

Should Routine Vitamin D/ Calcium Supplementation be Advocated to Prevent Nutritional Rickets?

Lerch C, Meissner T. Interventions for the prevention of nutritional rickets in term born children. Cochrane Database System Rev 2007; 4: CD006164. First published online: 17 October 2007.

INTRODUCTION

Nutritional rickets is a disease of growing children leading to bone pain and deformities, convulsions or delayed motor development. Developing countries have a high incidence of nutritional rickets; a surge is also being noticed in hitherto low incidence areas. This systematic review aimed to assess the effects of various interventions (vitamin D or calcium supplementation, sunlight exposure or a combination strategy) on the prevention of nutritional rickets in children born at term gestation.

SUMMARY

Four studies enrolling over 1700 participants were included in this systematic review. Of these, 3 studies were randomized controlled trials. Interventions included (i) medicinal vitamin D vs. no intervention ($n=676$; children aged between 3-36 months, Turkey); (ii) medicinal vitamin D vs. placebo ($n=66$; mean age 12.5 years, France); (iii) milk fortified with calcium vs. milk fortified with calcium and cholecalciferol vs. no intervention ($n=757$; mean age 10 years, China); and (iv) vitamin D and calcium supplementation plus nutritional counseling of the parents ($n=229$; mean age 1 month, China). The duration of intervention ranged from 6-24 months. A meta-analysis (statistical method to combine results of these 4 studies) could not be performed due to obvious clinical heterogeneity and limited number of included trials. Vitamin D compared to no intervention resulted in a lower risk of rickets (RR 0.04 [95% CI 0 to 0.71]). The Chinese trial in children up to 3 years of age also showed a lower risk of rickets in the intervention group (RR

0.76 [95% CI 0.61 to 0.95]) compared to no intervention. In two studies conducted in older children in China and France, no case of clinical rickets was documented in either the intervention or the control group. Despite limited availability of sound data and significant heterogeneity in studies, the authors concluded that it is reasonable to offer preventive measures (vitamin D or calcium) to all children up to two years of age especially to high risk children living in Africa, Asia, or the Middle East and migrants from these regions into areas where rickets is not frequent.

COMMENTARY

Are the results valid?

In general, nutritional rickets is the result of either calcium or vitamin D deficiency, or both. The etiology differs with calcium deficiency being the major cause of rickets in Africa and some parts of tropical Asia whereas vitamin D deficiency is responsible for resurgence of cases in North America and Europe(1). Accordingly, there are different strategies for prevention of rickets, including the following: increasing the calcium and/or vitamin D intake, increasing the endogenous synthesis of vitamin D; and promoting food/counseling based interventions. This review does not address a specific question, rather attempts to assess all these preventive interventions in a jumbled-up fashion. Also, the review fails to find out the quantum of benefit and the cost-effectiveness of these interventions in the community. Additionally, the studies included were not uniformly sound in methods and the final inclusion of studies was not as per criteria laid down in the review protocol. Most importantly, there was a significant difference in methods of included studies such as study design, type of intervention, dose and duration of the intervention etc. The age group of the included subjects also varied greatly with means ranging from 1 month to 12.5 years and not necessarily enrolling term born children thus not even justifying the title of the review!

Cochrane Conclusion

It is reasonable to offer vitamin D or calcium to all children up to 2 years of age to prevent nutritional rickets especially in high risk children living in Africa, Asia or the Middle East.

Our Conclusion

The evidence supporting large scale community based interventions for the prevention of nutritional rickets in term born children is scant and the quantum of benefit as well as cost effectiveness of such interventions is not known.

Clinical importance and Precision of the Results

Despite compromising on the quality of the included studies, the authors could not provide a pooled estimate of the treatment effect. Two of the included studies did not find any case of rickets in either intervention or control group. In the Turkish-study, there was an absolute risk reduction of 3.6% (95% CI: 1.1%-3.7%). This means that we need to treat about 28 (best estimate 27; worst estimate 91) children with vitamin D daily for 12 months to prevent 1 case of rickets. On this basis, the strategy does not seem to be economically sound especially for developing countries. However, if the prevalence of rickets is very high in certain setting, this might turn out to be a cost efficacious intervention as the number needed to treat would significantly decrease. For example, if we assume a prevalence of rickets among children to be 10%, number needed to treat (NNT) to prevent 1 case of rickets comes down significantly to 10 cases. Direct estimation of the quantum of benefit would be difficult to calculate as large population based data for prevalence of rickets is not available from the country.

Implications for Practice and Policy

Guidelines from some developed countries(2-4) have already recommended supplementation with Vitamin D for all at-risk children including breastfed infants. This Cochrane review also concludes that it is reasonable to offer preventive measures (vitamin D or calcium) to all children below 2 years of age especially if they live or originate from under-privileged areas. However, these conclusions do not emerge directly from the findings of this review but are solely based on the knowledge of pathophysiology and assumed high prevalence of rickets.

This review, however, has important research implications. First, large scale community based estimation of prevalence of clinically significant vitamin D/calcium deficiency is required especially from developing countries. Besides patient-oriented outcomes, the quantum of benefit and the cost-effectiveness of the chosen intervention should be studied before recommending large scale supplementation.

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REFERENCES

1. Thacher TD, Fischer PR, Strand MA, Pettifor JM. Nutritional rickets around the world: causes and future directions. *Ann Trop Pediatr* 2006; 26: 1-16.
2. Munns C, Zacharin MR, Rodda CP, Batch JA, Morley R, Cranswick NE, *et al.* Prevention and treatment of infant and childhood vitamin D deficiency in Australia and New Zealand: a consensus statement. *Med J Aust* 2006; 185: 268-272.
3. Gartner LM, Greer FR. Section on Breastfeeding and Committee on Nutrition: American Academy of Pediatrics. Prevention of rickets and vitamin D deficiency: New guidelines for vitamin D intake. *Pediatrics* 2003; 111: 908-910.
4. Ward LM, Gaboury I, Ladhani M, Zlotkin S. Vitamin D-deficiency rickets among children in Canada. *CMAJ* 2007; 177: 161-166.