Prevalence of hypocalcemia in children examined for serum calcium in Sana'a, Yemen

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ABSTRACT

Objective: To estimate the prevalence of hypocalcemia in children examined for serum calcium.

Methods: A record-based study was carried out in the Specialized Pediatric Center in Sana'a city, Yemen during the 4 year period 1999 to 2003. Out of 90600 patients seen for different causes, 310 (0.34%) were subjected to serum calcium level examination. Data regarding age and gender were also collected.

Results: The median age of the patients was 5 months, with minimum age of one day and maximum age of 4 years. Prevalence of hypocalcemia among children examined for serum calcium was 58%, 60% of them were males and 40% were females. Age group of 0-1 months constituted 17.8% while the age group of 1-3 months constituted 17.2%. Patients with serum calcium level between 4-6 mg constituted 27.8% and less than 7.5 mg were 72.2%.

Conclusion: Prevalence of hypocalcemia in children examined for serum calcium was high. Males were more affected than females and was more in neonates followed by age 1-3 months then age 3-6 months.

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Tetany and nutritional vitamin D deficiency are rare nowadays, but the latter occasionally develops in exclusively breast-fed infant and whose mother were unaware of human milk's vitamin D deficiency and does not provide supplementary vitamin D.[1-4]

Hypocalcemia and tetany are caused by vitamin D deficiency or abnormalities of vitamin D metabolism. The onset of vitamin D deficiency tetany usually occurs at 3-6 months of age, due to depletion of the infant's vitamin D stores requires this amount of time. However, an infant born of a vitamin D–deficient mother may develop hypocalcemia from vitamin D deficiency within the first week of life.[1] Maternal hypovitaminosis D occurs due to deficient intake of vitamin D, decreased exposure to sunlight, malabsorption, closely spaced pregnancies, prolonged lactation, dark skin and a diet poor in vitamin D.[2,5-8] Fetal calcium and vitamin D stores are derived exclusively from the mother. Depletion of maternal calcium and vitamin D stores will affect the calcium status of the fetus, resulting in hypocalcemia and rickets in the newborn.[9] The neonate is particularly susceptible to hypocalcemia associated with abnormal vitamin D metabolism, hypoparathyroidism, low calcium intake, or high phosphate intake. The main factors, which regulate parathyroid hormone production are calcium, phosphate, vitamin D, and estrogens.[1,10] Serum calcium values correlate directly with gestational age, and less-mature infants have a greater chance of developing hypocalcemia.[1,11] Hypocalcemia should be suspected as a possible cause of convulsions, it can be diagnosed only by determining serum concentrations of calcium ions. A serum calcium concentration below 7 mg/dl

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establishes the diagnosis; a level below 7.5 mg/dl is suggestive.[1,11,12] A strong association was found between pneumonia and nutritional rickets.[13-15] In recent years, the emphasis has changed from a vitamin D dosage that simply protects against rickets and osteomalacia, to one that suppresses parathyroid secretion and protects against the development of osteoporosis.[13,15-17] Children with high bone density associated with vitamin D sufficiency are unlikely to develop osteoporosis later.[18] To achieve these ends, adequacy of both calcium and vitamin D intakes is essential.[19] Administering 1,25-dihydroxyvitamin D3 during the first day of life to prematurely born infants at risk for hypocalcemia has either successfully prevented or reduced the severity and duration of hypocalcemia, but it is not recommended for routine prevention.[1,11,12] Irradiation with ultraviolet rays for a few minutes per day leads to adequate improvement of the vitamin D status. It is as effective as oral vitamin D3 in increasing serum 25 (hydroxy) D and suppressing secondary hyperparathyroidism.[20,21]

The most important presentation of hypocalcemia in infants are convulsions, respiratory distress,[4] carpopedal spasm, which are not usually seen. Laryngospasm with cyanosis and apneic episodes may occur. Irritability, muscular twitching, jitteriness, and tremors are common clinical manifestations in newborn.[1,12]

The aim of the study was to estimate the prevalence of hypocalcemia in children examined for serum calcium presented to Specialized Pediatric Center Sana'a city and to identify the possible cause of hypocalcemia. This study also serves as a base line for future study

Methods. Records of 90600 cases age ranged from 0-15 years, attending in Specialized Pediatric Center in Sana'a city during the period 1999 - 2003 were reviewed. Some 310 of the patients who had complain related to hypocalcemia (convulsions, usually generalized short and without loss of consciousness, carpopedal spasm, Chvostek sign, laryngospasm with cyanosis and apneic episodes, irritability, muscular twitching, jitteriness, and tremors), were subjected to serum calcium level examination. Blood sample collected by well trained technicians avoiding the squeezing and examined by calcium Liquicolor® photometric test for calcium. Serum calcium level 7.5 mg/dl or less was considered hypocalcemia. Patients were divided according to the severity of hypocalcemia, to those who had serum calcium level less than 6 mg/dl and those who had serum calcium level between 6 - 7.5 mg/dl. Also data about age and gender were collected and processed manually, Chi-square test was performed using EPI6 statistical program .

Table 1 - Serum calcium level according to ages of children.

Age group	Low serum calcium		Normal serum calcium	
	N	(%)	N	(%)
0 day - 1 months	32	(62.7)	19	(37.3)
>1-3 months	31	(49.2)	32	(50.8)
>3-6 months	45	(72.6)	17	(27.4)
>6-12 months	52	(96.3)	2	(3.7)
> 12 months	20	(25)	60	(75)
Total	**180**	**(58)**	**130**	**(42)**

Chi-square = 76.2, p<0.0000001

Results. Total patients seen during 4 year period were 90600. Some 310 (0.34%) patients (males 196 and females 114) were suspected for hypocalcemia and subjected to serum calcium level examination. Their age was ranged from 0-4 years with a median of 5 months and a minimum of one day and a maximum of 4 years. One hundred eighty (58%) of the examined patients had hypocalcemia (108 males and 72 females). (Chi-square = 1.9 and p=0.17). Age group from 0 - 1 month who had hypocalcemia were 17.8% while patients age ranged from 1-3 months were 17.2%, patients age ranged from 3-6 months were 25% patients, those age ranged from 6-12 months were 28.9%, and patients age ranged from 1-4 years were 11% **Table 1**. Patients with serum calcium level between 4 - 6 mg/dl were 27.8% and patients with serum calcium level between 6 - 7.5 mg/dl were 72.2%.

Discussion. In this study, presenting males with hypocalcemia were more than females. This can be attributed to many families in Yemen prefer males than females and bring them early for medical advice. The prevalence of hypocalcemia among children examined for serum calcium was high 58% in spite of the serum calcium level was not carried out for all patients who had compliant related to hypocalcemia. This was due to some families who were poor and unable to pay for the laboratory investigation and the diagnosis of hypocalcemia is straight forward. This may be attributed to many of the mothers in Sana'a city who have vitamin D deficiency due to cold weather, (Sana'a city 2100 meter above see level) the mothers are completely covered by cultural use of protective clothing, minimal exposed to sunlight, many of them had closely spaced pregnancies, prolonged lactation, and

took poor diet in vitamin D and calcium. However, an infant born to a vitamin D deficient mother may develop hypocalcemia from vitamin D deficiency within the first week of life.[1] Tetany and nutritional vitamin D deficiency are now rare, but the latter occasionally develops in a breast-fed infant whose mother was unaware of human milk's vitamin D deficiency and does not provide supplementary vitamin D.[1,11,12] Dietary calcium intake depends on the consumption of dairy products, almonds and sardines and leafy green vegetables. The primary method of prevention is to ensure maximum peak bone mass by providing optimal calcium intake during childhood and adolescence.[11]

The current study revealed that hypocalcemia was higher in neonates, and in younger infants than in older ones. This may be due to mothers who have vitamin D deficiency for the reasons mentioned above, also, the children was exposed to sunlight when they become older. In this study, hypocalcemia patients with serum calcium level between 4 - 6 mg/dl were 27.8% and patients with serum calcium level between 6 - 7.5 mg/dl were 72.2%. This may be correlated by severity of vitamin D deficiency of the mothers.

In conclusion, the prevalence of hypocalcemia in children was high. Hypocalcemia was more in males in comparison with females, also was more in neonate followed by age 1-3 months and then age 3-6 months. The mean cause of high percentage of hypocalcemia in children examined for serum calcium in Sana'a city was vitamin D deficiency.

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