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Vitamin D supplementation in neonates

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Abstract

Vitamin D deficiency may lead to the development of rickets. In our paediatrics department in a major London hospital, we audited the number of babies with low vitamin D levels attending our prolonged jaundice clinic. Prior to our newly designed intervention, those babies with low vitamin D levels would be given a letter to encourage collection of supplementation from their GP. The GP would receive a letter which included a 14-page guideline on vitamin D supplementation.

For this project, we included all breastfed babies that attended our prolonged jaundice clinic between August 2012 and December 2012. Those babies that were either vitamin D deficient or insufficient were identified. We then followed up these patients and asked them whether they were being prescribed the correct supplementation after being identified as vitamin deficient. For our intervention, we designed a leaflet to simplify guidelines that was then distributed to mothers and their GPs. Following this intervention, we re-audited the new cohort of patients who received the leaflet between August and November 2013.

The study found 71% of babies to be vitamin D deficient. Moreover, almost two in five mothers had less than the recommended six months of vitamin supplementation during pregnancy. After identifying a deficiency, one would expect that uptake of vitamin supplementation would increase dramatically. However, only four in 10 babies went on to receive the correct dose and preparation of supplements. A marked increase in uptake was seen during the re-audit post intervention, with 71% of babies receiving correct supplementation.

While an increase in government advertising would have contributed to the rise in uptake of vitamin D supplementation, a leaflet proved to be a simple yet effective intervention in improving vitamin uptake in babies. As a result, this was then implemented as part of trust guidelines.

Problem

Vitamin D supplementation for mothers and babies is a growing concern. The degree of sun exposure is often inadequate in the UK, especially during the winter months.[1] Currently, the Department of Health recommends 10 micrograms (400 units) of vitamin D daily for pregnant and breastfeeding mothers, and 8.5 micrograms (340 units) daily for breastfed babies under the age of 6 months.[2]

However, it is essential to appreciate that recommended doses of vitamin D supplementation are arbitary, and the threshold for toxicity is far higher. In fact, Hathcock et al demonstrated through well designed clinical trials that using doses in the range of 50-2500 micrograms daily were found to be safe.[1]. Indeed, there should be much more concern with deficiency causing subsequent health consequences than toxicity. In fact, it is incomprehensible that in the 21st century UK we should still allow such an easily preventable problem exist.[3]

In our paediatrics department in a major London teaching hospital, we tested vitamin D levels in babies who attended the prolonged jaundice clinic. The majority were babies who were between 2 to 5 weeks of age. Our reason for testing vitamin D was borne out of raised alkaline phosphatase levels on a significant number of babies who ended up being either vitamin D insufficent or deficient. Deficiency was defined as <25 nmol/L while insufficiency was <50 nmol/L on serum 25 (OH) vitamin D assays.

Background

Vitamin D is essential for strong healthy bones. It is mainly obtained from ultraviolet B (UVB) rays from sunlight. On average those with lighter skin complexions will gain enough vitamin D from exposure to just half an hour each day for two to three days each week.[4] In the UK, however, the intensity of the sunlight is weak during the autumn and winter months. In such times, vitamin D status is relied upon dietary intake and body stores. While vitamin D can be found in some foods, the only dietary source for babies is formula milk that has vitamin D added.[5]

Deficiency may lead to the development of rickets with bow-shaped legs, bone pains, muscle weakness, and increased risk of bony fractures. These deformities may be permanent if treatment is delayed. Moreover, those with severe deficiency can suffer muscle spasms, seizures, and breathing difficulties.[4]

Those at risk of vitamin D deficiency include: pregnant mothers, babies who are exclusively breastfed, those who have darker skin, those who cover up most of their body when outside, and patients with certain medical conditions affecting gut absorption or who suffer from long term liver and kidney disease.[4]

Current guidance from the Royal College of Obstetricians and Gynaecologists is to offer all pregnant women vitamin supplementation at the first antenatal appointment, with particular emphasis on those at high risk of deficiency.[6] Women considered

to be at high risk include those from black and ethnic minorities, those that are socially isolated or housebound, and those who are obese.[6]

Baseline measurement

For this project, we included all breastfed babies that attended our prolonged jaundice clinic between August 2012 and December 2012. Then, we identified those babies that were either vitamin D deficient or insufficient (less than 25 and 50 nmol/L respectively). Exclusion criteria included those babies who were bottle fed, those who did not have a blood test, and those whose blood sample was insufficient for analysis. With this criteria, a total of 55 babies were included in this study.

A questionnaire was designed and data were collected retrospectively by contacting the parents by telephone, to check whether the correct supplements had been taken. The survey also asked about the mothers' vitamin supplementation during pregnancy.

The results demonstrated an alarmingly high proportion (71%) of babies with vitamin D deficiency (Table 1). Moreover, almost two in five mothers had less than six months duration of vitamin supplementation during pregnancy (Figure 1). At the time of the study, pregnancy supplementation products that could be purchased over the counter in the UK provided either 200 or 400 units of vitamin D daily. However, we noticed that the duration of supplementation was arguably more important than the dose of the multivitamin preparation (Table 2).

Mothers of babies who attended the clinic were notified of the low vitamin D levels in their child and a letter with guidelines on prescribing medications for vitamin D deficiency was posted to their general practitioner (GP). When we followed up on the uptake of the vitamin D prescriptions, only 38% had been taking the correct dose of medication (Figure 2). In addition, one in five babies had still been given wrong prescriptions - whether it be the wrong vitamin preparation, wrong duration of therapy, or not been prescribed any replacement at all.

See supplementary file: ds2663.doc - “Tables and figures”

Design

Following discussions with the parents and the clinical team, we recognised that there was a lack of awareness of the importance of vitamin D for the health and development of babies. Moreover, the clinical guideline that was sent to the general practitioners consisted of 14 pages of text. This was not user friendly and took a considerable time to read.

Thus, we agreed to design a leaflet that was simple, succinct, and aimed at both mothers and health care professionals. A three sided leaflet was therefore created, including a self explanatory diagram aimed at promoting awareness as well as guidance on vitamin supplementation for deficient babies. This would be sent to both mothers and their general practitioners so that there would be no ambiguity over clinical guidelines.

Strategy

A draft leaflet was designed and proofread by the clinical lead for vitamin supplementation, the paediatric clinical director, and the clinical staff. We subsequently revised the leaflet to make it more understandable to the general public. After that, a trial for one month with mothers identified that a colourful scheme would be more appealing. Following these modifications we then sent the leaflet to the trust administrators who finalised the format. The leaflets were ready for use in clinical practice in August 2013. We re-audited the data from August to November 2013 to assess the impact of this intervention.

Results

Post intervention, we audited babies who attended the clinic between August 2013 and November 2013. The same inclusion criteria to the one used pre-intervention identified 54 babies. The results showed that 71% of vitamin prescriptions were given correctly compared to the previous 38% (Figure 3).

Interestingly, there was a significant reduction in severely deficient babies (<10 nmol/L) with only 13% in this category in comparison to previous data which found a staggering 44% (Table 3).

See supplementary file: ds2741.docx - “Online submission - part 2 tables and figures”

Lessons and limitations

We learnt a number of lessons from this project. Firstly, that education is one of the most powerful ways to influence healthcare and compliance to medications, both on healthcare professionals and patients. Interestingly, over the last year the UK government has promoted vitamin supplementation more avidly and this may well have had some contribution to the improved prescription rates. Mothers are more likely to ask prescriptions from their doctor, and an easy to follow dosing guide makes the process more efficient.

During the re-audit we found that there was a marked reduction (44% to 13%) in the percentage of babies with severely deficient vitamin levels (<10 nmol/L). This may be due to the increased awareness of vitamin D deficiency by the general public, and therefore an increased uptake of vitamin supplements during pregnancy. Unfortunately, we did not gather this data in the re-audit process.

Gathering data had its obstacles. Often there was no answer to the telephone calls, and almost a quarter of patients were lost to follow up. We found that phoning the parents after working hours was the most convenient time and would recommend this approach for future studies. Further limitations include that, being a retrospective study, it was often difficult for the mothers to remember what preparation of vitamin supplements were taken and for how long

during their pregnancy they took it for. In future, this should be established in a prospective study. As breastfeeding is still best encouraged, it was important that this was highlighted in the leaflet. Moreover, by the time of the re-audit all over the counter vitamin supplements in the UK provided the same 400 units daily of vitamin D instead of the lower 200 unit daily dose. This would have undoubtedly helped to raise the vitamin D levels of mothers and thus availability in the breast milk. A relatively small data set meant it was not possible to draw convincing conclusions between dose of vitamin supplementation during pregnancy and vitamin D levels in babies.

A further suggestion is for the hospital to prescribe the supplements in order to avoid the delay in waiting for an appointment with the GP. However, it is crucial that the GP appointment is made eventually, so that the patient can be followed up and if necessary further prescriptions can be made.

Despite these limitations, the leaflet clearly made a positive impact on the uptake of supplementation in babies and it was a simple yet effective intervention. In order to sustain the benefits from this project, we have implemented this leaflet as part of our hospital guidelines, and we will re-audit the data in the future in order to assess this.

Conclusion

Designing a leaflet to encourage patients and clinicians to increase uptake of vitamin D had a positive impact on the number of babies having correct supplementation. However, many factors would have contributed to the increase of vitamin D uptake, including government advertising and better education for health care professionals. Moreover, we do not know what the long term uptake of vitamin supplements would be for these patients over the next few years of their childhood. The most desirable follow up would be to measure their vitamin D levels in a few years time, but this was beyond the scope of this project. Ultimately the leaflet was a simple yet successful intervention.

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Declaration of interests

Nothing to declare.

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