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Clinical Profile and Risk Factors of Rickets among the Children: A study in a Tertiary care level hospital

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Abstract

Introduction: Rickets is a disease of growing bone that is unique to children and adolescents. It is caused by a failure of osteoid to calcify in growing children. Failure of osteoid to calcify in adults is called osteomalacia.

Aim of the Study: This study aimed to see clinical profile & risks factors children's with rickets in a tertiary care hospital.

Material & Methods: The retrospective study was conducted in the Department of Pediatric Endocrinology and Metabolioc Disorder of Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh during the period from January 2018 to December 2019. Child aged 1-5 years attending in the mentioned with complaints bowing of leg and/or clinical symptoms consistent with rickets were approached. The participants of the study were 124. Informed consent and ethical measures were ensured in each case. Data analysis was done by SPSS 23.

Results: In analyzing the diagnostic findings of the participants we found the highest 96 (77.42%) participants were with nutritional rickets, 17(13.71%) were with non-nutritional rickets and the rest 11(8.87%) were rickets-like diseases. Infant of maternal vitamin D deficiency were 12(9.68%) of (1-2) months of infant came with convulsion. In analyzing the spectrum of presentation of children with both the nutritional and non-nutritional rickets we found, 31(25.00%) participants were with bow leg whereas, 4(3.23%) were with knock knee, 13 (10.48%) were with sabre tibia. On the other hand, as upper limb deformities we found 36(29.03) % with swelling and/or widening wrists. We also found head findings 2(1.61%) with craniotabes and 7(5.65%) with wide anterior fontanelle. Besides these, as other deformities we found 8(6.45%) with rib beading, 4(3.23) % with pectus carinatum, 9(7.26%) with delayed growth and 10(8.06%) with delayed dentition. The ricks factor of rickets Low sunlight intake (sun light explorer) were 94(75.81%), Infant of maternal vitamin D deficiency were 12(9.68%), Industrial area were 1(0.81%), Rural area were 5(4.03%), Urban area were 9(7.26%) and low socio-economic condition were 3(2.42%).

Conclusion: Nutritional rickets is the commonest subtype of rickets in Bangladesh. In ours study 'nutritional rickets' are found 70% to 80% (77.42%) among the patients with rickets. Sometimes physician may be misguided or be confused by the etiology of rickets like diseases without any clinical findings.

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, 7]; 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]. This 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]. The aim of this study was to determine the clinical profile & ricks factors of children with rickets in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh.

2. Objectives

a. General objective

- To determine the clinical profile & ricks factors of children with rickets in a tertiary care hospital.

b. Specific objectives:

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

3. Methodology and Materials

The retrospective study was conducted in in Dhaka Shishu (Children) Hospital, Dhaka, Bangladesh during the period from January 2018 to December 2019. Child aged 1-5 years attending in the mentioned with complaints bowing of leg and/or clinical symptoms consistent with rickets were approached. The participant of the study was 124. 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]. Borderline result was considered criteria of exclusion and it was replaced by another consecutive purposive sampling. The child was 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 not like rickets but proof by investigation). 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. Results

In this study among 124 participants 46% were male and the rest 54% were female. So female were dominating in number. In analyzing age of the participants we found, the highest 63(50.81%) participants were from (9-18) months age group. Then 28(28.58) % were from (19-24) months age group, 16(12.90%) were from (25-48) months age group, 15(12.10%) were from (1-8) months age group, 2(1.61%) were from (49-60) months age group. In analyzing the socio-economic status of the participants we found most of the cases were from Dhaka city families which were 99(79.84%) and 25(20.16) % was from outside part of Dhaka city. Besides these 29(23.39%) parents were illiterate, 50(40.32%) parents (At least one: father/mother) were primary level educated, 31(25.00%) were secondary to higher secondary level educated and 14(11.29%) were graduate. On the other hand, 70(56.45%) participants were found from lower class family according to their family income. Then 45(36.29%) were from middle class and only 9(7.26%) were from upper class families. In analyzing the diagnostic findings of the participants we found the highest 96 (77.42%) participants were with nutritional rickets, 17(13.71%) were with non-nutritional rickets and the rest 11(8.87%) were rickets-like diseases. Infant of maternal vitamin D deficiency were 12(9.68%) of (1-2) months of infant came with convulsion. Which are investigated and diagnose. the investigation show that low ca+ level, low 25(OH) D level, high PTH level. Those mothers we are investigated, ca+ level, 25(OH) D level, PTH level which shows ca+ level normal, low 25(OH)D level, high PTH level. In analyzing the spectrum of presentation of children with both the nutritional and non-nutritional rickets we found, 31(25.00%) participants were with bow leg whereas,4(3.23%)were with knock knee, 13(10.48%) were with sabre tibia. On the other hand, as upper limb deformities we found 36(29.03) % with swelling and/or widening wrists. We also found head findings 2(1.61%) with craniotabes and 7(5.65%) with wide anterior fontanelle. Besides these, as other deformities we found 8(6.45%) with rib beading, 4(3.23) % with pectus carinatum, 9(7.26%) with delayed growth and 10(8.06%) with delayed dentition. In last analyzing the ricks factor of rickets Low sunlight intake (sun light explorer) were 94(75.81%), Infant of maternal vitamin D deficiency were 12(9.68%), Industrial area were 1(0.81%), Rural area were 5(4.03%), Urban area were 9 (7.26%)and low socio-

economic condition were 3(2.42%).

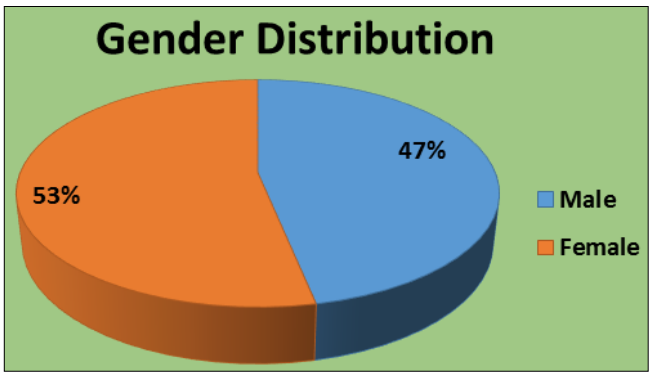

Fig 1: Gender Distribution of the Participants (N=124)

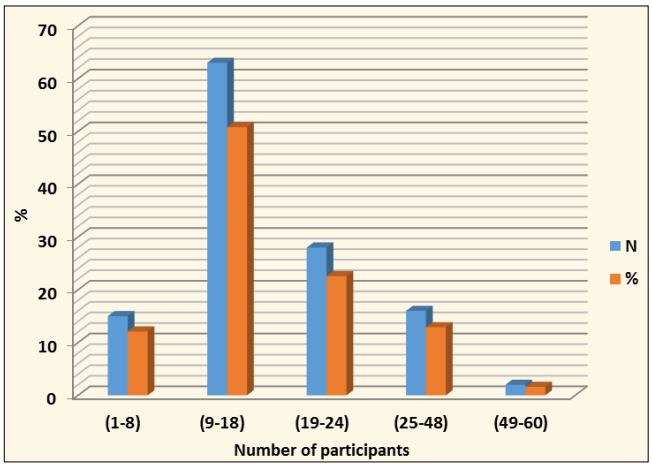

Fig 2: Age Distribution of the Participants (N=124)

Table 1: Socio-economic characteristics of children with rickets (N=124)

Variables	N	%
Residence		
Dhaka city	99	79.84
Outside Dhaka city	25	20.16
Education of Parents		
Illiterate	29	23.39
Primary	50	40.32
SSC-HSC	31	25.00
Graduate	14	11.29
Economic Status(family)		
Lower	70	56.45
Middle	45	36.29
Upper	9	7.26

Table 2: Diagnosis of participants with rickets (N=124)

Types of Rickets	N	%
Nutritional rickets	96	77.42
Non-nutritional rickets	17	13.71
Rickets like disease	11	8.87

Table 3: Spectrum of presentation of children with rickets (N=124)

Presentation		n	%
Lower limb deformity	Bow Leg	31	25.00
	Knock knee	4	3.23
	Sabre Tibia	13	10.48
Upper limb deformity	Swelling-widening wrist	36	29.03
Head findings	Craniotabes	2	1.61
	Wide Anterior Fontanelle	7	5.65
Other deformity	Rib beading	8	6.45
	Pectus Carinatum	4	3.23
	Delayed Growth	9	7.26
	Delayed Dentition	10	8.06

Table 4: Risks factors of rickets among participants (N=124)

Ricks factors of Rickets	N	%
Low sunlight intake	94	75.81
Infant of maternal vitamin D deficiency	12	9.68
Industrial area	1	0.81
Rural area	5	4.03
Urban area	9	7.26
Low Socio-economic condition	3	2.42

5. Discussion

The aim of this study was to determine the clinical profile & ricks factors of children with rickets 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. 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 124 cases of rickets and found 77.42% cases of nutritional deficiency rickets. In all of them, 25-hydroxy vitamin D [25(OH) D level] 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]. 25-hydroxy vitamin D [25(OH)D level] level was with in 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]. 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 female children in this study. In analyzing the spectrum of presentation of children with both the nutritional and non-nutritional rickets we found, 31(25.00%) participants were with bow leg whereas, 4(3.23%) were with knock knee, 13(10.48%) were with sabre tibia. On the other hand, as upper limb deformities we found 36(29.03) % with swelling and/or widening wrists. We also found head findings 2(1.61%) with craniotabes and 7(5.65%) with wide anterior fontanelle. Besides these, as other deformities we found 8(6.45%) with rib beading, 4(3.23) % with pectus carinatum, 9(7.26%) with delayed growth and 10(8.06%) with delayed dentition in our study. However, Karim [23]. 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 these 29(23.39%) parents were illiterate, 50(40.32%) parents (At least one: father/mother) were primary level educated, 31(25.00%) were secondary to higher secondary level educated and 14(11.29%) were graduate. 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 [23]. Because,a Nigerian study found significantly higher education years in fathers of rachitic children [26]. Majority of the families were running on a monthly deficit budget. A similar finding was reported by Karim and his colleagues [23]. Further carefully designed studies are needed to establish low socio-economic status as a factor of nutritional deficiency rickets. Nutritional rickets is the commonest sub type of rickets. In ours study 'nutritional rickets' are found 70% to 80% (77.42%) 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. In ours study nutritional rickets' are found 70% to 80% (77.42%) 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.

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