ORIGINAL ARTICLE

Clinical and Biochemical Profile of Nutritional Rickets in Infants: A Study from Peshawar

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ABSTRACT

Objective: To determine the factors associated with nutritional rickets among infants in Peshawar and its surrounding.
Methods: This descriptive cross-sectional study was conducted at Khyber Teaching Hospital Peshawar, Pakistan among mothers and their infants. Clinical and biochemical examination of all infants were performed.
Results: A total of 65 infants were included. There were 42 (65%) infants from urban while 23 (35%) cases from rural areas. Out of 65 cases, 47 (72%) were breast feeding and none of them (0%) benefited by sunlight. Among these 47 breastfed infants, 42 (89%) had lactating mother those were malnourished and only 5 (11%) nutritional rickets were found in breast feeding infants of nourished mother. Radiological abnormalities of rickets were found in 23 (55%) infants of malnourished mother and none in nourished mother.
Conclusion: Nutritional Rickets is prevale nt problem among infants and a great risk in those who along with their malnourished mothers are deprived exposure to sun shine.

Key words: Nutritional rickets, breast feeding, malnourished, sun exposure.

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INTRODUCTION

Nutritional deficiency is a major cause of nutritional rickets in children and vitamin D as well as calcium is important for the normal growth of bone.[1] Rickets in children can b reversible upon treatment with vitamin-D and calcium.[2] Rickets received great attention as a clinically important nutritional disorder in Europe after the first world as the after of industrialization and resultant urbanization.[3] High incidence of rickets in Asian, particular Pakistani Immigrants living in UK has been mentioned in several studies.[4] Rickets was common in neonate of mother having osteomalacia and pelvic deformities. It is observed that rickets is mainly due to dietary deficiency and parameters such as food taken, pre-mature baby, environments, and nutrition of mother.[5]

Rickets is seen in women who keep themselves covered.[6] In Libyan children it is found that rickets problem originated due to avoidance of sunlight.[7] Low socio-status, family history, low food taken by mother, low sunlight and breast feeding for long period were considered as Possible causes in Sudanese children (aged 3 months to 7 years) with rickets[8]. In children the importance of vitamin D as a widely prevalent nutritional deficiency need to be recognized and effective strategies for prevention evolved.[9,10] In developed state of the world, rickets is also considered as a major problem of their peoples.[11-13] In developed countries like Europe and United State, rickets disease is treated by the supplementation of vitamin D.[14]

METHODS

This descriptive cross-sectional study was conducted at pediatric outpatient door and unit, Khyber teaching hospital Peshawar, Pakistan. A Performa was used to record the history of rickets patient. All consecutive infants of either gender were included. Demographic characteristics such as age, weight and height of each participant was measured.

Clinical examination of the rickets patients was based on the following observations. Anterior fontenolla, fontal bossing, craniotabes, rachitic rosary, broad wrist, harrison sulcus, caput quadratum, pigeon chest deformity, anterior curvature of sternum, depression above the sub costal margin, bow legs or knock knees, short stature, widening of ankles. X-ray was carried out to examine the bone abnormalities in wrist.

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The blood sample (5ml) from dorsum of hand in infants was collected and analyzed for calcium, phosphorus and alkaline phosphates. Blood sample was transferred immediately to centrifuge tube and centrifuged it at 3000 rpm for 5 minute and serum was obtained. Each serum was appropriately labeled and analyzed. The spectrophotometer 4010 was used for the analysis of serum sample.

RESULTS

A total of 65 infants suffered with nutritional rickets were examined, taken from pediatric outpatient door and unit, Khyber teaching hospital Peshawar. Analyses of data shows that out of total 65 infants, 42 (65%) were males and 23 (35%) were females. The urban distribution was 47 (72%) and rural was 18 (28%). (Table 1)

Table 1: Gender & geographical distribution of rickets in Infants

Groups	Number	Age (months)	Sex		Geographical distribution	
			Male	Female	Urban	Rural
Group-I	47	7.4	29	18	34	13
Group-II	18	12	13	05	13	05
Total	65	9.7	42	23	47	18
(%)			(65)	(35)	(72)	(28)

Group-I; Breast feeding
Group-II; Non breast feeding

The mean age was 8.78 ±2.71 months, height 0.62±0.05 meters, weight 6.8 ±1.67kilograms and biochemical parameters such as calcium 9.1± 0.56 mg/dl, phosphorus 3.2 ± 0.63 mg/dl which were significant (P<0.05) and alkaline phosphatase 793 + 200 u/l which was highly significant (P<0.001). (Table 2)

Table 2: Physical & biochemical level of breast / non breast feeding infants

Groups	Number	Weight (kg)	Height (m)	Calcium (mg/dl)	Phosphorus (mg/dl)	Alkaline Phosphatase(u/l)
Group-I Mean+SD	47	6.22±1.50	0.60±0.04	9.2±0.52	3.3±0.56	756±165
Group-II Mean+SD	18	8.58±0.41	0.67±0.03	9.07±0.67	3.08±0.80	889±252
Total Mean+SD	65	6.8±1.67	0.63±0.05	9.1±0.56	3.2±0.63	793±200

Group-I; Breast feeding
Group-II; Non breast feeding

All the infant patients were categorized into two group, group-I (breast feeding) & group-II (non breast feeding).

In group-I, 29 (62%) were male and 18 (28%) were females. Urban to rural ratio was 34 (72%) urban and 13 (28%) respectively. The mean age of this group was 7.5±2.16 months, height 0.61 ±0.04 meters and weight 6.22±1.50 kilogram. Serum level of calcium, phosphorus were found 9.2±0.52 and 3.3±0.56 (mg/dl) respectively with the increased of ALP (756±165 u/l) & none of them benefited by sun light. Among group-I, 42 (89%) breast feeding infants having malnourished mothers and 05 (11%) having nourished mother. (Table 3)

Table 3: Effect of sun light and maernal diet on breast feeding infants

Groups	Number	Yes	No	Malnourished	Nourished	Yes	No
Group-I (%)	47 (72)	47 (100)	-	42 (89)	05 (11)	-	47 (100)
Group-II (%)	18 (28)	-	18 (100)	8 (44)	10 (56)	-	18 (100)

Group-I; Breast feeding
Group-II; Non breast feeding

Both nourished and malnourished mothers were deprived from exposure to sun shine. Out of 42 infant patients, 23(55) had radiological abnormalities in their wrist x–rays and the mean calcium (9.1±0.54) and Phosphorus level (3.2±0.56 mg/dl) with ALP (658±6.27 u/l). While in 05(11) infants of nourished mother having no radiological abnormalities and mean calcium was found 9.5±0.04, phosphate value 3.8±0.11(mg/dl) and ALP level 658±6.27 u/l. Result of study shows that breast feeding infants of malnourished mother had significant (P<0.05) more biochemical abnormalities as compared to infants of nourished mother. (Table 4)

Group-II was consist of 13 (72%) males and 05 (28%) females infants, out of which 13 (72%) were belonged to urban and 05 (28%) from rural areas. The mean age of this group was 12±0.00 months, height 0.67±0.03 meters, weight 8.57±0.40 kilogram, calcium 9.0±0.667 mg/dl, phosphorus 3.08±0.80 mg/dl and alkaline phosphatase 889±252 u/l.

Table 4: Comparison of biochemical levels among infants having malnourished and nourished mother

Groups	Radiological abnormalities	Biochemical finding		
		Calcium (mg/dl)	Phosphorus (mg/dl)	Alkaline Phosphatase(u/l)
Group-I (MNM) Mean+SD	23	9.1±0.54	3.2±0.56	768±171
Group-I (NM) Mean+SD	(55)	9.5±0.04	3.8±0.11	658±6.27
P value	-	P<0.05	P<0.05	P<0.05

Group-I; Breast feeding
MNM = Malnourished Mother, NM = Nourished Mother,
Normal value: Calcium = 9.5 – 11 mg/dl, Phosphorus = 4 – 7 mg/dl,
Alkaline Phosphatase = < 645 u/l

DISCUSSION

This study was design to determine the prevalence of nutritional rickets among infants in Peshawar belonging to urban and rural areas including both male and female sexes. This study revealed that nutritional rickets is common among infants. It is evident from the fact that large number of infants having nutritional rickets registered in single pediatric unit of Khyber teaching hospital Peshawar. Rickets in children due to imbalance of calcium and phosphorus metabolism occur by vitamin D insufficiency.[15]

Rickets is diagnosed by clinical examination which was spotted by abnormal biochemical level of calcium, phosphorus and alkaline phosphates. Results in series of studies suggested that rickets was attributed to vitamin-D deficiency and correlated with sunlight.[16] Wrapping the children by warm cloths denies the baby exposure to sun light[17], as well as the mother of these babies who also spend most of their times indoor in pardah may be deficient in vitamin D.[18] It was found in nineteen century that vitamin D which is helpful for curing rickets, produced in skin and food through the action of ultraviolet radiation.[19] Supplements containing vitamin D play important role for children having pigmented skin and whose residence location are inside the congested city.[20,21] Exposure to sunlight and vitamin D supplements are economical source and necessary for the eradication of rickets problem in infants and children.[22-24] Sun exposure is important for Pregnant, lactating mothers as well as for their infants for vitamin D synthesis by skin.

Analysis of our data showed that in both group breast feeding infants and non-breast feeding infants were deprived of sun exposure. Majority of them from urban area that was living in multistory buildings in congested area of city where sun light could not reached. On the other hands were rural where mother restrict herself in pardah and keep their babies warm by wrapping in cloths resultantly avoid them from sun light. Bone disease of children and adults can be curing by given milk and vitamin D supplements.[25] It was found that vitamin D deficiency occur in infants and in breast feeding mother, predominantly, those belonging to the upper socio-economic class.[26,27] Breastfed infant born of mother having insufficient vitamin D store and rickets may subsequently develop if these infants are not exposed to sunlight or do not receive supplementary vitamin-D.[28] Many of the lactating mothers are suffering from occult osteomalacia.[29] Vitamin D deficiency rickets is resulting from lack of exposure to sun light and inadequate dietary intake.[30] Mother milk is very important for infants from nutritional aspect and its quantity is directly related to status of vitamin D in mother.[31] Infants are at risk to rickets problem those who do not intake the supplements of vitamin D. Rickets problem is reported in infants of Middle East and Africa due to avoidances of sun light and lack of calcium as well as phosphorus intake.[32]

Maternal diet and maternal sun shine exposure are play important role and necessary for the health of breast feeding infants. The fact proved by the data of this study that breast feeding infants having malnourished mother had significant ($P<0.05$) more biochemical abnormalities as compared to infants of nourished mother. The malnourished status of mothers are due to poor dietary intake and deprived exposure to sun light by indoor activities keeping themselves covered from head to with clothes.

CONCLUSION

Nutritional Rickets is common problem among infants and a great risk in those who along with their malnourished mothers are deprived exposure to sun shine.

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