Protein –Calorie Malnutrition in Children with Vitamin D Deficiency Rickets

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ABSTRACT:

BACKGROUND:

Vitamin D Deficiency rickets(VDDR) had been noticed in children with protein –calorie malnutrition (PCM) in many parts of the world , so we undertook this study to verify the association between the VDDR and PCM in outpatient clinic of a hospital in Baghdad

METHODS:

We assessed120 children with rickets in the outpatient clinic at Fatema AL-Zahra Teaching Hospital nutritionally, clinically, and (&) anthropometrically, and they were compared with 120 nonracktic children as a control.

RESULTS:

We had proved that 46(38.3%) children of the racktic group were malnourished compared to 59(49.16%) malnourished children of the nonracktic group. So we found that the PCM in rachitic children was not significantly different from the PCM in the control group children (p value >0.05).

CONCLUSION:

Vitamin D deficiency rickets occurred as isolated entity related to environmental deprivation of sunlight among children with no supplementary vitamin D, especially the breast fed children whose mothers had Vitamin D deficiency also.

KEY WARDS: Vitamin D deficiency rickets, protein –calorie malnutrition, nutritional rickets.

INTRODUCTION:

Vitamin D deficiency rickets (VDDR) is a term applied to the failure of mineralization of growing bone or osteoid tissue which could be due to either inadequate direct exposure to ultraviolet rays in sunlight or to inadequate intake of vitamin D or both[1,2,3] . The vitamin D content of human milk is low (approximately 22 IU/L). However, among most breast-fed infants, the combination of breast milk and sunlight exposure provides sufficient vitamin D. American Academy of Pediatrics recommends 400 IU per day vitamin D supplementation for breast-fed infants whose mothers are vitamin D deficient or for those infants not exposed to adequate sunlight[4] .The World Health Organization (WHO) estimates that by the year 2015, the prevalence of malnutrition will have decreased to (17.6%) globally , with 113.4 millions children younger than 5 years affected as measured by low weight for age. The majority of these children will live in developing countries. In addition to PCM children may be affected by micronutrient deficiencies , most commonly , iron, iodine , zinc, and vitamin A, while deficiencies of vitamin C, B, and D, have improved in recent years[5,6,7]. It had been noticed that VDDR could occur in unsupplemented breastfed infants who had insufficient exposure to sun light .It had been also noticed that breast milk can lack adequate vitamin D to prevent rickets in purely breastfed infants [8,9]. A high incidence of PCM among children with active rickets had been reported in many parts of the world [10, 11, and 12]. We undertook this study to verify the association between the VDDR and the protein-calorie nutritional status of rachitic children in the outpatient clinic at Fatema AL-Zahra Teaching Hospital in Baghdad.

METHODS:

The study group included 120children of 6-24 months of age .They were diagnosed clinically and radiologically as having VDDR at the outpatient clinic of Fatema AL-Zahra Teaching Hospital over a period of 2 years (June 2004-June 2006) .The clinical diagnosis of rickets was based on the presence of swollen wrists , rachitic rosary ,large anterior fontanel ,caput quadratum & other signs of rickets confirmed by radiological evidence of rickets in the forearm .The body weight were assessed by using Seca scale .The individual weights for age were plotted on the international growth charts of the appropriate sex[12,13] .The weight for age percentages were classified according to Wellcome Group classification of malnutrition [14,15] ,which considers 80% of the expected median weight for age as the entry for malnutrition , this corresponds to the standard third percentile on the international growth charts .The group of below 60% of the expected median weight for age standards without edema was considered marasmic. Children with liver &renal

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diseases were excluded. Data were gathered including child age, sex, method of feeding at the time of study, blood samples were taken from children for investigation of serum calcium, phosphorous, & alkaline phosphatase . The rachitic children were proved to be due to vitamin D deficiency by demonstrating radiological bone healing after 4 weeks after single vitamin D dose (injection). As a control, 120 age matched children, they were healthy children but without rickets were selected from the vaccination clinic, were also assessed anthropometrically in the same way.

RESULTS:

The age distribution of rachitic children were between 6 -24 months , with mean age of 9.3 months .The male to female ratio was1.3 ; 1.The 120 rachitic children were found to be : 94 (78.33%)of them were breast -fed only. 20(16.33%) were fortified bottle fed, 6 (5%) were fed by mixed feeding . The 120 non rachitic children were found to be: 61 (50.83%) children were breast-fed only . 48(40%) were fortified bottle fed. 11(9.16%) were on mixed feeding . The prevalence of breast feeding was significantly higher in rachitic children , as compared to the non rachitic children (p value <0.01). The weights of the rachitic & non rachitic children were plotted on the international growth charts of the appropriate sex ,and we had found that 46 (38.3 %) of the rachitic children & 59(49.16%) of the non rachitic children were below 3rd percentile as shown in figure (1) for girls and figure (2) for boys .By using the Wellcome Group classification of malnutrition we found that 74 (61.66%) of rachitic children were well nourished, 38(31, 66%) were under nourished, & 8(6.66 %) were marasmic . The malnourished (undernourished& marasmic) were about 46(38.3%). We found that 61(50.83%). of the non rachitic children were well nourished, 43(35.83%) were undernourished, & 16(13.33%) were marasmic, so the malnourished were about 59(49.16%). So we found that the PCM in rachitic children was not significantly different from the PCM in the control group children (p value >0.05) .as seen in(table 1). We had classified the nutritional status of children (rachitic & controls) by using the Wellcome Group classification of malnutrition , into 2 age groups below12 months & above 12 months ,as shown in table(2,& 3). Many cases of PCM (27children 58.69%) were in rachitic breast fed children ,who were purely breast fed beyond their 1st year of life ,and we found that there was significant association between the incidence of PCM in the rachitic children and their age (p value <0.05).The mean serum calcium, phosphorous, & alkaline phosphatase levels of the rachitic children were ; 8.2(-/+ 1.5) mg % (normal value 9-11 mg %) ,3.4(-/+ 1.4) mg% (normal value 4.3 – 6.2 mg%) ,270(-/+ 53.4)iu / dl (normal value less than 200 iu/dl), which were consistent with nutritional deficiency rickets.

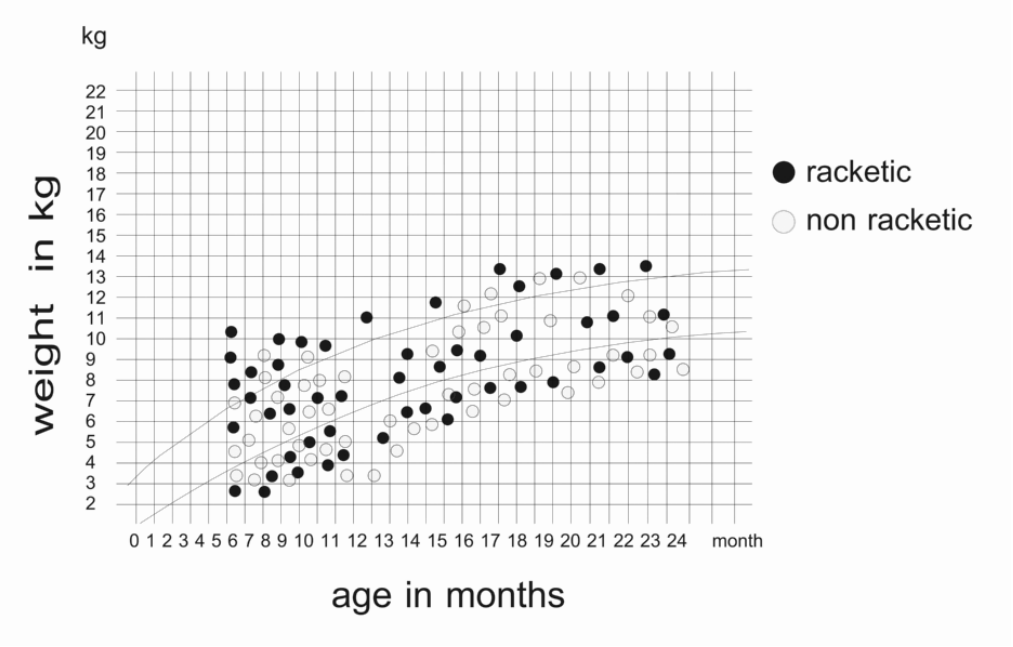

Fig.(1):shows the anutritional status of girls with rickets compared to controls plotted On international growth chart

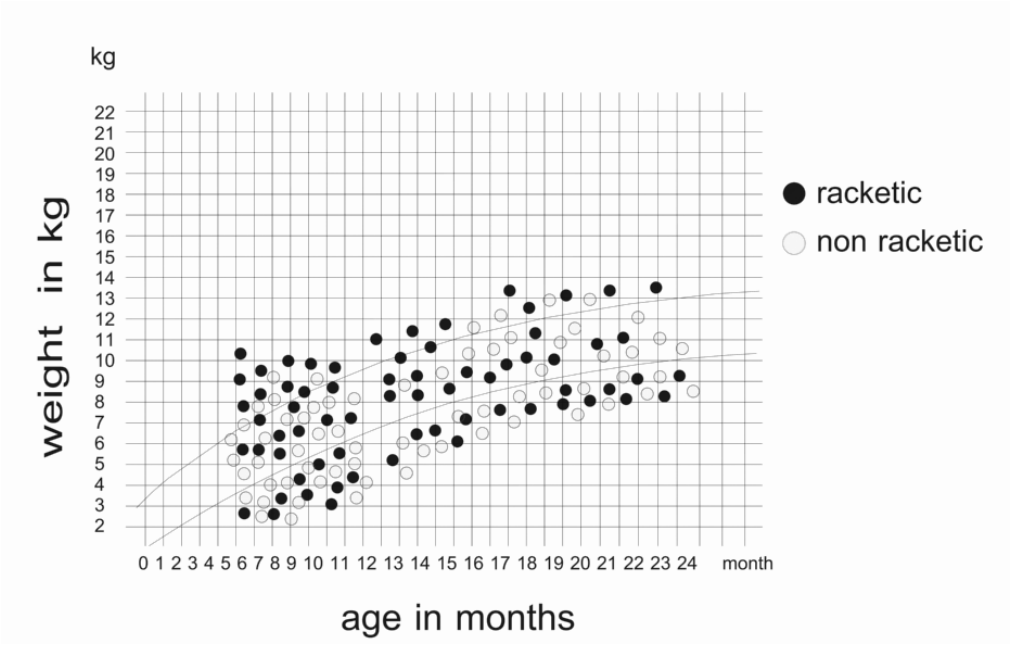

Fig.(2):shows the nutritional status of boys with rickets compared to controls plotted On international growth chart

Table (1): VDDR, malnutrition crosses tabulation;

	With malnutrition	Without malnutrition	Total	P value
Children with VDDR No. %of total	 46 19.2%	 74 30.8%	 120 50%	0.059
Children without VDDR No. %of total	 59 24.6%	 61 25.4%	 120 50%	
Total no. % of total	105 43.8%	135 56.2%	240 100%	

Table (2): Nutritional status of rachitic children , divided into 2 age groups ;
Age below12 months

Sex	Normal (above80%)	undernourished (80—60%)	Marasmic (below60%)
Male	20	8	2
female	15	7	2
Total	35	15	4

Age above 12 months

Sex	Normal (above80%)	Under nourished (80—60%)	Marasmic (below60%)
Male	23	12	3
female	16	11	1
Total	39	23	4

Table (3): Nutritional status of control children divided into 2 age group
Age below12 months

Sex	Normal (above80%)	undernourished (80—60%)	Marasmic (below60%)
Male	18	11	3
female	14	6	4
Total	32	17	7

Age above 12 months

Sex	Normal (above80%)	undernourished (80—60%)	Marasmic (below60%)
Male	17	12	5
female	12	14	4
Total	29	26	9

DISCUSSION:

Researchers comparing a single intramuscular dose (600,000 IU) of vitamin D to a lower daily oral dosage (2,000 IU) for four weeks found that patients who received the intramuscular dose responded promptly without hypervitaminosis, whereas 40 percent of infants who received the oral dosages had no or minimal response[17,18,19] ,that's why we used the single injectable dose of vitamin D. We found that (78%)of the rachitic children were breast –fed only , this finding is consistent with the fact that breast milk can lack adequate vitamin D to prevent rickets [4,8,9,20,21,22,23] . Many cases of PCM were in rachitic breast fed children ,who were purely breast fed beyond their 1st year of life, this could be the result of the continued breast feeding without solid foods supplementation . This result was in agreement with other studies [22,25,26] Both the low vitamin D content of human milk and the decreasing phosphorus concentrations with increasing length of lactation are thought to contribute to the lower bone accretion observed among human milk-fed infants[21,22,23]. We had found that (61.6%)of the rachitic children were well nourished .This finding was lower than in other studies [10,11,12] in which the incidence of PCM were more than (70%)of the rachitic children . Our findings were in agreement with Abdelwahab T.H.Elidrissy [24] , when he found that(84%) of the rachitic children were breast fed &(69%) of them were well nourished. We found that the PCM in the rachitic children was not significantly different from the PCM in the non rachitic children (p value>0.05) .This means that the rickets could occur as an isolated phenomenon related to the lack of exposure to the sun light .This finding is consistent with other studies [20,22,24]. The findings in this study are subject to at least 2 limitations, first we can not estimate level of 25-hydroxyvitamin D in mothers breast milk of breastfed rachitic children & in the rachitic children ,the second was the extent of rickets which was underestimated because the study was limited to the patients who attended the outpatient clinic only .

CONCLUSION:

Vitamin D deficiency rickets occurred as isolated entity related to environmental deprivation of sunlight among infants with no supplementary vitamin D , especially the breast fed infants whose mothers had Vitamin D deficiency also . To prevent rickets in such situations , we recommend more exposure of the breastfed infants & their mothers to sunlight , if this couldn't be achieve , then supplementation of breast fed infants with vitamin D (400 IU/day) ,could be adequate to prevent rickets .

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