Introducción

La rickets es una enfermedad del hueso en crecimiento que es exclusiva de los niños y adolescentes. Es causada por la incapacidad de la osteoid para calcificarse en una persona en crecimiento. La Deficiencia de vitamina D ocurre cuando las metabolinas de vitamina D están deficientes. Más comúnmente, la deficiencia dietética de calcio y fósforo puede dar lugar a la rickets. La vitamina D3 (colecalciferol) se forma en la piel de derivados de colesterol en respuesta a la luz ultravioleta B. La luz ultravioleta B o el aceite de hígado de bacalao fue un importante fuente de vitamina D hasta principios del siglo XX cuando se sintetizó la ergosterol (vitamina D2) a partir de sustancias irradiadas de plantas. Durante la revolución industrial, la rickets apareció en forma epidémica en las zonas templadas donde la contaminación de las fábricas bloqueaba los rayos ultravioletas del sol. Por lo tanto, la rickets pudo ser la primera enfermedad del niño causada por la contaminación ambiental.

En Reino Unido, 30% de los inmigrantes de la India subcontinente y el Caribe Occidental fueron diagnosticados con rickets y el número aumentó debido a la exposición insuficiente a la luz solar y la fórmula de lactancia. El suministro de vitamina D rico para los lactantes durante la lactancia y las mujeres en edad reproductiva es esencial. El uso de una dieta rica en vitamina D durante el embarazo puede prevenir la aparición de rickets durante el embarazo y la lactancia. La exposición insuficiente a la luz solar y la dieta rica en vitamina D son factores de riesgo importantes para la rickets. La vitamina D es un factor de riesgo importante para la rickets. La exposición insuficiente a la luz solar y la dieta rica en vitamina D son factores de riesgo importantes para la rickets.
74% when biochemical findings were included in the study [5]. Rickets is quite prevalent in Ethiopia and 41% of children age five year and less than their age and is commonly associated with protein energy malnutrition, infectious diseases of various cause including respiratory tract, anemia, congestive heart failure and gastrointestinal tract risk recurrent diarrhea and mal absorption [6].

**Aim**

The aim of this study is to determine the prevalence of rickets and associated factors in children admitted to Jimma University specialized hospital from May 1, 2010 to April 30, 2013.

**Methods and Materials**

**Study Setting and Participants**

The study was conducted in JUSH pediatric ward which is located in Jimma town, 352 km southwest of Addis Ababa, the capital city, from April 1 to 30, 2014. Retrospective analysis of the patient records was conducted by revising the clinical charts of patients admitted to pediatrics department of JUSH with rickets from May 1, 2010 to April 30, 2013. The source populations are all pediatric patients admitted to JUSH during May 1, 2010 to April 30, 2013 and study populations are all patients diagnosed to have rickets and admitted to the pediatrics department of JUSH during the abovementioned period.

**Data Collection Process**

Chart of patients admitted with rickets at pediatric ward of JUSH from May 1, 2008 to April 30, 2013 were revised to extract relevant data using structured data collection format. Data was collected by trained nurses. The questionnaires contain socio demographic characteristics of the mothers/ care givers and children, dietary habit and clinical factors. The dependent variable was prevalence of Rickets while the independent variables included socio demographic, dietary related and clinical variables.

**Data Analysis**

Data were analyzed using SPSS version 16 statistical software. Chi-square test were used to test the association at 95% confidence interval and P- value of <0.05 was considered as a cut-off point for statistical significance and presented using tables, graph and descriptions.

**Ethical Consideration**

Ethical Clearance was obtained from Ethical Review Committee of Jimma University and Jimma University Specialized Hospital and the confidentiality of the information was kept.

**Results**

**Distribution of Rickets Among Children by Socio Demographic Characteristics**

170 rachitic children who were admitted to pediatric ward of JUSH from May 1, 2010 to April 30, 2013 were studied for prevalence of rickets over a period of three years from 1620 children admitted to pediatric ward revealing about 10.5% prevalence rate. There was no significant sex difference with females 49.4% and males 50.4%. Out of them, 97.6% were within the age range from 3-24 months, while the remaining 2.4% of them were in the age range from 25-59 months of age. No cases were observed in infants under 3 months of age and above 59 months of age. Majority of children were ordered as 4th and 5th birth order 41.8% followed by 2nd and 3rd 33.9% as indicated in Table 1. No rachitic children labeled as the first birth order. The children who were exposed to sunlight were 66(38.8%) and majority of children were exposed sunlight on weekly basis 38(57.6%) followed by 2-3 days/week, 27(40.9%) (Table1).

**Dietary Factors**

A total of 91(58%) were breastfed for one year or less and 66(42%) were breastfed for more than one year. Rickets was also found to be higher among children even with longer duration of breast feeding with X=6.19 and P=0.013. The majority received their complementary feeding after six months 99(58.2%) and the rest 71 (41.8%) received before six months of age. Significant association was found between prevalence of rickets and time of starting complementary feeding with X=24.99 and P<0.001 indicating that early introduction of complementary food has a protective effect against rickets. Significant association was observed between rickets and sun shine exposure status with X=82.4 and p=0.000 indicating rickets is more likely to occur in children with no sun shine exposure. Significant association was observed with X=17.01 and p=0.000 indicating rickets prevalence increases among children as frequency of sunlight exposure decreases (Table 2).

**Table 1:** Distribution of rickets in children by social and demographic characteristics in Jimma University Specialized Hospital, Jimma, South West Ethiopia, April 2014.

| S. No | Variables | Prevalence of Rickets |
|-------|-----------|-----------------------|
|       |           | Frequency | Percentage |
| 1     | Age of children | 3-24 month | 98 | 57.6 |
|       |           | 25-59 month | 72 | 42.4 |
|       |           | total | 170 | 100 |
| 2     | Sex | male | 86 | 50.6 |
|       |           | female | 84 | 49.4 |
|       |           | total | 170 | 100 |
| 3     | Order of the child | 1st | 21 | 12.3 |
|       |           | 2nd and 3rd | 58 | 33.9 |
|       |           | 4th-5th | 71 | 41.8 |
|       |           | ≥6th | 30 | 18.0 |
|       |           | total | 170 | 100 |
| 4     | Exposure to sunlight | yes | 66 | 38.8 |
|       |           | no | 104 | 61.2 |
|       |           | total | 170 | 100 |
| 5     | Exposure frequency | daily | 1 | 1.5 |
|       |           | 2-3 days/w | 27 | 40.9 |
|       |           | weekly | 38 | 57.6 |
|       |           | total | 66 | 100 |
| 6     | Sunlight hours | ≤1 hour | 46 | 70 |
|       |           | >1 hour | 20 | 30 |
|       |           | total | 66 | 100 |

**Citation:** Kenenisa C, Ewnetu H, Sime H (2014) Retrospective Analysis of Prevalence of Rickets and Associated Factors among Children Admitted to Pediatric Ward in Jimma University Specialized Hospital. J Pediatr Neonatal Care 1(7): 00044. DOI: 10.15406/jpnc.2014.01.00044
Distribution of Rickets Among Children with Clinical Conditions

Concerning clinical condition widening of wrist was found in 69% of cases at all age groups and all cases that had craniotabes were under 6 months of age, while the frequencies of other physical signs were variable (Figure 1). As indicated in Table 2 below from the total of 170 studied rachitic children, 58% were also diagnosed to be under weight, while other 23% were marasmic, and other 12% were diagnosed to have kwashiorkor and 34.7% were anemic (Table 3).

Discussion

Nutritional rickets remains a major health problem for children in many regions of country including Ethiopia. Its etiology and pathogenesis is thought to be multi factorial [1]. This study revealed that rickets is prevalent among studied children with prevalence rate of 10.5%. This is almost the same to the result obtained by a case control study conducted in Addis Ababa at Ethio-Swedish children’s hospital [7]. This study found that there is significant association between rickets and sunshine exposure status (p=0.000) in indicating higher prevalence of rickets in children with no sun shine exposure which is comparable with a case control study carried out in Kuwait. This is because vitamin D production in the skin is by product of sun shine exposure [8].

This study also revealed that breast feeding (p=0.000) and duration of breast feeding (p=0.013) were associated with rickets indicating higher prevalence among children who breastfed exclusively and for longer duration. This finding is similar to the result of a study carried out in Vander-berg to assess prevalence of rickets in infant. This can be attributed to that exclusively breast fed children and children breast fed for longer duration are more likely to not feed other sources of Vitamin D like fishes, milk and eggs and also human milk contains a vitamin D concentration of <25IU/L making it a low source of vitamin D [9].

Initiation time of complementary feeding was found to be associated to rickets (P=0.000) indicating less prevalence among children who started complementary feeding early. This coincides with finding from a case control study carried out in

Table 2: Association between prevalence of rickets and different dietary and social factors of children in Jimma University Specialized Hospital, Jimma town, South west Ethiopia, June, 2014.

| S. No | Variables                  | Prevalence of Rickets | X²  | P     |
|-------|---------------------------|-----------------------|-----|-------|
|       |                           | Frequency | Percentage |     |       |
| 1     | Type of breastfeeding     | Exclusive | 138 | 81.2 | 24.99 | <0.001|
|       |                           | Nonexclusive | 32  | 18.8 |       |       |
|       |                           | Total            | 170 | 100  |       |       |
| 2     | Duration of breast feeding| ≤12 months | 76  | 42.0 | 6.19  | 0.013 |
|       |                           | >12 months       | 91  | 58.0 |       |       |
|       |                           | Total            | 170 | 100  |       |       |
| 3     | Start of complementary   | ≤6 months        | 71  | 41.8 | 24.99 | <0.001|
|       |                           | >6 months        | 99  | 58.2 |       |       |
|       |                           | Total            | 170 | 100  |       |       |
| 4     | Exposure to sunlight      | Yes               | 66  | 38.8 | 82.4  | <0.001|
|       |                           | No                | 104 | 61.2 |       |       |
|       |                           | Total            | 170 | 100  |       |       |
| 5     | Exposure frequency        | Daily             | 1   | 1.5  | 17.01 | <0.001|
|       |                           | 2-3/week         | 27  | 40.9 |       |       |
|       |                           | Weekly           | 38  | 57.6 |       |       |
|       |                           | Total            | 66  | 100  |       |       |
Kuwait which reported that early introduction of complementary food has a protective effect against rickets. This can be because of delayed complementary feeding/prolonged breastfeeding may lead to a breast milk dependent child who prefers milk over complementary food which may not be solely adequate as the age of the child increases more than six months. Nevertheless, the exact age at which to introduce complementary food, duration, appropriate frequency, content and factors affecting intake of complementary food are beyond the scope of the current study and requires further investigation [8].

This study also identified that most of rachitic children were presented with widened wrist which is same finding to a systematic nutritional survey carried out in Ethiopia. It may be because of it is easy sign to pick out for it is at periphery although it needs further investigation [6]. Protein energy malnutrition and anemia were identified as common nutritional problems in studied rachitic children which is similar to a case control study conducted at Ethio-Swedish children’s hospital in Addis Ababa that reported infectious diseases, PEM, anemia and congestive heart failure as common associated conditions. This may be due to most identified associated factors like low socio economic status/care taker is also associated with other poor nutritional status of children but its assessment is beyond scope of this study [7].

### Conclusion

This study found that the prevalence of rickets is high. Prolonged exclusive breast feeding, inadequate or absence of sunshine exposure, delayed initiation of complementary food were associated with rickets. Most of the rachitic children studied were presented with widened wrist and frequency for other clinical findings varies. Protein Energy malnutrition and Anemia were some of the nutritional problems identified associated with rickets in studied children.

### Acknowledgements

We acknowledge Jimma University for financing the study. We thank Jimma University Specialized Hospital for providing us the data.

### Conflict of Interests

The authors declare that they have no competing interests regarding the publication of this article.

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Table 3: Distribution of rachitic children by their clinical nutritional status in Jimma University Specialized Hospital, Jimma town, South West Ethiopia, June, 2014.

| S. No | Variables               | Frequency | Percentage |
|-------|-------------------------|-----------|------------|
| 1     | Nutritional status (Anthropometry) |           |            |
|       | Marasmus                | 39        | 23         |
|       | Kwashiorkor             | 21        | 12         |
|       | Marasmic kwashiorkor    | 13        | 7          |
|       | Under weight            | 97        | 58         |
|       | Total                   | 170       | 100        |
| 2     | Anemic                  |           |            |
|       | Yes                     | 60        | 34.7       |
|       | No                      | 110       | 65.3       |
|       | Total                   | 170       | 100        |

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