

# STUDY OF RICKETS IN ADMITTED PATIENTS AT LADY READING HOSPITAL, PESHAWAR

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## ABSTRACT

**Objective:** A survey of rickets in Postgraduate Medical Institute, Lady Reading Hospital Peshawar and to pinpoint the cause.

**Material and Methods:** This study was carried out in children A unit, Postgraduate Medical Institute Lady Reading Hospital, Peshawar from September 1998 to August 2001. During the three years period 300 cases were included in the study. Total number of admitted patients during three years period were 10161.

**Results:** Frequency of Rickets was found to be 2.25%. 198(66%) patients were less than one year of age, 72(24%) were of 1-2 years age, 18(6%) were of 2-3 years old and 12(4%) patients were above 3 years age. Rickets was predominant in less than one year age group. 192(64%) patients were male and 108(36%) were female patients. Male to female ratio was 1.77:1. Rickets was predominant in male children. 228(76%) patients were of low socioeconomic group, 54(18%) were of middle and 18(6%) patients were of high socioeconomic group. Rickets was predominant in low socioeconomic group. 162(54%) patients belonged to urban areas and 138(46%) patients were of rural areas of different districts of NWFP. 144(48%) patients were malnourished, and 120(40%) patients were associated with acute respiratory infections(ARI), 78(26%) were associated with gastroenteritis, 30(10%) were associated with hypocalcemic fits, 24(8%) had with meningitis, 21(7%) were associated with various other diseases. Rickets was commonly found in malnourished children. 273(91%) patients had nutritional rickets and 27(9%) had of non nutritional rickets in our study. In these 300 children of rickets, 273(91%) patients responded to treatment with vit.D3 and 27(9%) patients were resistant to treatment with vit. D3.

**Conclusion:** It is clear that in our province (NWFP) most cases of rickets are nutritional and responsive to vit. D3 treatment.

**Key words:** Rickets, Vit D, Nutritional Rickets.

## INTRODUCTION

Rickets is a metabolic bone disease and is a failure of mineralization of growing bones. The causes of rickets is vit. D deficiency which can result from inadequate diet, insufficient exposure to ultra violet rays of sun or a combination to the two.

Rickets is a common disease in children of tropics and sub-tropical countries especially in low socio-economic families and usually occur in the first two years of life.

It is common in urban localities where houses are multistoried and have little exposure to sun.

Rickets is more common in the period of life with rapid growth e.g preterm babies with a rapid growth, marasmic babies after feeding and rehabilitation and in the infancy.<sup>1</sup>

In spite of good sunshine, rickets is quite common in most of the sunny countries especially in countries where purdah is observed by the females. This along with custom of over-clothing the infants and keeping the infants indoor in order to protect them from extreme of the weather, predisposing young infants to rickets.<sup>2</sup>

Early diagnosis of rickets is difficult because the initial symptoms are un-remarkable. Children developing rickets are often pale, irritable, sleepless and perspire profusely.<sup>3</sup>

The common presenting features are broadening of wrist joints, recurrent chest infections, bone deformities and abnormal gait. There may be cranio-tabes in infants and frontal bossing, ricketic rosary, harrison's sulcus, bow legs or knock knees in older children.

The disturbed metabolism of calcium and phosphorus in Vit. D deficiency results in softening of bones with subsequent bony

deformities. The ricketic children are more prone to infections (mostly chest infections), diarrhea, motor delay and sometimes acute hypocalcemic tetany and convulsions.<sup>4</sup>

Though rickets was known for centuries, it is essentially a modern disease which peaked in the industrial age. "Francis Glisson" gave the first detailed description of the disease early in the seventeenth century.

Though rickets has largely disappeared from the industrial world, it is still found in developing nations most notably in Africa and India.

Nevertheless, especially as urbanization and industrialization expand in poverty, stricken areas, there is a potential for new outbreaks of rickets which needs to be watched.<sup>5</sup>

Rickets seldom kills its victim, but it retards mental as well as physical growth and leaves permanent disabilities if left untreated.

Majority of cases of rickets are responsive to one to two (1-2) injectable dose of Vit. D(600,000 units) i.e stoss therapy. Those cases which are refractory to doses of Vit. D are called non-nutritional rickets.<sup>1</sup>

This study was aimed to study:

- 1)- The prevalence of the disease.
- 2)- The age group commonly affected.
- 3)- The sex ratio of the disease.
- 4)- The economic class most commonly affected.
- 5)- Whether more in urban or rural areas.
- 6)- Association with other disease.
- 7)- Percentage of cases responding to adequate recommended dose of Vit.D.
- 8)- Percentage of cases resistance to adequate recommended dose of Vit.D.

## MATERIAL AND METHODS

This study was conducted at Paediatric "A" unit, Postgraduate Medical Institute Lady Reading Hospital, Peshawar from September 1998 to August 2001. Infants and children admitted in Paediatric "A" unit for various diseases who were having rickets were included in this study.

Patient having features of rickets on clinical ground were thoroughly examined and detailed history taken.

They were investigated radiologically as well as bichemically. Radiographs of wrist and ankle joints were taken initially. If there was any evidence of rickets radiologically, then blood was tested for calcium, phosphorus and alkaline phosphatase level. The diagnosis was supported by biochemical evidence of low phosphorus and raised alkaline phosphatase level. Serum Vit. D level could not be checked due to lack of such facilities at Peshawar.

Rickets was confirmed by the presence of clinical features, characteristic x-rays changes including osteopenia, splaying, fraying and cupping at the lower end of radius and ulna mostly and sometimes at the lower end of tibia and fibula and biochemically by low serum phosphorus and raised serum alkaline phosphatase level.

All confirmed cases of rickets were treated by single intramuscular injection of Vit. D(600,000 units) "Stoss therapy" followed by oral syrup calciostelin. At monthly follow up, again x-rays of wrist and ankle joints were taken and blood was tested for calcium, phosphorus and alkaline phosphatase. The patients who responded to single dose of Vit. D radiologically as well as biochemically were labeled as having nutritional rickets while those who did not respond to single dose of Vit. D were labeled as non-nutritional rickets.

## RESULTS

This study was carried out in children "A" unit, Postgraduate Medical Institute, Lady Reading Hospital, Peshawar, included three hundred children from the age of one month to the age of 12 years. Of these 192 patients were male and 108 patients were female. One hundred and ninety eight (198) patients were less than one year ago group. Eighteen(18) patients were from 2 year to 3 year age group. Twelve(12) patients were of more than 3 year age group. The following results were obtained. The results were concerned with the prevalence of the rickets, the age group commonly affected, the sex ratio of the disease, the economic class commonly affected, comparison of rickets occurrence in urban versus rural areas of different districts of NWFP, association of rickets with other diseases, and number of patients responding to treatment with single dose of Vit. D or refractory to treatment .

In biochemical results of our study, serum calcium was normal in 204 patients(74.72%) while it was below normal in 69 patients (25.26%). The serum inorganic phosphate was below normal in 246 patients(90.10%) while in 27 patients (9.8%) it was nearly normal. The serum alkaline phosphates was within normal limit in 45 patients(16.48%) while it was raised above normal in 228 patients(83.49%).

### BIOCHEMICAL DATA OF 91 CASES OF NUTRITIONAL RICKETS

#### SERUM CALCIUM (Normal range 9-11mg/dl)

| Mg/dl | No. of Cases |
|-------|--------------|
| 7-8   | 30           |
| 8-9   | 39           |
| 9-10  | 180          |
| 10-11 | 24           |

TABLE - 1

**SERUM INORGANIC PHOSPHATE**  
(Normal range 3.5-6.5mg)

| Mg/dl   | No. of Cases |
|---------|--------------|
| 2.5-3.0 | 216          |
| 3.0-3.5 | 30           |
| 3.5-4.5 | 27           |

TABLE - 2

**SERUM ALKALINE PHOSPHATASE.**  
(Normal range 38-138u/l at 37 °C by  
Boehringer Mannheim diagnostica)

| International Units (IU) | No. of Cases |
|--------------------------|--------------|
| 38-138                   | 45           |
| 138-300                  | 114          |
| 300-500                  | 90           |
| 500-1000                 | 15           |
| 1000-1500                | 9            |

TABLE - 3

In this study, 300 cases of rickets were found during the period of September 1998 to August 2001. the total number of admitted patients in children "A" unit during this period were 10161. the prevalence of rickets was calculated i.e 2.95%.

This study included three hundred children of various age group from one month to twelve years. One ninety eight patients were of less than one year, seventy four were of 1-2 year age, eighteen were of 2-3 year of age and twelve patients were more than three years.

Rickets was commonly found in less than one year age group(66%) in our study.

**RATIO OF SEX DISEASE**

| Sex    | Number of Cases |
|--------|-----------------|
| Male   | 192             |
| Female | 108             |

TABLE - 4

Out of 300 children, one ninety two were males and one hundred and eight were female patients.

Rickets was predominant in male children in our study.

The economic class was divided into three groups i.e low, middle and high. Two

**DISTRIBUTION IN DIFFERENT AREAS**

| City                       | Total No. of cases | Urban | Rural |
|----------------------------|--------------------|-------|-------|
| Peshawar                   | 204                | 144   | 60    |
| Kohat                      | 18                 | 6     | 12    |
| Mardan                     | 6                  | 3     | 3     |
| Charsadda                  | 27                 | 6     | 21    |
| Landikotal (Khyber Agency) | 6                  | 0     | 6     |
| Dir                        | 6                  | 0     | 6     |
| Parachinar (Kurram Agency) | 9                  | 3     | 6     |
| Swat                       | 6                  | 0     | 6     |
| Mohmand Agency             | 9                  | 0     | 9     |
| Hungu                      | 6                  | 0     | 6     |
| Bajawar Agency             | 3                  | 0     | 3     |
| Total                      | 300                | 162   | 138   |

TABLE - 5

**DISEASES ASSOCIATION WITH RICKETS**

| Disease            | No. of cases | Percentage (%) |
|--------------------|--------------|----------------|
| Malnutrition       | 210          | 70             |
| ARI                | 120          | 40             |
| Gastroenteritis    | 78           | 26             |
| Hypocalcaemic fits | 30           | 10             |
| Meningitis         | 24           | 8              |
| Tuberculosis       | 21           | 7              |
| Others             | 27           | 9              |

TABLE - 6

hundred and twenty eight patients were of low socio-economic class fifty four were of middle class and eighteen patients were of high socio-economic class.

Rickets was common in low socio-economic class in our study (76%).

In three hundred ricketic patients it was tried to see the response of the patients to single intra-muscular injection of Vit.D<sub>3</sub> 600,00 units (stoss therapy) by regular monthly follow up.

At monthly follow-up, X-rays of wrist and ankle joints were again taken and blood was tested for calcium, phosphorous and alkaline phosphatase.

It was found that 273 patients showed excellent response to single intramuscular injection of Vit. D<sub>3</sub> and labeled them as having nutritional rickets.

#### NUTRITIONAL AND NON-NUTRITIONAL RICKETS

|                                  |     |
|----------------------------------|-----|
| Total number of cases of rickets | 300 |
| Nutritional rickets              | 273 |
| Non-nutritional                  | 27  |

TABLE - 7

This study include three hundred patients. A dose of Vit. D (600,000 units im) was given to every patient. At monthly follow up, twenty seven patients showed no response to treatment as evidence readilogically by no sign of healing in X-ray wrist and ankle joints. Also there was no change in serum concentrations of Ca, P, and alkaline phasphatase and by chemical results were the same as before treatment. And other dose of Vit. D (600,000 units I/M) was given to these nine patients. Again, at monthly follow up, these twenty seven patients failed to show response to 2<sup>nd</sup> dose of Vit. D. They were labeled as having non-nutritional rickets. Of these twenty seven patients, six were with Fanconis syndrome having aminoaciduria, six of age 8 and 12 years were

#### NON-NUTRITIONAL RICKETS IN 300 CASES

| Non-nutritional rickets    | No. of cases |
|----------------------------|--------------|
| Fanconis syndrome          | 6            |
| Genuvalgum (unknown cause) | 6            |
| Cirrhosis liver            | 6            |
| Osteopetrosis              | 3            |
| Muscular dystrophy         | 3            |
| Osteogenesis imperfecta    | 3            |

TABLE - 8

with genuvalgum who were referred to orthopaedic surgeon for surgical correction of deformities, six were with cirrhosis liver. Three were with osteopetrosis, three with muscular dystrophy and three patients were with osteogenesis imperfecta.

## DISCUSSION

The total number of admitted patients during three year period were 10161. Rickets was found to be 2.95%. In study done by Baser E et al 1994<sup>6</sup> showed that prevalence of rickets was 9.8%. Chen Y 1994<sup>7</sup> in his study showed that prevalence of rickets in boys and 4.6% in girls of less than 18 months age. He showed that prevalence of rickets in preterm was 9.4% versus 5.2% in term infants.

In the present study of three hundred cases, it was found that 198(66%) patients were of less than one year, 72(24%) were of 1-2 years age group, 18(6%) were of 2-3 years age and 12(4%) patients were above 3 years age in study done by El-Hag Al et al 1995<sup>8</sup> showed that rickets was 42% in infants of less than one year. Nyakundi PM et al 1994<sup>9</sup> showed in their study 58.6% ricketic patients were below 2 years of age. In study done by Azra Jamal and Ghaffar A. Billoo et al 1996<sup>10</sup> showed that 8(10%) patients of rickets were of less than one year, 30(30.5%) were of 1-2 years age, 22(27.5%) were of 2-3 years, 14(17.5%) were of 3-4 years, 2(2.5%) were of 4-5 years and 4(5%) patients of rickets were more than 5 years.

In other words 60 patients of rickets(75%) were less than 3 years and 20 patients(25%) were above 3 years In their study. In our study 288 patients (96%) were below 3 years and 12 (4%) were above 3 years.

In our study of 300 cases, male to female ratio was 1.77:1. In study done by El-Haq Al et al 1995<sup>8</sup> showed that male to female ratio 1.56:1.

Ekanem EE et al 1995<sup>11</sup> in their study showed that there was no sex preponderance. Similarly Baser E et al 1994<sup>6</sup> found in their study no distinction between males and females. In study done by Azra Jamal and Ghaffar A. Billoo et al 1996<sup>10</sup> showed that male to female ratio was 1.66:1. M.Saeed Akhtar 1992<sup>12</sup> reported in his study that male patients were predominant 54%. I. Ahmad et al 1995<sup>13</sup> showed that male patients were 73% of their study.

In our study of 300 cases, 228 patients (76%) were of low income group, 54(18%) were of medium and 18(6%) patients were of high socio-economic class. Similarly, studies done by Chen Y 1994<sup>7</sup> and Azra Jamal et al 1996<sup>10</sup> concluded that majority of children with rickets belonged to lower socio-economic families. Ekanem EE et al 1995<sup>11</sup> showed in their study that majority of parents of ricketic children belonged to elite and middle class.

In our study of 300 children, more than half were urban dwellers (54%) from different districts of NWFP collectively. In Peshawar district, urban to rural ratio was 2.4:1 which was higher than rest of the districts of NWFP. In other words, most of the patients (48%) belonged to inner Peshawar City in our study. Azra Jamal and Ghaffar A. Billoo et al 1996<sup>10</sup> reported in their study that most of the ricketic patients were resident of New Karachi City and were living in flats. Saleh SM and El-Sherif MA 1993<sup>14</sup> reported in their study that seventy(70%) of ricketic children were living in rural areas.

In our study majority of children were malnourished(70%). Rickets was commonly associated with acute respiratory infections (ARI) (40%), gastro-enteritis (26%), hypocalcemic fits (10%), meningitis (8%), tuberculosis (7%), and 27 patients (9%) were having various other rare diseases. Ekanem EE et al 1995<sup>11</sup> reported in their study that majority of children were well-nourished. Shimles D et al 1994<sup>15</sup> in their study showed that rickets was seen in 37% malnourished children. From the study of Saleh SM et al 1993<sup>14</sup> and Azra Jamal et al 1996<sup>10</sup>, it is evident that rickets was found in majority of malnourished children. Baser E et al 1994<sup>6</sup> showed that rickets was associated with acute respiratory infections(ARI) In 47.62% cases. Azra Jamal et al 1996<sup>10</sup> reported in their study that fifteen percent(15%) ricketic children were having acute respiratory infections(ARI). From the study of M.Saeed Akhtar 1992<sup>12</sup> and Elidhrissy ATH 1991<sup>16</sup>, it is evident that acute respiratory infection was the common infection associated with rickets in 46% and 48% cases respectively. All these reports are quite consistent with the results of our study(40%). Baser E et al 1994<sup>6</sup> reported in their study that association of rickets with enteritis was 29.76%. Azra Jamal and Ghaffar A. Billoo et al 1996<sup>10</sup> reported in their study that forty five(45%) percent of children with rickets presented with diarrhea, I. Ahmad et al 1995<sup>13</sup> reported that sixty five percent(65%) infants presented with hypocalcaemia and convulsion. This higher incidence as compared to our study(10%) may be due to their study done only on infants with seizures.

In our study 273(91%) patients were nutritional rickets and 27(9%) were non-nutritional rickets. In study done by Azra Jamal and Ghaffar A. Billoo et al 1996<sup>10</sup> showed that 74 patients (92.5%) were having nutritional rickets and 6(7.5%) were having non-nutritional rickets. This study is quite consistent with the results of our study.

In biochemical results of our study of 273 cases of nutritional rickets, serum calcium was normal in 204 patients (74.72%) while it was below normal in 69 patients (90.10%) while in 27 patients (9.8%) it was nearly normal. The serum alkaline phosphates were within normal limit in 45 patients (16.48%) while it was raised above normal in 228 patients (83.49%). The study done by Saleh-SM el-sharif 1993<sup>12</sup> showed that hypophosphatemia was a constant finding in his study while serum alkaline phosphatase was below normal in majority of cases. Azra Jamil and Ghaffar A. Billoo et al 1996<sup>10</sup> reported that all cases of their study were having raised alkaline phosphatase which are quite consistent with our study.

One thing we observed in our study that majority of patients belonged to Mohmand tribe who are migrated and settled in different areas of Peshawar City. The cause may be genetic which needs further study. One possibility is that these people belonged to low socio-economic class, illiterate and living in small houses having little exposure to sun light.

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