ABSTRACT

Vitamin D plays an important role in bone and muscle growth and function. This is particularly the case during periods of rapid growth, during infancy and adolescence (1-4). It is recognised that recent lifestyle patterns have reduced exposure of many to adequate ultraviolet light, the main source of this sterol. Although the actual vitamin D requirement of adolescents continues to be investigated and remains to be derived in detail (5), case histories and series of deficiency have been documented. Further, as a proportion of older adolescents become pregnant, their nutritional state will impact on the health of their infants. Case histories from west London have suggested that vitamin D deficiency in mothers is leading to hypocalcemic seizures in infants born here in the first 10 years of the 21st century. Initial strategies for treatment or prevention of this deficiency must involve information relating to how teenagers understand this problem.

Key words: Vitamin D, Adolescence, Muscle function, Pregnancy.

METHODS

A pilot survey was developed to learn more of teenage health literacy relating to vitamin D. All able children aged 12-16 years, recovering as inpatients on a paediatric ward at Ealing Hospital were asked to voluntarily complete a questionnaire on basic knowledge of vitamin D. The questionnaire was employed as part of their ‘homework’ and used by the ward schoolteacher. In addition we collated vitamin D results for all children’s samples collected from those aged 12-17 years for 2009 and 2010 from our biochemistry laboratory. Although this sample is skewed as it represents only a small proportion of the local adolescent population, it offered a perspective on the magnitude and nature of the problem in the same geographical area.
RESULTS

The survey was conducted between 2010 and 2011; 30 responses were collected. None of those approached with the questionnaire refused to assist; one of the responses was incomplete. Respondents had a median age of 13 years; 24 belonged to ethnic minorities. All attended local mainstream schools. Two thirds of respondents were female. The survey showed that 50% of adolescents were aware of the benefits of sunlight and the consumption of certain food on vitamin D levels (Fig.1). More than 80% stated that they were aware that particular foods contained vitamin D, yet the majority were unaware of good food sources. Only one third stated that they had learnt about vitamin D at school. The majority of adolescents stated they wanted to learn about food sources high in vitamin D, and they would like further information relating to its benefits (Fig.2).

![Fig.1: What is the best way to boost vitamin D levels?](image-url)
A total of 610 12-17 year olds had vitamin D levels measured in 2009 and 2010 in the Hospital laboratory system. There were 464 females and 146 males. In this 24 month period, 341 adolescents (55.9%) had a level <25 nmol/L; 266 were female (78%) and 75 were male (22%), Fig.1. Levels <50 nmol/L were found in 525 adolescents (85.9%); 392 were female (74.8%), 132 were male (25.2%). Results of the sampling are shown in Figure 3.
DISCUSSION

It has been known for many years that sunlight exposure restricts vitamin D in many Britons giving rise to symptoms ranging from hypocalcemic seizure to osteomalacia. This may relate to susceptibility to tuberculosis in some, and conditions such as multiple sclerosis are more frequently identified in those with low vitamin D (6-8). When sampled, vitamin D levels have been shown to be low in a number of patient groups regarded as ‘normal’ individuals (9,10). In adolescence low levels of this vitamin causes symptoms including muscle pain and poor physical fitness. Insufficiency or deficiency is therefore relevant to teenage mobility, sporting and physical ability and will have related effects on social development too. Obese adolescents are probably more likely to be affected and have been found to have lower blood levels. Insufficiency and deficiency can influence fetal development in those becoming pregnant as adolescents or young adults. Such fetal imprinting has been shown to influence bone mineral content into early puberty of the next generation (11). Levels of this micronutrient therefore have pleiotropic effects within populations, many of which are sub-clinical, difficult to measure and may influence health over many years.

Our survey suggests that there is no strong knowledge base relating to vitamin D in a range of adolescents responding to a survey. Further it seems unlikely that information relating to this vitamin is currently taught as a regular component of any school curriculum. It is probable that modifying the curriculum would be an effective approach. Involvement of schools in improving health literacy has been found effective in a number of settings in response to health challenges ranging from infectious diseases to obesity (12-15). It might be argued that over the longer term this educative approach would be a low cost and effective method of approaching the issues of sunshine deprivation in pregnancy and infancy too. Improvement in adolescent health literacy could have the potential to improving fitness and activity levels in teenagers as well as fetal health therefore. Although this strategy was not one outlined in the Wanless report of 2002 in any of the three scenarios outlined (16), more recent guidance, such as that related to smoking of healthy diets in teenagers, recommended that prevention be integrated into the school curriculum in order to be most effective (17,18).

CONCLUSIONS

A lack of awareness in adolescents of the problems associated with vitamin D deficiency and of vitamin D itself has been identified in a pilot study. This will make detection and treatment of such problems challenging. Health literacy will need to develop to allow individuals to balance the appropriate sun exposure, diet and lifestyle. Vitamin D deficiency is common
in adolescents in west London, as identified in a population sampled for this purpose. We propose that school-based health education relating to vitamin D deficiency should be considered as a valuable strategic public health measure to inform the next generation of mothers.

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The authors have no conflicts of interest to disclose

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