Original article

Rickets and the knowledge and practice of exposure to sunlight in Jimma town

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Abstract: Six hundred and twenty eight randomly selected children between six and 59 months of age were examined for signs of rickets in Jimma town. Twenty five (4%) children were found to have rickets. The highest rate (11%) occurred in infants. The male to female ratio was 1.27:1. Infants were more likely to have rickets than older children. Rickets was also significantly associated with increased frequency of respiratory infections. There were no significant differences between rachitic and non-rachitic children when they were compared in terms of the maternal or caregivers knowledge and the practice of exposure to sunlight. The possible explanations for such a paradoxical findings are discussed. [*Ethiop. J. Health Dev.* 1998;12(1):29-32]

Introduction

Contrary to general belief, rickets is widely prevalent in many tropical and subtropical regions despite abundant sunshine. Poor living conditions and certain social customs may prevent adequate exposure of children to sunlight. The incidence of rickets is particularly high in slum children who live in crowded houses almost devoid of sunlight (1).

According to a study done in Addis Ababa in the 1960's, 41% of children below three years of age visiting an out-patient department had rickets and the frequency was higher in infants (2). About 7% of under-five children were diagnosed to have Rickets in a more recent review of paediatric admissions in Jimma Hospital (3) and there are indications that it is on the increase (4). However, all studies so far have been from health institutions and the magnitude of rickets in Ethiopia is not fully known (5).

Apart from bone deformities, rickets is associated with increased rates of infections (4,6,7). It also contributes to increased mortality. In a retrospective case-control study done in Addis Ababa, the odds of dying in rachitic patients was found to be about five times higher than that of controls (4). The current study was conducted with the objectives of estimating the prevalence of rickets as part of a nutritional survey in Jimma town. The risk factors for rickets and the knowledge of the mother (caregiver) about preventive measures were also investigated.

Methods

The study was conducted in Jimma town, South-West Ethiopia, between February and April 1995 as part of a nutritional survey.

Two "kebeles" were randomly selected from each of the three "Highers" in Jimma town and census of children 6 to 59 months of age was done. Accordingly, a total of 1901 children were registered. Eight hundred and thirty one households where children in the specified age group live, were randomly selected from the six clusters with probability proportional to size using

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computer generated random numbers. Where more than one under-five children live in the same household the youngest was selected for the study. Out of these 831 children, information was collected on 826.

A pretested questionnaire was administered to parents (caregivers). The data collected included child's and parent's particulars, socioeconomic background, environmental variables, dietary

history, illnesses due to common infections and knowledge and practice concerning exposure to sunlight. A maternal knowledge score was calculated based on the response of mothers (caregivers) to five knowledge questions.

Of the 826 children 669 were brought to the examination sites and these formed the study population. Anthropometric measurements were done by trained medical students. Three paediatricians (including two of the authors) examined the children for signs of rickets. A child was diagnosed to have rickets when two or more of the following clinical signs were present as modified from Robertson I (8): frontal bossing, caput quadratum, wide anterior fontanelle, chest wall deformity, rachitic rosary, wide wrist and double malleoli.

The data were entered into a computer and anthropometric measurements were compared to the NCHS reference using EPI-INFO version 6 soft ware. Data were analyzed using EPI-INFO version 6 and SAS for windows version 6.11. $\times^2$ test was employed to evaluate associations between the selected variables and rickets.

Results

Out of the 669 children who came to the examination sites information concerning the signs of rickets was complete in 628 (response rate = 76%).

Twenty five children (4%) were found to have clinical rickets (Table 1). Almost all (92%) were 36 months old or younger. Eleven percent of infants (6-12 months old) as compared to 2.7% of older children (13-59 months) had rickets ($P < 0.001$). The male to female ratio was 1.27:1.

Factors which may have association with rickets were investigated by comparing children with and without rickets. No significant association was found between rickets and child's sex, with whom the child lives, number of siblings, the type of diet and breast feeding status. Family income and parental literacy were not statistically significant factors.

Birth weight was known in only 141 children. Eighteen percent of the children who started life with low birth weight, compared to 4.6% of those with normal birth weight, were diagnosed to have rickets ($P > 0.05$).

Table 1: **Frequency of signs of Rickets in 25 Children, Jimma, 1995.**

Clinical sign	Number of Patients (%)*
. Wide wrist	24 (96)
. Rachitic rosary	23 (92)
. Wide anterior fontanelle	8 (32)
. Frontal bossing	8 (32)
. Double malleoli	6 (24)
. Caput quadratum	7 (28)
. Chest wall deformity	1 (4)

* Each child does have two or more signs

Using -2 Z-Score as a cut-off-point for weight-for-age, weight-for-height and height-for-age, a high rate of Protein-Energy Malnutrition (PEM) was found in children with rickets; 13 (52%), 4 (16%) and 12 (48%) were underweight, wasted and stunted, respectively. No significant difference ($p > 0.05$) was observed between those with and without rickets (Table 2).

Children with Rickets were more likely to have three or more episodes of respiratory infections per year as compared to normal children (OR = 2.65, 95%CI: 1.01 - 6.83) but the frequency of diarrheal diseases was not significantly associated with rickets.

Table 2: **Anthropometric measurements in Children with and without Rickets, Jimma, 1995.**

	Rickets

Anthropometric measurement	Absent No. (%)	Present No. (%)
Weight for age (N=625)		
< -2 Z-Score	209 (94.1)	13 (5.9)
≥ -2 Z-score	391 (97.0)	12 (3.0)
Weight for Height (N=624)		
< -2 Z-Score	55 (93.2)	4 (6.8)
≥ -2 Z-Score	544 (96.3)	21 (3.7)
Height for age (N=619)		
< -2 Z-Score	211 (94.6)	12 (5.4)
≥ -2 Z-Score	383 (96.7)	13 (3.3)

Missing values not shown.

N.B. p > 0.05 for all the above comparisons.

Table 3: **Sunlight exposure in children with and without rickets, Jimma, 1995.**

	Rickets	
Sunlight exposure	Absent No. (%)	Present No. (%)
Frequency of exposure to Sunlight(N=625)		
. Daily	555 (96.4)	21 (3.6)
. Less Frequently*	43 (91.5)	4 (8.5)
. Never	2 (100%)	0 (0.0)
Condition of clothing during Exposure(N=624)		
. Unclothed/with diapers	527 (96.2)	21 (3.8)
. Partly/Completely covered	72 (94.7)	4 (5.3)

Missing values not shown.

* Less than once per day

N.B. p > 0.05 for all the above comparisons.

Parents (caregivers) reported that all rachitic children were exposed to sunlight, the majority of them daily. Moreover, 19 (76%) children were exposed with no clothes on. There was no significant difference between rachitic and nonrachitic children in the frequency of exposure to sunlight and the condition of clothing during exposure (Table 3).

Table 4: **Knowledge of mother (caregiver) about exposure to sunlight, Jimma,1995.**

Mother's (caregiver's) response to the test (score)	Rickets	
	Absent No. (%)	Present No. (%)
Exposure to sunlight (N=619)		
. Useful (1)	592 (95.9)	25 (4.1)
. Harmful (0)	2 (100)	0 (0.0)
ffect of exposure to sunlight (N=619)		
. Strengthen bones (1)	385 (96.2)	15 (3.8)
. Prevent deformity (1)	66 (97.1)	2 (2.9)
. Strengthen body (0)	84 (93.3)	6 (6.7)
. Keep child warm (0)	6 (100)	0 (0.0)
. Others (0)	47 (97.9)	1 (2.1)
. Do not know (0)	6 (85.7)	1 (14.3)
Age infant need to start exposure to sunlight (N=616)		

. 0-15 days (1)	252 (97.3)	7 (2.7)
. 16-30 days (0)	154 (96.2)	6 (3.8)
. 31-45 days (0)	132 (93.0)	10 (7.0)
. 46 days and above (0)	53 (96.4)	2 (3.6)
Condition of clothing during exposure (N=615)		
. Unclothed/With diapers only (1)	540 (96.3)	21 (3.7)
. Partly/Completely covered (0)	50 (92.6)	4 (7.4)
Fear on exposure to sunlight (N=617)		
. No fear (1)	557 (95.7)	25 (4.3)
. Becomes cold or sick (0)	24 (100)	0 (0.0)
. Evil eyes (0)	9 (100)	0 (0.0)
. Other (0)	2 (100)	0 (0.0)
Maternal Knowledge score* (N=613)		
. 0 - 3	137 (93.8)	9 (6.2)
. 4 - 5	451 (96.6)	6 (3.4)

Missing values not shown.

*The sum of scores in the above five variables. N.B.

$p > 0.05$ for all the above comparisons.

The knowledge of the mother (caregiver) about sunshine exposure was also assessed. Almost all mothers knew that exposing a child to sunshine is useful but 24% did not know what good it will do or had some misconceptions. About 6% had fears in exposing a child to sunlight while 9% preferred to have the child covered during exposure. Nearly 32% believed that a child should be taken outdoors after the first month of life. Twenty four percent scored 3 or less on a knowledge scale of five (Table 4). However, we did not find a significant association between maternal (caregivers) knowledge and rickets.

Discussion

The prevalence of rickets was 4% in Jimma town. The highest rate (11%) occurred in infants (612 months). Earlier reports from health facilities in this country showed a much higher prevalence of rickets (2). The peak occurrence of rickets in infants is in accordance with other studies (2,4). Several studies have shown a male predominance (4,7,9) and an x-linked mechanism is hypothesized (9). In our study the male-to-female ratio is high but the sex difference was not statistically significant.

We have documented the birth-weight only in a small proportion of children. This might have contributed to the lack of significant association between birth weight and rickets.

Our results show a high rate of PEM in children with rickets though the association was not strong. Nevertheless, this finding is in agreement with the observation that rickets does occur in the face of PEM (4,7,10,11).

Contrary to a previous report where nearly half of the rachitic children had been carefully protected against sunshine (2), all rachitic children in this study were reportedly exposed to sunlight, the majority daily and with no clothes on. In our experience a history of exposure to sunlight may be misleading. The child may not have been taken outdoors soon after birth and secondly, mothers quite often give history of sunbathing. On further interview, however, it becomes apparent that the child was not exposed to sunlight frequently enough because of illness, unfavour-able weather conditions and/or poor living conditions.

It is also possible that other factors are at play. Genetic factors have been incriminated in rickets (9). Furthermore, reduced calcium intake and/or absorption from the gut may contribute to the development of rickets (1,10-14). We found an association between respiratory infections and rickets which may suggest a causal role as children are confined indoors during illnesses. Infections could also be complications of rickets (4). However, the possibility of recall bias should be taken into consideration.

The knowledge and practice of exposing a child to sunshine in Jimma town leaves room for improvement. Health education should be aimed at taking babies outdoors daily with no clothes on starting soon after birth. To this end all possible opportunities, i.e. the mass media, antenatal visits, discharge from the nursery and immunization or sick baby visits, should be explored.

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