

The mean vitamin D intake in diet of all these children ranged between 14-30 IU in different age groups. Breast milk was not considered for calculations due to difficulty of its measurement. Average intake of the breast milk is 400-660 ml in infants past six months of age and children up to 3 years of age(9). Human milk contains <40 IU of the vitamin D per litre(10). Therefore, even after considering the breast milk for calculation, the mean vitamin D intake of these children was much below 40 IU per day.

It is concluded that dietary requirements of vitamin D of under five children in Haryana are very small, i.e., much below 40 IU per day.

REFERENCES

1. Perera WDA, Reddy V. Effect of vitamin D supplements on calcium absorption in children. *Indian J Med Res* 1971, 59: 961-64.
2. ICMR. Recommended dietary intakes for Indians. 1980, pp 32-34.
3. Jeans PC. Vitamin D. *JAMA* 1950, 143, 177-181.
4. Christakis G. Nutritional Assessment in Health Programs: Dietary methodologies. *Am J Public Health (Suppl Nov)* 1973, 63: 11-17.
5. Gopalan C, Ramasastri BV, Balasubramanian SC. Nutritive value of Indian foods. *Indian Council of Medical Research*, 1971.
6. National Academy of Sciences, National Research Council, Recommended Dietary Allowances, 7th edn. 1968, p 24.
7. Joint FAO/WHO expert group on requirements of ascorbic acid, vitamin D, vitamin B₁₂, folate and iron. *WHO Tech Rep Ser* 1970, 452.
8. Singh J. Effect of vitamin D supplementation on the growth of children. M.D.

Thesis, Social and Preventive Medicine, Maharshi Dayanand University, Rohtak, 1988.

9. Someswara Rao K, Swaminathan MC, Swarup S, Patwardhan VN. Protein Malnutrition in South India. *Bull World Health Org* 1959, 20: 603-639.
10. Leerbeck E, Sondergaard H. The total content of vitamin D in human milk and cow's milk. *Br J Nutr* 1980, 44: 7-12.

Screening of Rickets in a Haryana Town

J. Singh
R.K. Marya
A. Sharma

Osteomalacia and rickets are highly prevalent amongst Asian immigrants in the U.K. In Rochdale(1), for example, a survey revealed that 30% of the Asian children and adults had overt rickets or osteomalacia, and 74% of the children and 53% of the adults showed changes in plasma calcium and alkaline phosphates typical of vitamin D deficiency.

Osteomalacia has been reported from Delhi(2), and rickets has been reported from Delhi(3-4), Bombay(5), Nagpur(6), Amritsar(7), Vellore, Poona, etc. However, during examination of children in 'Anganwadis' of Rohtak town (Haryana), it

From the Departments of Social and Preventive Medicine, Physiology and Pediatrics, Medical College, Rohtak.

Reprint requests: Dr. Jagvir Singh, Assistant Director, Epidemiology, National Institute of Communicable Diseases, 22, Shamnath Marg, Delhi 110 054.

*Received for publication September 12, 1991;
Accepted December 16, 1991*

was observed that none of the children was suffering from clinical rickets(8). To confirm this observation, children attending the Pediatric OPD of Medical College, Rohtak were screened for rickets.

Material and Methods

All the children below 5 years age, drawn from various districts of Haryana, attending the Pediatric OPD of Medical College Hospital, Rohtak during six consecutive months (January to June, 1987) were clinically screened for signs of rickets by one of us (AS). The signs of rickets considered were: craniotabes; frontoparietal bossing; enlarged costochondral junctions; wide open anterior fontanelle; thickening of wrists and rachitic deformities.

Children showing any one or more of the clinical signs of rickets were subjected to radiological examination of the wrists and biochemical investigations including estimation of calcium, inorganic phosphate and alkaline phosphatase.

Results

A total of 5400 children (3545 boys and 1855 girls) were screened for clinical evidence of rickets. Only 14 children (12 boys and 2 girls) aged 7 months to 2 years showed slight thickening of wrists. However, radiological examination did not support the diagnosis of rickets in any of them. Two male babies aged 6 and 8 months and exclusively breast-fed suffered from hypocalcemia (serum calcium 8.8 and 7.3 mg/dl respectively). However, no abnormality was detected in serum inorganic phosphate and serum alkaline phosphatase levels in any of the 14 babies investigated.

Discussion

The diet of Indian infants and children

consists primarily of cereals and provides very little vitamin D. Therefore, we in India rely heavily on sunshine as natural source of vitamin D. It has been claimed that the entire requirement of vitamin D can be obtained through exposure to sunlight(9,10). Specker *et al.*(10) have estimated that serum 25-OHD concentrations would be within normal limits in infants who have sunshine exposure 30 minutes per week wearing only a diaper or 2 hours a week fully clothed without a hat. This amount of exposure is not difficult to achieve in India.

A high incidence of vitamin D deficiency in the Asian immigrants in Britain and in some subjects of Delhi and other big cities may be actually related to the lack of availability of sunshine. In U.K., it is due to the cloudy weather during greater part of the year, whereas in industrial towns of India the smoke prevents the penetration of ultraviolet rays.

Increased urbanization affects the sunshine exposure due to large amount of smoke and air pollution, and congested houses situated in narrow lanes. Young children living in such homes may not have enough sunlight. Moreover, the babies may be protected from exposure to sunlight for various cultural reasons, such as wishing to avoid a dark complexion or because of the risk of the "evil eye". In winter the baby may be kept indoor due to fear of "chilly wind". All these factors contribute to decreased endogenous synthesis of Vitamin D.

Rohtak is only 70 km away from Delhi. Dietary and cultural practices are similar in both places. Still rickets has been reported from Delhi by many workers(3,4) while rickets is conspicuous by its absence in Rohtak. Industries and air pollution are not present in Rohtak. There are no

narrow lanes in Rohtak unlike Delhi. The sunlight penetrates to almost all the houses. Therefore, children living in Rohtak with abundant sunshine throughout the year are free from rickets even with low vitamin D intake in diet(11).

REFERENCES

1. Holmes AM, Enoch BA, Taylor JL, Jones ME. Occult rickets and osteomalacia amongst the Asian immigrants population. *Quart J Med* 1973, 42: 125-149.
2. Vaishnava H, Rizvi SNA. Osteomalacia in northern India. *Br Med J* 1967, i: 112.
3. Ghosh S, Bhardawaj OP, Saini L, Varma KPS. A survey of rickets. *Indian Pediatr* 1966, 3: 9-14.
4. Datta Banik ND, Nayar S, Krishnan R, Lila Raj. A study of epidemiologic basis of malnutrition in preschool children in slum areas in Delhi. *Indian Pediatr* 1973, 10: 19-25.
5. Agrawal JR, Sheth SC, Tibrewala NS. Rickets—A study of 300 cases. *Indian Pediatr* 1969, 6: 792-798.
6. Chakravarty A, Sur AM. A survey of rickets at Medical College, Nagpur. *Indian J Child Health* 1957, 6: 333.
7. Manchanda SS, Lal H. The challenge of rickets in Punjab. *Indian J Pediatr* 1972, 39: 52-57.
8. Singh J. Effect of vitamin D supplementation on the growth of children. Thesis for Doctor of Medicine, Social and Preventive Medicine. Maharshi Dayanand University, Rohtak, 1988.
9. National Academy of Sciences. National Research Council. Recommended Dietary Allowances, 7th ed, 1968, p 24.
10. Specker BL, Valanis B, Hertzberg V, Edwards N, Tsang RC. Sunshine exposure and serum 25-hydroxy-vitamin D concentration in exclusively breast-fed infants. *J Pediatr* 1985, 107: 372-376.

11. Singh J, Marya RK, Sood VP, Khanna P. Vitamin D requirements of children in Haryana. *Indian Pediatr* 1992, 29: 208-210.

Platelet Function Tests in Protein Energy Malnutrition

A. Tyagi
J. Chandra
S. Narayan
D. Sharma

Although hemorrhagic manifestations are well described in protein energy malnutrition (PEM), its pathogenesis is not very clear(1). Vascular lesions have been implicated as a causal factor by Bhattacharya *et al.*(2) while coagulation factor abnormalities and presence of disseminated intravascular coagulation are described by others(3,4). Abnormalities in platelet function and thrombocytopenia are also described(1,5).

In these studies, children with acute infections, mostly severe, have been included. Since the presence of infection can cause hemostatic abnormalities(6), it is difficult to attribute the observed defects to PEM. Therefore, we studied platelet functions in children with PEM who did not have active infection.

From the Departments of Pediatrics and Pathology, Lady Hardinge Medical College, New Delhi 110 001.

Reprint requests: Dr. Jagdish Chandra, Department of Pediatrics, Kalawati Saran Children's Hospital, New Delhi 110 001.

*Received for publication September 6, 1990;
Accepted February 20, 1991*