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Risk Factors of Nutritional Rickets among Children Under-five Years of Age

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Abstract

Purpose: Rickets is one of the most common diseases of childhood and is more prevalent in the developing countries. It affects the rapid growth phase of the children. Rickets is affected by different factors which are understudied in Pakistan. This study aimed to identify the risk factors that lead to rickets in children under five years of age among diagnosed cases of the nutritional rickets. This may cause reduction in the incidence of the rickets by prevention of the factors that lead to rickets in the children.

Methodology: This descriptive cross-sectional study was performed in the pediatric outpatients department of the Holy Family Hospital, Rawalpindi, Pakistan for 1 year from June 2021 to June 2022 on 132 diagnosed cases of the nutritional rickets. Patients were enrolled via non- probability convenient sampling technique and a set developed inclusion and exclusion criteria. Data was collected through self-structured questionnaire after taking informed consent. Data analysis was done through SPSS version 25.

Findings: Nutritional rickets was more common among children who had, age range from 1 to 3 years group (64.39%), male gender (68.94%), lower socioeconomic status (55.30%), exclusive breastfeeding (70.45%), cow's milk use (71.96%), no sunlight exposure (66.67%), shorter duration of sunlight exposure (57.58%) fully dressed during sunlight exposure (40.90%), no oil massage during sunlight exposure (63.30%), poor nutritional status (72.73%), and mothers with poor nutritional status (69.70%). In short, age group with range 1 to 3 years, male gender, lower socioeconomic status, exclusive breastfeeding, cow's milk use, no sunlight exposure, shorter duration of sunlight exposure, fully dressed during sunlight exposure, no oil massage during sunlight exposure, child poor nutritional status, and mothers with poor nutritional status, all raise the of the nutritional rickets in children of under five years age.

Recommendations: Supplements should be added in the diet of children during breastfeeding. Also, there should be adequate sunlight exposure of children. Finally, malnutrition of both children and mothers should be treated.

Keywords: *Risk, factors, nutritional rickets, pediatric, age, tertiary, care, hospital.*

Introduction

Nutritional rickets is a disease of childhood in which delay or failure of growth of long bones occur due to lack endochondral calcification of the growth plates of the bones. Rickets is characterized by widening and spraying of metaphysis of the bones which lead to enlargement of the wrist joint, costochondral junction of ribs, knock-knee, and bowed legs.[1] Nutritional rickets is one of the common diseases of the childhood. Its prevalence is high all over the world, however, its more common in the developing regions of the world such as Africa, Asia, and Middle East. The prevalence of it in the South Asia is reported about 15-18%. Its prevalence in the Africa is 10%.[2]

Rickets could lead to versatile complications such as delay in the achievement of the developmental milestones, bone deformity, pathological facture, pain, risk of falls, difficult labor, infection, growth retardation, and short height.[3,4] These all complications of rickets cause overburden on the health system of the countries especially on the limited resources of the developing countries. There are different reasons for nutritional rickets in the various regions of the world. However, the most common causes are vitamin d deficiency, low calcium, and low phosphate. Vitamin d deficiency could be due to malnutrition, lack of sunlight, complete covering of children during sunlight exposure, pollution, and regional difference.[5] Some studies have reported other causes of nutritional rickets as well which include exclusive breastfeeding, no intake of supplements, use of cow's milk, mothers' poor nutritional status, and low socioeconomic status.[2,6,7]

Although many studies have been conducted around the world to assess the risk factors of the nutritional rickets.[5,6,7] However, the risk factors of the nutritional rickets are under-studied in the Pakistan especially in the region of Rawalpindi. Therefore, this study aims to determine the risk factors of the nutritional rickets among the children in Holy Family Hospital of Rawalpindi. Identification of those factors may help us to prevent rickets in the children and that could further lead to decrease in the burden on the people and health sectors.

Material and Methods

This descriptive cross-sectional study was conducted at the Pediatric outdoor patients department of Holy Family Hospital on diagnosed patients of the nutritional rickets for one year from June 2021 to June 2022. Clinical diagnosis of rickets was made by presence of any of three features from these following five features age< 5years, length/height-for-age z-score <-2, leg pain/bow legs/knock-knees, wrist enlargement, and costochondral enlargement. A total of 132 patients who were enrolled in the study with through non-probability convenient sampling technique and a set of established inclusion and exclusion criteria. Only those patients who had, age between 1 year to 5 years, no chronic liver disease, no chronic kidney disease, and no history of anticonvulsant medicine were included in the study, whereas, patients who had, age less than 1 year or above 5 years, chronic kidney disease, chronic liver disease, and history of anticonvulsant were excluded from the study. A self-structured questionnaire was used to collect information about the demographic details and potential risk factors for the nutritional rickets in participants. Demographic details included age group in years (Above 1 to up to 3 years or above 3 to less than 5years), gender (boy or girl), and socioeconomic status based on monthly income parents (lower class= less than 25,000 Pkr, middle class= 25,000 to 100,000 Pkr, upper class= above 100,000 Pkr). Potential risk factors included exclusive breastfeeding (yes or no), cow's milk use (yes or no), lack of sunlight exposure (yes or no), duration of sunlight exposure in minutes (less than 10

minutes, 10 to 20 minutes, or above 20minutes), dressing during sunlight exposure (undressed, partially dressed, or fully dressed), oil massage during sunlight exposure (yes or no), nutrition status of children (poor or good), and mother nutritional status (poor or good). Before the collection of data objectives of the studies were explained to the parents of the children and informed consent was obtained.

After data collection, data analysis was done through SPSS version 25. Descriptive statistics were applied. Frequencies and percentages of the qualitative variables were calculated, while means were calculated of the quantitative variables.

Results

From the total of 132 participants of the study 91(68.94%) were boys, while 41(31.06%) were girls. The mean age of the study population was 2.70 with SD (standard deviation) of±1.64years. Table 1 describes that the nutritional rickets was more prevalent among the patients who had, lower age group, male gender, and lower socioeconomic status in contrast to those who had, higher age group, female gender, and higher socioeconomic status respectively.

Table 2 shows that the nutritional rickets were more common in the patients who had, exclusive breastfeeding, cow's milk use, no sunlight exposure, sunlight exposure for shorter duration, dress on body, no oil massage during sunlight exposure, poor nutritional status, and mothers with poor nutritional status in comparison to patients who had, no exclusive breastfeeding, no cow's milk, sunlight exposure for longer duration, no dress on body, oil massage during sunlight exposure, good nutritional status, and mothers with good nutritional status respectively.

Table 1: Socio-demographic characteristics of the study population.

Variable	Frequency	Percentage
Age group		
Above 1 to up to 3 years	85	64.39%
Above 3 to less than 5 years	47	35.61%
Gender		
Boy	91	68.94%
Girl	41	31.06%
Socioeconomic status		
Lower	73	55.30%
Middle	44	33.33%
Upper	15	11.37%

Table 2: Frequency and percentages of the risk factors in the study population.

Variable	Frequency	Percentage
Exclusive breastfeeding		
Yes	93	70.45%
No	39	29.55%
Cow's milk use		
Yes	95	71.96%
No	37	28.04%
Sunlight light exposure		
Yes	44	33.33%
No	88	66.67%
Duration of sunlight exposure		
Less than 10 minutes	76	57.58%
10 to 20 minutes	45	34.10%
Above 20 minutes	11	8.32%
Dressing during sunlight exposure		
Undressed	33	25.0%
Partially dressed	45	34.10%
Fully dressed	54	40.90%
Oil massage during sunlight exposure		
Yes	48	36.37%
No	84	63.63%
Child nutritional status		
Good	36	27.27%
Poor	96	72.73%
Mother nutritional status		
Good	40	30.30%
Poor	92	69.70%

Discussion

This study has provided significant information about the risk factors of the nutritional rickets in the children. In first step of the data analysis, it was noted the role of socio-demographic factors in the development of the rickets in the children and it was found that nutritional rickets was more common among the children with age range from 1 year to 3 years (64.39%). Similar results were also presented in a study that was conducted in Lahore, Pakistan.[2] Another study that was carried out in Eastern Ethiopia also showed high prevalence of rickets in same age group.[4] About the gender difference in the prevalence of the nutritional rickets, in this study high prevalence of rickets was noted in the male children (68.94%). Higher prevalence of rickets in male children was also observed in another study.[8] Lower socioeconomic status was also found a major risk factor for nutritional rickets in this study. Similar role of lower socioeconomic status was noticed in a study that was conducted in Kenya.[9]

In next step of data analysis, it was assessed that how different potential risk factors affects incidence of the nutritional rickets in children. The exclusive breastfeeding and cow's milk use were found to cause higher incidence of nutritional rickets and consistent findings were noted in some other studies.[2,8] Sunlight exposure of adequate duration with proper exposure of body and oil massage during sunlight exposure was found protective against nutritional rickets. Whereas, the lack of sunlight exposure, sunlight exposure of shorter duration, fully dressed body of child during sunlight exposure, and no oil massage during sunlight exposure were found to raise the nutritional rickets in children. Similar results about the role of sunlight in the prevention of nutritional rickets has been noted by many studies.[4,10,11]

Role of children and mothers' nutritional status was also noted in the development of the nutritional rickets. In this study it was observed that poor nutritional status of children and mothers were also found to predispose children to the nutritional rickets. Similar results about the role of nutritional status were noted by other studies in different parts of the world.[4,8,9] Although this study has highlighted the risk factors of the nutritional rickets in children, however, it has some limitations as well such as cross-sectional design of the study that was used in this study and small sample size. Because of cross-sectional study design of the study we could find the temporal relationship between the nutritional rickets and its risk factors in this study, therefore, further research is needed to find the causal association between the nutritional rickets and its risk factors in children.

Conclusion

This current study results indicates that nutritional rickets occurs more commonly among the children with age group with range of 1 to 3 years, in male children, and children with lower socioeconomic status. The major risk factors for the nutritional rickets in the study population were exclusive breastfeeding, cow's milk use, lack of sunlight exposure, sunlight exposure with shorter duration, sunlight with fully covered body during sunlight exposure, no oil massage during sunlight exposure, poor nutritional status of children and mothers. Health authorities should educate the parents about the risk factors of the nutritional rickets and about the methods for the prevention of the rickets in their children. This would lead to better development of the children and consequently it would bring down the economic burden of rickets on parents and hospital especially in the countries with limited resources for health.

Recommendations

The study recommend that supplements should be added in children diet during breastfeeding. Also, proper and adequate sunlight exposure should be given to the children. Finally, malnutrition should be treated of both children and mothers.

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