International Journal of Medicine Research
ISSN: 2455-7404; Impact Factor: RJIF 5.42
Received: 14-09-2019; Accepted: 16-10-2019
www.medicinesjournal.com
Volume 4; Issue 4; October 2019; Page No. 53-55

Deficiency of vitamin d in paediatric fracture patients: Prevalence, risk factors, and vitamin D supplementation

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Abstract
Deficiency in Vitamin D can accrue from the lack of sufficient exposure to sunlight. Infant can acquire minimal amounts of this vitamin from breast milk and a limited amount of this mineral makes them suffer from diseases like Scurvy. Accelerated catabolism from various medications is also the origins of this vitamin and the lack of it presents in the bowing of legs. The lack of Vitamin D in the adult population shows in the form of a protruding forehead. The international pediatrics Association recommends an intake of 400 international units per day for infants before the age of 12 months. Children and young adults require up to 600 IU per day for the proper functioning of their bodies and the growth of bones and development. In the event that a child lacks sufficient Vitamin D, the supplements are recommended until the child comes of age. Vitamin D in orthopedics is an essential component of the functioning, development, and maintenance of the musculoskeletal. Sufficient levels of vitamin D mean greater mineral density of the bones and this means a healthy bone structure.

Keywords: pediatrics, orthopedics, vitamin D deficiency, scurvy

Introduction

According to research, more than half of all young people below the age of 12 years develop fracture or breakage of their bones by the time they develop into adolescents. Fractures of the forearm are one of the most common forms of injuries and can be deemed as indicators of the poor health of the bones. Additional research evidence indicates that such fractures may be connected to future events of osteoporosis. Research indicates that some of the markers of lower bone mineral density include poor exposure to sunlight, poor nutrition, genetics, pigmentation, and general lack of physical activity. The purpose of this research lies in the determination of whether children who have distal radius impaction fractures have and increase in the pervasiveness of 25(OH) D levels. This is associated with healthy peers leading to the findings that deficiency may have been connected to an increase in the incidence of the fracture of the forearm in young children.

According to research, up to a quarter of boys and a sixth of girls undergo fracturing of their bones during their early years in the life (Gorter, Oostdijk, Felius, Krijnen, & Schipper, 2016) [8]. An increase in the level of participation in sports and exercise leads to increase chances of fracturing and breakage of the bones (Gorter, Krijnen, & Schipper, 2016). The relative lack of essential minerals during the early stages of infant growth and development is also a factor that potentially leads to weak bones and a high likelihood of breakage and fracturing (Sprague, *et al*., 2016) [14]. Deficiency in Vitamin D is a consistent world problem that has been present for a long time and it is caused due to the deficiency in sunlight and the energy that accrues from the light in the sun.

According to research, the prevalence of the health among children of European descent oscillates around eight and 95% and this depends on the risk factors which include geographical location, the occurrence of obesity, supplementation of Vitamin D, the type of skin, exposure to the sun, and geographical location (Bischoff-Ferrari, 2009) [2]. Vitamin D is a significant element for the formation of bones and other structures related to the bones like the hair and the nails. The element performs these functions via skeletal homeostasis and calcium regulation. Vitamin D performs vital functions in the complex cellular processes of the healing of fractures (Saglam, Kizildag, Toprak, Alp, & Yalcinkaya, 2017) [13]. Numerous studies have been completed addressing the risk factors that cover the deficiency of vitamin D as well as the outlook of the clinical effects of these effects. The following graph shows the distribution of vitamin D in children at the age of 12 years juxtaposed against infants at the age of 12 months.

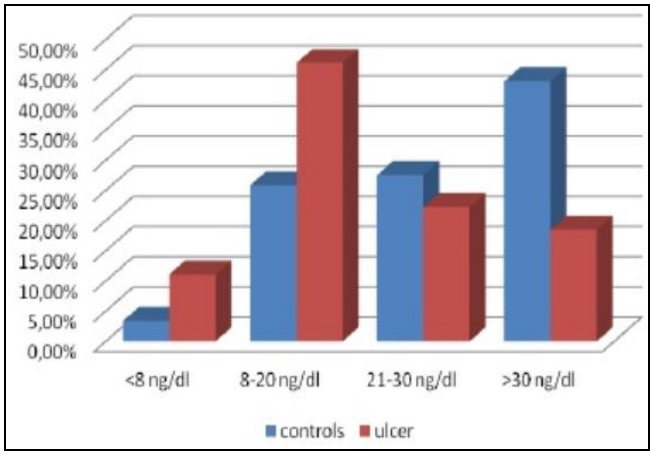

Fig 1: Distribution in Percentages of Serum 25 OH-vitamin D in Control Subjects (Bischoff-Ferrari, *et al*., 2009) [2]

Material and Methods

A study of the cross-section of approval is acquired from the review committee of ethics in medicine. This study incorporates all the patients who appear as the consecutive pediatric. These patients are treated for fractures of the upper or the lower extremities for a given period (Contreras, Hiestand, O'Neill, Schwartz, & Nadkarni, 2014) [5]. Children above the age of 16 years are allowed to give personal informed consent since they are considered old enough to make a personal judgment (Thompson, Dean, Goldberg, Kwasny, Langman, & Janicki, 2017) [15]. Therefore, this population makes the right group of participants who have the liberty to take part in responding to the survey questions and any other reviews to which they may be subjected. The following table shows the various sources of Vitamin D.

Table 1: Table showing vitamin D distribution in different foods

Food	Serving	Vitamin D (IU)	Vitamin D (mcg)
Pink Salmon, Canned	3 ounces	530	13.3
Sardine, Canned	3 ounces	231	5.8
Mackerel, Canned	3 ounces	213	5.3
Cow's milk,	8 ounces	98	2.5
Soy Milk	8 ounces	100	2.5
Orange juice	8 ounces	100	2.5
Egg yolk	1 large	21	0.53

For children aged below 16 years, the researchers seek informed consent from both the children and the parents before they can be included in the interrogation process. Children below the age of 12 years only require their parents to agree to consent (Gallacher, McQuillian, Harkness, Finlay, Gallagher, & Dixon, 2005) [7]. The study involves taking a blood sample at the start of the first procedural visit after the incident of the fracture. The researchers measure the 25-hydroxyvitamin D serum concentration. Various populations respond to the lack of vitamin D in different ways as explained in the graph below:

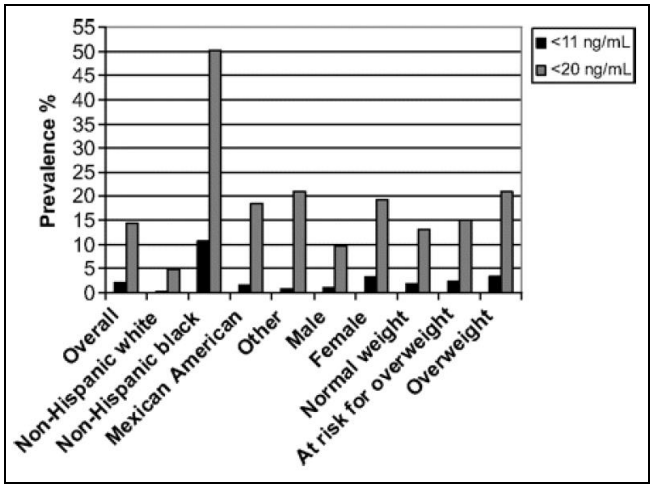

Fig 2: Graph showing the different reactions to a deficiency in Vitamin D according to race (Bischoff-Ferrari H., 2009) [2]

The majority of the literature does not have a center point around which recommends the amount of Vitamin D necessary for body growth. This may well relate to the bouts of inconsistency that connect to information relating to the level of effectiveness as well as the efficiency of Vitamin D. This occurs on the metabolic bone disease, the occurrence of hypocalcemia and also the hyperparathyroidism (Bischoff-Ferrari, *et al*., 2009) [2]. According to research, it is essential that the body maintains a minimal level of body serum concentration of about 50 milliliters. Additionally, this should be the target value in the case of the need for supplementation. According to the clinical practice guidelines for the endocrine society, having serum concentrations below 50 milliliters is defined as inefficient (Bergman, Fan, McFetridge, & Sen, 2010) [1]. Patients with low levels of concentration of the vitamin D nutrient are referred to specialists for further examination

Role of Paediatrics and Orthopedics

Pediatrics and Orthopedics doctors play essential roles in advising as well as determining the course of action to take to address the deficiency in vitamin D prevalence. The researchers determine Body Mass Index (BMI) depending on the age and the gender of the children. Furthermore, the researcher uses the distribution of the BMI to determine the factor of being obese or underweight and being of normal weight (Bischoff-Ferrari, *et al*., 2012) [2]. Since the research is conducted over a long period the month of fracture is categorized into summer, spring, winter, and autumn. Parents, as well as their children, are offered an opportunity to complete a questionnaire (Lips, *et al*., 2010) [10]. Giving both the parents and their children an opportunity to complete the questionnaire is an opportunity for them to offer their views on the subject and this provides information that can be compared side by side for a better outcome.

The questionnaire describes daily exposure to UV light as the number of hours the subject spends outside the house between 10.00 in the morning and 3.00 in the afternoon. The researchers use the Fitzpatrick scale to determine the skin type (Cranney, *et al*., 2007) [6]. The scale classifies individuals according to six different skin types from those that burn moderately and tan uniformly in the sun to those that tan disproportionately and tan inconsistently in the sun. This research is meant to qualify the effects of lack of sufficient vitamin D on the skin and how this generally affects the health of every individual.

Results

The study finds 40% of children selected eligible for the study. These children are found to have fractures in the forearm. Of all the children selected 60% are boys and hence the remaining are girls who are also found to have fractures (Newberry, *et al*., 2014) [12]. The mean age of the children examined is about 14 years. Moreover, of all the children examined about 31% agree to write informed consent. Most of the fractures in the different case studies are treated conservatively (Medical Advisory Secretariat, 2010). Many of the fractures in need of surgery are treated using k-wires. Of all the patients receiving treatment only 18% are receiving medication. The majority of the mediations are predominately antalgic in nature.

The long term effects of the deficiency of vitamin D on the growth of bones as well as the mass of bones are difficult to determine by simple experiments. The present study is aimed at demonstrating that the commonness of Vitamin D, the deficiency or the insufficiency is advanced in patients who have an impaction at the front of the arm forms of breakages compared to the starting point reported and the

healthy controls (Gorter, Oostdijk, Felius, Krijnen, & Schipper, 2016). Additionally, there are no significant differences between the serum involving PTH, ALP, and P. This applies between the controls of health as well as case-patients. The research makes the finding of the need for additional research to regulate between the levels of vitamin D and the bone turn over (Contreras, Hiestand, O'Neill, Schwartz, & Nadkarni, 2014) [5].

Discussion

Vitamin D is an essential mineral for bone remodeling as well as calcium hemostasis. Occurrences of rickets among children have been connected with the aspect of poor quality of the bones as well as an increase in the fracturing of bones. An increase in the level of vitamin D deficiency was investigated among the girls, children with darker skin complexion and children dealing with obesity (Bischoff-Ferrari, *et al*., 2009) [2]. According to the findings of the research less than half of all the children investigated met their requirements for vitamin D.

Infants born in such populations were found to have little Vitamin D in their storage systems. Such children were known to develop a little more vitamin D if they were subjected to long periods of breastfeeding. The use of breastfeeding supplements was also permissible as a viable alternative for improving the concentration of Vitamin D. Lack of sufficient Vitamin D leads to the failure to mineralize the nutrients in the body. Such children experience a slow bone growth rate and an increase in the risks of fractures. Some of the effects that accrue from the deficiency of vitamin D in the body include constant episodes of disease infections, having dark skin, being obese or overweight, and other characteristics. The less Vitamin D the patient has the more they are likely to have various infections in their bodies.

Conclusion

The presence of Vitamin D plays an essential and crucial role in the development of the skin, the bone and other structures in the human body related to the bones. Young children under the age of 12 years must be exposed to sufficient sunlight between 10 o'clock in the morning and 3 o'clock in the afternoon since these are the best times for the energy-rich sunlight. Care must be observed to prevent sunburns and turning in the sun.

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