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Original Research Article.

Analysis of Serum 25-Hydroxyvitamin D Levels of Apparently Healthy Children Aged 1-24 Months

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ABSTRACT

Background: Vitamin D functions in the body through both an endocrine mechanism and an autocrine mechanism. The present study was conducted to assess Serum 25-Hydroxyvitamin D Levels of Apparently Healthy Children Aged 1-24 Months.

Materials and Methods: This study was carried out toevaluate Serum 25-Hydroxyvitamin D Levels of Apparently Healthy Children Aged 1-24 Months. The study was conducted over a 6-months period. The subjects were 230 apparently healthy children aged 1-24 months. Three milliliters of peripheral venous blood was collected from each of the recruited children. The clotted blood sample was then centrifuged, and the serum separated. Serum 25(OH)D (vitamin D) was assayed. Data was analyzed using SPSS (version 20: IBM Corporation). A p value of less than 0.05 was considered statistically significant.

Results: In the present study a total number of 230 children aged 1-24 months were included in which 62.17% children were males and 37.82% were females. 44.34% children had Serum 25(OH)D level<50 nmol/l, 33.47% children had Serum 25(OH)D level between 50-75 nmol/l and 22.17% children had Serum 25(OH)D level above > 75 nmol/l. The mean 25-hydroxyvitamin D levels for males were 57.3 ± 28.9 nmol/l and females were 57.8 ± 29.5 nmol/l. Children in the first 6 months had the lowest mean serum 25-hydroxyvitamin D level compared to others.

Conclusion: The present study concluded that 44.34% children had Serum 25(OH)D level<50 nmol/l, 33.47% children had Serum 25(OH)D level between 50-75 nmol/l and 22.17% children had Serum 25(OH)D level above > 75 nmol/l. Children in the first 6 months had the lowest mean serum 25-hydroxyvitamin D level compared to others.

Keywords: Serum 25(OH)D Level, Serum 25-hydroxyvitamin D Level, Healthy Children.

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INTRODUCTION

Vitamin D is a fat-soluble vitamin that promotes mineral homeostasis and absorption of calcium, phosphorous, magnesium, iron, and zinc in the intestine.[1]Vitamin D_3 (cholecalciferol) comes from 2 sources: exposure to UV-B rays in natural sunlight and dietary intake (including supplements). Because few foods contain vitamin D precursors, sunlight exposure is the primary determinant of vitamin D status in humans.[1] It plays a pivotal role in maintaining adequate serum calcium and phosphate concentrations which ultimately helps in maintaining normal bone mineralization.[2,3] Apart from this, it has also been found to be associated with regulation of insulin and glucose secretion[4,5], and regulation of cardiac and renal functions. Increasing cellular immunity by stimulating production of anti-microbial peptide (cathelicidin)[6], reduction of inflammation, and modulation of cell growth[7] are also influenced by vitamin D. Serum or plasma 25-Hydroxy Cholecalciferol (25(OH)D) is the most commonly used and appropriate biochemical marker of vitamin D status.[8,9] The Institute of Medicine of the United States National Academies[10] defined vitamin D deficiency as serum 25(OH)D concentrations < 12 ng/ml (< 30 nmol/l), insufficiency as serum 25(OH)D concentrations from 12-20 ng/ml (30-50 nmol/l) and sufficiency as serum 25(OH)D concentrations > 20 ng/ml (> 50 nmol/l). Thus, a higher serum 25(OH)D concentration between 50 and 125 nmol/l was proposed to be adequate.[11-14] The present study was conducted to assess Serum 25-Hydroxyvitamin D Levels of Apparently Healthy Children Aged 1-24 Months.

MATERIALS AND METHODS

This study was carried out to evaluate Serum 25-Hydroxyvitamin D Levels of Apparently Healthy Children Aged 1-24 Months. Written informed consent was obtained from parents/guardians before enrollment of children into the study. The study was

conducted over a 6-months period. The subjects were 230 apparently healthy children aged 1-24 months who were brought for immunization or who accompanied sick siblings; and whose parents consented to participate. Children with known chronic medical conditions like HIV, sickle cell anaemia, severe malnutrition etc. were excluded from the study. Children who were taking drugs known to affect vitamin D metabolism (such as phenytoin, phenobarbitone, carbamazepine, clotrimazole, rifampicin and dexamethasone) or who had received vitamin D supplements or cod liver oil in the six weeks preceding enrollment into the study were excluded.

A structured questionnaire was used to obtain relevant information about the recruited children. Detailed Physical and systemic examinations were carried out on each child. Three milliliters of peripheral venous blood were collected from each of the recruited children into a plain tube and allowed to clot at room temperature. The clotted blood sample was then centrifuged, and the serum separated into another plain tube using a Pasteur pipette. The serum was transported on dry ice packs to the chemical pathology laboratory where samples were stored at -20 °C until analysis. Serum 25(OH)D (vitamin D) was assayed using commercial vitamin D ELISA kit[15].

We determined the prevalence for each vitamin D groups: Deficiency (serum 25(OH)D concentration < 50 nmol/l), insufficiency (serum 25(OH)D concentration 50-75 nmol/l), and sufficiency (serum 25(OH)D concentration > 75 nmol/l) as recommended by Endocrine Society.[14]

Data was analyzed using SPSS (version 20: IBM Corporation). A p value of less than 0.05 was considered statistically significant.

RESULTS

In the present study a total number of 230 children aged 1-24 months were included in which 62.17% children were males and 37.82% were females. 44.34% children had Serum 25(OH)D level<50 nmol/l, 33.47% children had Serum 25(OH)D level between 50-75 nmol/l and 22.17% children had Serum 25(OH)D level above > 75 nmol/l. The mean 25-hydroxyvitamin D levels for males were 57.3 ± 28.9 nmol/l and females were57.8 ± 29.5 nmol/l. Children in the first 6 months had the lowest mean serum 25-hydroxyvitamin D level compared to others.

Table 1: Distribution of children according to vitamin D status.

Serum 25(OH)D level	N (%)
Deficiency (< 50 nmol/l)	102(44.34%)
Insufficiency (50-75 nmol/l)	77(33.47%)
Sufficiency (> 75 nmol/l)	51(22.17%)
Total	230(100%)

Table 2: Mean Serum 25-Hyroxyvitamin D Levels according to sex, age group

Variable	Frequency (%)	Mean serum 25(OH)D nmol/l	P value
Gender			<0.05
Male	143(62.17%)	57.3 ± 28.9	
Female	87(37.82%)	57.8 ± 29.5	
Age group			
1-6 months	70(30.43%)	48.3 ± 30.2	
7-12 months	78(33.91%)	61.8 ± 32.4	
13-18 months	47(20.43%)	60.1 ± 22.2	
19-24 months	35(15.21%)	68.2 ± 27.2	
Total	230(100%)		

DISCUSSION

In children, there are sparse outcome data to help define a healthy or optimal level of 25(OH)D. Although vitamin D deficiency has been defined as a child having a serum 25(OH)D level of <25 nmol/L[16] or <27.5 nmol/L,[17] some have proposed that levels of <50 nmol/L should define vitamin D deficiency.[18,19] The initial definitions and discussion about a healthy level of vitamin D concerned the prevention of rickets.[17] Data however, demonstrate that vitamin D is a prohormone with receptors throughout the body.[20] As a result, health outcomes beyond rickets are now being considered when experts and national panels try to define a healthy level of 25(OH)D for children.[21]

In the present study a total number of 230 children aged 1-24 months were included in which 62.17% children were males and 37.82% were females. 44.34% children had Serum 25(OH)D level<50 nmol/l, 33.47% children had Serum 25(OH)D level between 50-75 nmol/l and 22.17% children had Serum 25(OH)D level above > 75 nmol/l. The mean 25-hydroxyvitamin D levels for males were 57.3 ± 28.9 nmol/l and females were 57.8 ± 29.5 nmol/l. Children in the first 6 months had the lowest mean serum 25-hydroxyvitamin D level compared to others.

A study in India reveals that 51% had values of 25(OH) D < 37.5 nmol/L among 35 three months aged breastfed infants and they had a mean 25(OH) D of 49 nmol/L.[22]

In Pakistan (25° N), 38 six months aged breastfed infants had a mean 25(OH)D of 25 nmol/L (18 SD), and 71% of infants (12/17) aged less than three months, had 25(OH)D <40 nmol/L.[23]

Pfitzner, et al. had earlier reported over two decades ago, that vitamin D deficiency was absent in young Nigerian children (aged 6-35 months) living in Jos, North-Central Nigeria. However, they used a lower cut off point of 10 ng/ml (25 nmol/l) to define normal 25-hydroxyvitamin D levels at that time compared to the cut off points recently proposed by the Endocrine Society of below 50nmol/l for deficiency and 50-75 nmol/l for insufficiency. Also, more than half of the children studied by Pfitzner, et al. had serum 25(OH)D below 30 ng/ml (75 nmol/l).[24]

The Canadian Paediatric Society has termed children with levels of 25(OH)D of <75 nmol/L as insufficient.[16]

CONCLUSION

The present study concluded that 44.34% children had Serum 25(OH)D level<50 nmol/l, 33.47% children had Serum 25(OH)D level between 50-75 nmol/l and 22.17% children had Serum 25(OH)D level above > 75 nmol/l. Children in the first 6 months had the lowest mean serum 25-hydroxyvitamin D level compared to others.

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