformities we found 27.78% with swelling and/or widening wrists, 11.11% with craniotabes and 12.22% with wide anterior in

our study. However, Karim *et al*. [14]. Found knock knee (38%) followed by bow leg (26%) to be the leading presentation of lower limb rickets in their study. On the other hand, a Nigerian study reported swollen wrist to be the leading sign (65%), followed by bow leg (60%) [26]. Our study found a higher frequency of uneducated (32%) and less-educated parents (30% with education between 1 to 5 years) in the suspected rickets children. Although the Cox's bazaar study found a similar picture, lesser number of parent's education year may not be associated with increased incidence of rickets [22]. Because, a Nigerian study found significantly higher education years in fathers of rachitic children. Majority of the families were running on a monthly deficit budget. Similar findings was reported by Karim and his colleagues [22]. Further carefully designed studies are needed to establish low socio-economic status as a factor of nutritional deficiency rickets. Nutritional rickets is the commonest subtype of rickets. Generally 'nutritional rickets' are found 80% to 90% among the patients with rickets. Sometimes in treating the patients, physician may be misguided or be confused by the etiology of rickets like diseases.

6. Limitations of the study

This was a single centered study with a small sized sample. So the findings of this study may not reflect the exact scenario of the whole country.

7. Conclusion and recommendations

Nutritional rickets is the commonest subtype of rickets in Bangladesh. Generally 'nutritional rickets' are found 80% to 90% among the patients with rickets. Sometimes physician may be misguided or be confused by the etiology of rickets like diseases. For getting more specific findings we would like to recommend for conducting more studies regarding the same issue with larger sized sample.

8. References

1. Lerch C, Meissner T. Interventions for the prevention of nutritional rickets in term born children. Cochrane Database of Systematic Reviews. 2007, CD006164-4
2. Welch TR, Bergstrom WH, Tsang RC: Vitamin D-deficient rickets: the reemergence of a once-conquered disease. Journal of Pediatrics. 2000; 137(2):143-145. 10.1067/mpd.2000.109008.
3. Wagner CL, Greer FR: Prevention of rickets and vitamin D deficiency in infants, children, and adolescents. American Academy of Pediatrics Section on Breastfeeding; American Academy of Pediatrics Committee on Nutrition. Pediatrics. 2008; 122(5):1142-1152. 10.1542/peds.2008-1862.
4. Allgrove J. Is nutritional rickets returning? Archives of Disease in Childhood. 2004; 89(8):699-701. 10.1136/adc.2003.036780.
5. Kreiter SR, Schwartz RP, Kirkman HN, Charlton PA, Calikoglu AS, Davenport ML, *et al*. Nutritional rickets in African American breast-fed infants. Journal of Pediatrics. 2000; 137(2):153-157. 10.1067/mpd.2000.109009.
6. Thacher TD, Fischer PR, Pettifor JM, Lawson JO, Isichei CO, Reading JC, *et al*. A comparison of Calcium, vitamin D, or both for nutritional rickets in Nigerian children. The New England Journal of Medicine. 1999; 341(8):563-568. 10.1056/NEJM 199908193410803.
7. Dey M, Dey SC. Calcium and Vitamin D Deficiency Situation in Bangladesh: A Review. Int J Res Rev. 2015; 2:281-94.
8. Thacher TD, Fischer PR, Strand MA, Pettifor JM. Nutritional rickets around the world: causes and future directions. Ann Trop Paediatr. 2006; 26(1):1-16.
9. Fraser DR. Vitamin D-deficiency in Asia. J Steroid Biochem Mol Biol, 1996, 491-5.
10. Matsuo K, Mukai T, Suzuki S, Fujieda K. Prevalence and risk factors of vitamin D deficiency rickets in Hokkaido, Japan. Pediatr Int. 2009; 51:559-62.
11. Tom D, Thacher M, Philip R, Fischer M, John M, Pettifor M, *et al*. A comparison of calcium, vitamin D, or both for nutritional rickets in Nigerian children. N Engl J Med. 1999; 341(8):563-8.
12. Pettifor J. Nutritional Rickets: Deficiency of Vitamin D, Calcium or Both? Am J Clin Nutr. 2004; 80:17255-95.
13. Roth DE, Shah MR, Black RE, Baqui AH. Vitamin D status of infants in northeastern rural Bangladesh: Preliminary observations and a review of potential determinants. J Heal Popul Nutr. 2010; 28(5):458-69.
14. Fischer PR, Rahman A, Cimma JP, Kyaw-Myint TO, Kabir ARML, Talukder K, *et al*. Nutritional rickets without vitamin D deficiency in Bangladesh. J Trop Pediatr, 1999, 291-3.
15. Haider N, Nagi AG, Khan KMA. Frequency of nutritional rickets in children admitted with severe pneumonia. J Pak Med Assoc. 2010; 60(9):729-32.
16. Aziz TK, Lehrasab W, Ahmed N, Batool Z. Frequency of Nutritional Rickets in Children 2-59 Months of Age with Severe Pneumonia Khawaja. Ann Pak Inst Med Sci. 2016; 12(2):105-8.
17. Jones HL, Jammeh L, Owens S, Fulford AJ, Moore SE, Pettifor JM, *et al*. Prevalence of rickets-like bone deformities in rural Gambian children. Bone. 2015; 77:1-5.
18. Robinson PD. The re-emerging burden of rickets: a decade of experience from Sydney. Arch Dis Child. 2005; 91(7):564-8.
19. Strand MA, Perry J, Jin M, Tracer DP, Fischer PR, Zhang P, *et al*. Diagnosis of rickets and reassessment of prevalence among rural children in northern China. Pediatr Int. 2007; 49(2):202-9.
20. Tau C, Ciriani V, Scaiola E, Acu˜na M. Twice single doses of 100,000 IU of vitamin D in winter is adequate and safe for prevention of vitamin D deficiency in healthy children from Ushuaia, Tierra Del Fuego, Argentina. Journal of Steroid Biochemistry & Molecular Biology. 2007; 103:651-654.
21. Thacher TD, Fischer PR, Pettifor JM, Lawson JO, Isichei CO, Chan GM, *et al*. Case-control study of factors associated with nutritional rickets in Nigerian children. J Pediatr. 2000; 137(3):367-73.
22. Munns CF, Shaw N, Kiely M, Specker BL, Thacher TD, Ozono K, *et al*. Global Consensus Recommendations on Prevention and Management of

Nutritional Rickets. J Clin Endocrinol Metab. 2016; 101(2):394-415.
23. Karim F, Chowdhury AM, Gani MS. Rapid assessment of the prevalence of lower limb clinical rickets in Bangladesh. Public Health. 2003; 117:135-44.
24. Munns CF, Simm PJ, Rodda CP, Garnett SP, Zacharin MR, Ward LM, *et al*. Incidence of vitamin D deficiency rickets among Australian children: An Australian Paediatric Surveillance Unit study. Med J Aust. 2012; 196(7):466-8.
25. Sahay M, Sahay R. Rickets-vitamin D deficiency and dependency. Indian J Endocrinol Metab. 2012; 16(2):164-76. [cited 2017 Dec 10]
26. Ekanem EE, Bassey DE, Eyong M. Nutritional rickets in Calabar, Nigeria. Ann Trop Paediatr. 1995; 15:303-6.