Original Research Article

A cohort study and an audit project on vitamin D prescribing practices for children in pediatric clinics at a tertiary hospital in Jordan

Abstract

Background

Vitamin D is required for skeletal development and bone health. A severe deficit can cause rickets and osteomalacia among children and adults respectively. There are few dietary sources of vitamin D. Various recommedations states that all infants and young children aged 6 months to 3 years are advised to take a daily supplement containing vitamin D in the form of vitamin drops.

Aims

This study was done to assess the adherence NICE recommendations regarding supplementation of vitamin D for children in pediatrics clinics at tertiary hospital in south of Jordan according to the NICE recommendations.

Methods

Data was collected in retrospective manner. The following information was gathered for each sample: gestational age when delivered, age and developmental age, type of feeding, amount, past medical and drug history and allergic history, social history and if prescribed vitamin D or not.

Results

A total of 64 children were recorded in which 42 out of them (65.6%) were prescribed vitamin D supplements.

Conclusion: Collaboration between policymakers and health care professionals is required to fill the gap between guidelines and clinical practice.

Introduction

Vitamin D has a significant impact on baby and child health, growth, and development. Its levels are low in breast milk, putting solely breastfed infants at danger of vitamin D deficit or insufficiency, which contributes to nutritional rickets and osteomalacia. [1] It is commonly known that vitamin D can be derived through the sun or from a few natural food sources. The American Academy of Dermatology identified UV radiation to be a known skin carcinogen, therefore getting vitamin D from the sun or other artificial sources may not be safe or efficient. As a result, many pediatricians and physicians advise vitamin D prescription to attain adequate plasma levels. [2] The National Institute for Health and Care Excellence (NICE) recommends providing vitamin D to newborns and children under the age of four. Also to raise knowledge of the importance of vitamin D among health, social care, related practitioners, and the local population [3] In this study we aim to review infants and young children aged 6 months to 3 years supplementation of vitamin D according to NICE Recommendations.

Literature Review

A comprehensive search of the literature yielded only two relevant audit articles were published to optimize Vitamin D supplementation in pediatrics age group. The search database used was PubMed for all years up to 2023, using articles in English only under the mesh Clinical Audit and using keywords Vitamin D supplementation and Audit. All irrelevant articles were excluded and not discussed through the present review (i.e. articles discussing the management ofvitamin D deficiency). A summary table of the relevant audit articles found in the literature was created (Table1).

Table 1 A summary table of the relevant audit articles

Author	Cycle	No.Of Cases	Improvements methods
Thomas, L [4]	Audit	164	Education of the risks associated with lack of vitamin D. Standardising practice, enhancing services and the advice provided to patients are ways to encourage compliance to guidelines and ultimately improve the health of those populations who are at risk.
Santi, M [5]	Audit	795	Collaboration between policymakers and health care professionals is required to fill the gap between guidelines and clinical practice

Materials and Methods

Data collection was done prospectively by taking a relevant history about the baby (gestational age when delivered , developmental age , type of feeding , amount of feeding , past medical history , drug history , allergic history , social history), and if vitamin D was prescribed from mothers of a children aged from six months to 3 years come to the hospital pediatrics clinics on a duration of 5 weeks.

The audit followed ethical principles and obtained approval from the hospital's ethical committee. The data collection process ensured the confidentiality of the patients and their medical records, which were accessed only by authorized personnel and only for audit purposes. The patients' privacy and autonomy were respected throughout the audit. The audit had some limitations, such as the small sample size and the retrospective data collection method. Future audits could use a larger sample size and a prospective data collection method to generate more reliable findings.

Result:

First loop:

Evaluation of the audit findings identified that the 100% standard NICE guidelines meet the reach of 42 of 64 (65.6%) children. Figure (1) Table (1).

Table (1) Frequencies of if vit. D was prescribed

if vit. D was prescribed	Counts	% of Total	Cumulative %
Yes	42	65.6 %	65.6 %
No	22	34.4 %	100.0 %

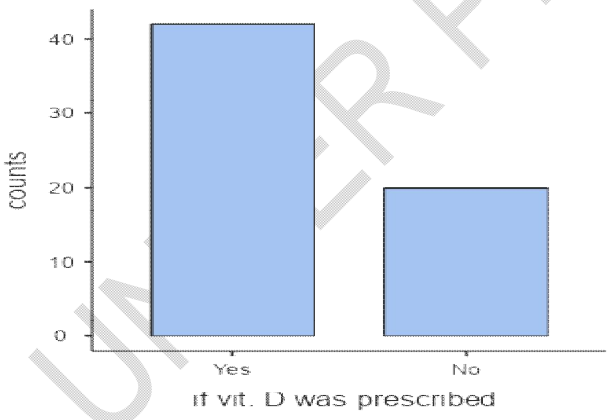

Figure.1 shows the frequency and percentage of prescribed vit.D or not.

Of 64 children, all of the children were appropriate for developmental age. Also, 18 (28.1%) of children were on bebelac, 8 (28.1%) of babies were on breastfeeding, 5 (7.8%) children were on home food,2(3.1%) on liquid food,5(7.8%) on Nido,3(4.7%) on primilac, and 13(20.3%) on S-26. Figure (2) Table (2).

Table (2) Frequencies of Type of feeding

Type of feeding	Counts	% of Total	Cumulative %
Bebelac	18	28.1%	28.1%
Breastfeeding	18	28.1%	56.3%
Home food	5	7.8%	64.1%
Liquid food	2	3.1%	67.2%
Nido	5	7.8%	75.0%
Primilac	3	4.7%	79.7%
S-26	13	20.3%	100.0%

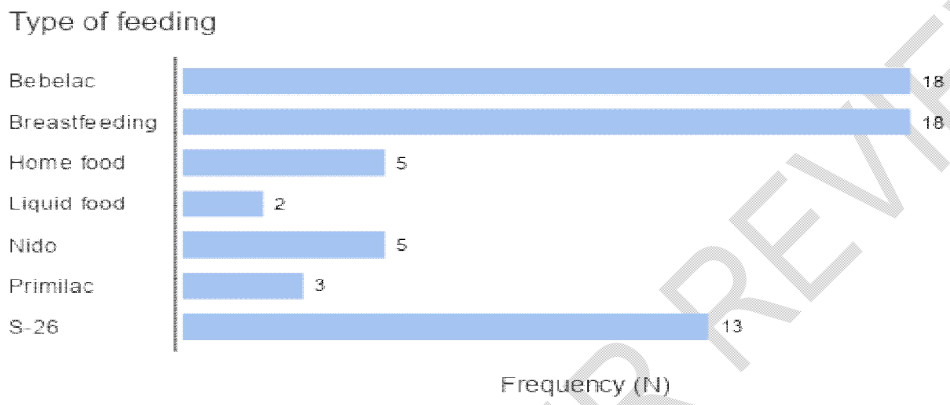

Figure.2 shows the frequency and percentage of types of feeding

The mean amount of feeding was 453ml with a standard deviation 273Figure. The mean and standard deviation for the age of children, and gestational age when delivered were 10 months (0.86), and 37.2 (2.08), respectively. Of 59 children 44 (74.6%) are free, while one has Spina bifida and shunt procedure, one has Metabolic syndrome/glycogen storage disease, one has ASD, one has chronic obstructive pulmonary disease, an otitis media, one has Developmental dysplasia of the hip, one has type-1 DM and atopic dermatitis, one has the respiratory condition of a newborn, one has Q fever, one has AR, one has Aspiration, one has a seizure, one has Down syndrome, one has Down syndrome, one has celiac disease, one has tracheitis, and one has type 1 dm alone. Figure (3) Table (3).

Table (3) Frequencies of past medical history

past medical history	Counts	% of Total	Cumulative %
free	44	74.6%	74.6%
Spina bifida and shunt procedure	1	1.7%	76.3%
Metabolic syndrome/glycogen storage disease	1	1.7%	78.0%
ASD	1	1.7%	79.7%
chronic obstructive pulmonary disease & otitis media	1	1.7%	81.4%
Developmental dysplasia of the hip	1	1.7%	83.1%
type-1 DM and atopic dermatitis	1	1.7%	84.7%
respiratory condition of a newborn	1	1.7%	86.4%
Q fever	1	1.7%	88.1%

Table (3) Frequencies of past medical history

past medical history	Counts	% of Total	Cumulative %
AR	1	1.7 %	89.8 %
Aspiration	1	1.7 %	91.5 %
Seizure	1	1.7 %	93.2 %
Down syndrome	1	1.7 %	94.9 %
celiac disease	1	1.7 %	96.6 %
tracheitis	1	1.7 %	98.3 %
type 1 dm	1	1.7 %	100.0 %

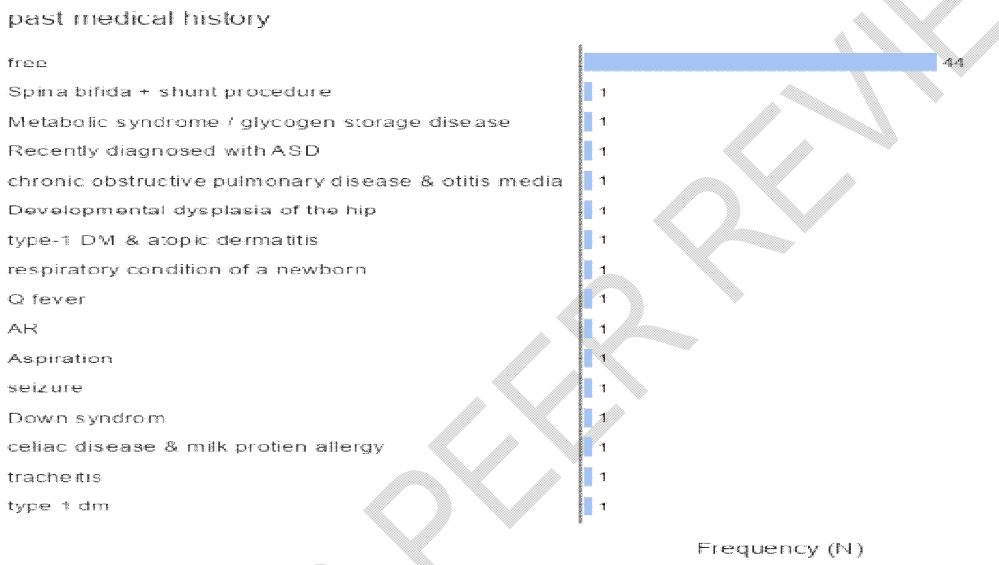

Figure.3 shows the frequency and percentage of past medical history.

Second loop:

Re-Evaluation of the audit findings identified that the 100% standard NICE guidelines meet the reach of 54 the 64 (84.4%) children. Table (4) Figure (4)

Table (4) Frequencies of if vit. D was prescribed

if vit. D was prescribed	Counts	% of Total	Cumulative %
Yes	54	84.4 %	84.4 %
No	10	15.6 %	100.0 %

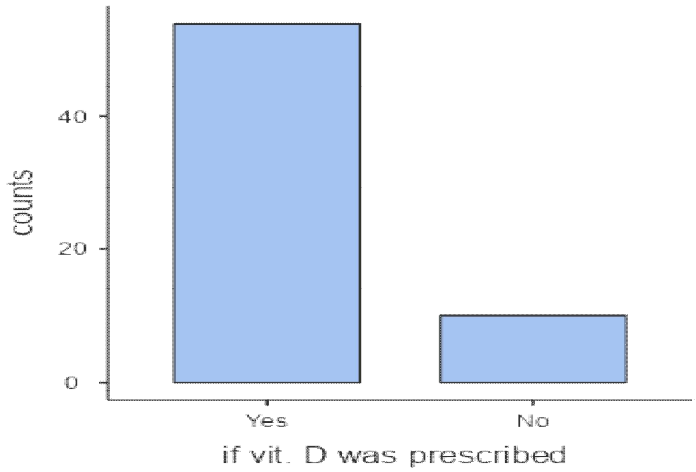

Figure.4 shows the frequency and percentage of prescribed vit.D or not.

Discussion

Vitamin D is necessary for proper bone development in infants and children. Because breastmilk and some formulas are deficient in vitamin D, newborns should receive oral vitamin D supplementation to prevent vitamin D deficiency. Another known cause of vitamin D deficiency is malabsorption, which can occur as a result of gastrointestinal disorders such as Crohn's disease, celiac disease, chronic active hepatitis, chronic kidney disease (CKD) with or without dialysis, chronic pancreatitis, cystic fibrosis, diabetes mellitus, gastric bypass, and primary biliary cirrhosis.[6] This can cause rickets in children. A 25(OH) D level less than 20 ng/mL is considered vitamin D deficiency. Patients who fall below this level are at a higher risk of muscle weakness, bone pain, and fragility fractures. A serum 25(OH) D level of 21 to 29 ng/mL without overt clinical symptoms has been defined as vitamin D deficiency. Despite the fact that definitions have been hotly debated. Vitamin D deficiency reduces intestinal absorption of dietary calcium and phosphorus, resulting in an increase in parathyroid hormone levels. With 25(OH) D levels between 30 and 40 ng/mL, parathyroid hormone levels begin to plateau in adolescents and adults. [7] To meet the needs of most people aged 1 to 70 years, the Institute of Medicine recommends 600 IU of vitamin D per day. [7]

Children can get vitamin D from sun exposure, fortified foods, and supplements. Supplements come in a variety of formats, including drops, tablets, capsules, and gummies. Milk, yogurt, cereals, and some juices with added vitamin D are among the fortified foods. UVB ray exposure from the sun causes the skin to naturally produce vitamin D. However, because too much sun exposure can harm the skin and raise the risk of developing skin cancer, it should be moderated and balanced with sun protection measures.[8]

Depending on a child's age, weight, feeding style, skin tone, location, season, and medical conditions, there are different indications for vitamin D supplementation. Some kids may require more vitamin D than others due to a higher risk of deficiency or a medical condition that interferes with their metabolism or uptake of the vitamin .[9] Children who are overweight, suffer from celiac disease, cystic fibrosis, chronic kidney disease, liver disease, or take anticonvulsant medications, for instance, may require higher doses of vitamin D.[10] To heal

their bones, rickets patients may require extremely high doses of vitamin D. Higher vitamin D doses may be beneficial for children with type 1 diabetes to reduce their risk of developing the condition or to improve blood sugar control.[11]

The American Academy of Pediatrics recommends that all children receive 400 IU of vitamin D per day from birth to adolescence.23 Because vitamin D deficiency in children has been reported to be between 10% and 65%, rickets is still being reported in the United States. Because breast milk contains little to no vitamin D, breastfed infants are at a higher risk of vitamin D deficiency.[11] Children who are vitamin D deficient should be given 50,000 IU per week or 2000 IU per day for 6 weeks to achieve serum 25(OH)D levels of 30 ng/mL.[12] The IOM advises adults to take 1500–2000 IU of vitamin D daily and children between the ages of 1 and 70 to take 600 IU daily. These suggestions are supported by professional judgment and scientific studies that examined biomarkers for vitamin D status. They are also founded on the practice of using 400 IU of vitamin D to both prevent and treat rickets. [13]

Children who receive vitamin D supplements may benefit from decreased rates of type 1 diabetes, improved bone health and growth, decreased risk of respiratory infections, and prevention and treatment of rickets. [11]
Additional research is required to confirm the protective effects of vitamin D against certain cancers, autoimmune disorders, and cardiovascular diseases. [14]
Although unlikely, vitamin D supplementation in children can have toxicities and side effects. Constipation, diarrhea, vomiting, nausea, and gastrointestinal discomfort are the most typical side effects. The most dangerous toxicity is vitamin D overdose or hypervitaminosis D, which can result in soft tissue calcification, kidney damage, kidney stones, or high blood calcium levels (hypercalcemia). Loss of appetite, thirst, frequent urination, weakness, confusion, headaches, or muscle pain are all signs of vitamin D overdose. When taking very high doses of vitamin D for an extended period of time or when taking specific medications that interact with vitamin D, the risk of vitamin D overdose is higher. [15]

Conclusion

Vitamin D deficiency is a common problem in pediatrics, particularly in those with chronic illnesses, who are malnourished, geographically limited in their sun exposure, and are on chronic medications. The accelerated rate of bone development in children suggests that adequate vitamin D concentrations are an important issue in this population. The prescription of vitamin D supplements for children is suggested to follow the AAP and IOM guidelines and consider individual factors and needs. Pediatricians and family physicians should educate parents about the benefits and sources of vitamin D and monitor their children's vitamin D status regularly.

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