



Investigation of vitamin D, vitamin B12 and ferritin levels in children receiving home health care services in southeastern Türkiye

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Abstract

Aim: For proper nutrition of children followed by the Home Health Care (HHC) unit, a close follow-up is extremely important. Vitamin deficiencies are common in children in this group who need parental or caregiver-dependent nutrition. The purpose of this study conducted in Batman Province, was to investigate vitamin D, vitamin B12 and ferritin levels of individuals under 18 years of age who are followed by the HHC unit and continue their lives and treatments at home, except for emergencies.

Materials and Methods: This study was derived from the files of 416 pediatric patients who were followed up in Batman Province HHC unit between January 1, 2022, and December 31, 2022. It was designed as a retrospective, single-center study evaluating 25-hydroxyvitamin D (OH) levels, vitamin B12 levels, ferritin levels, and demographic variables from individuals followed by HHC unit. The data were collected from the HHC unit's files. IBM-SPSS version 24 was used for analysis.

Results: The mean age of the 416 children receiving home health care services included in the study was 10.38 ± 4.37 years. 234 (56.2%) of the participants were male and 182 (43.8%) were female. The 25(OH)D level was 18.47 ± 5.41 ng/mL for all ages, and the ferritin level was 34.90 (33.08) ng/mL. The vitamin B12 level was 480.31 ± 190.38 ng/L. The 25-OH-D vitamin levels of the children in the study were significantly low.

Conclusion: Patients followed within the scope of home health care services are at risk for malnutrition and vitamin deficiencies, and annual follow-up of the patients in this regard and personalized diet programs should be created. Vitamin D insufficiency and deficiency are common in children in this group, who cannot leave the house except for compulsory situations and cannot benefit from sunlight sufficiently. We think that these children with chronic diseases should take vitamin D prophylaxis.



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Introduction

Today, the increase on average life expectancy has raised the need for home health care, especially in the elderly population. Although home health services concern the elderly more, the number of children receiving care is substantial. Especially with the appropriate care of premature babies in the neonatal period, mortality has decreased significantly, and therefore the number of patients in need of home health care is increasing day by day in the pediatric age group. With the help of medical and technological developments, mortality rates are decreasing, and chronic patient care can be provided in the home environment with appropriate devices [1,2]. Home health services have significantly reduced hospitalizations in developing countries

and have, become an important option for lower costs [3]. As of February 1, 2010, in Turkey, professional support has started to be offered by all health institutions affiliated with the Ministry of Health within the scope of the "Directive on the Implementation Procedures and Principles of Home Health Services Provided by the Ministry of Health" [4].

Vitamin D is among the fat-soluble vitamins and is a pro-hormone with a primary effect on bone mineralization [5]. There are many publications reporting that vitamin D, which has many physiological functions other than bone health, is associated with cancer, infectious diseases, heart diseases, autoimmune diseases, psychiatric disorders, and metabolic syndrome [6,7]. Under normal conditions, almost all of the vitamin D in the human organism is synthesized in the skin by the influence of sunlight. Sunlight

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is generally the main source of vitamin D. If enough sunlight is not available, vitamin D deficiency is inevitable. Dietary vitamin D is most abundant in fish, liver, and egg yolk [8].

To determine the vitamin D level in humans, the 25(OH)D level with a half-life of 15 days should be measured. Levels of 1,25(OH)2D, whose conversion has been completed in kidneys, are not suitable for meaningful measurement. Because its half-life is extremely short and its circulating levels are hundreds of times lower than 25(OH)D. Many studies have been conducted define vitamin D deficiency and insufficiency and to define the reference range of 25(OH)D levels. Because of these studies, it is concluded that there is a vitamin D deficiency if the level of 25(OH)D is lower than 20 ng/ml, a vitamin D insufficiency if the level is between 21 and 29 ng/ml, an adequate level if it is higher than 30 ng/ml (the preferred range is 40-60 ng/ml), and if 25(OH)D level is higher than 150 ng/ml, it is accepted as vitamin D intoxication [9,10]. The Endocrine Society guidelines have specified daily vitamin D supplement doses for each age group. Individuals with chronic disease, malnourished patients, and those taking antiepileptic drugs may require higher doses [11]. ??? Who? Uses serum ferritin to evaluate total body iron stores. The limit value for diagnosis in IDA was determined as 12-15 mg/L. If there is a concomitant chronic disease, the limit is accepted as 50 mg/L [12].

Vitamin B12 is available in three forms: hydroxycobalamin, methylcobalamin, and adenosylcobalamin. The last two of these forms are active forms that are involved in methylation processes that are important for DNA and cell metabolism, and they play an important role in cell division and nervous system myelination. Problems such as megaloblastic anemia and neuromotor developmental delay, which occur in its deficiency, are serious causes of morbidity. It has been shown that there is a relationship between low levels of vitamin B12 in the blood and a decrease in cognitive functions. Vitamin B12 is needed to maintain neurological function [13,14].

In this study, we aimed to evaluate the ferritin, vitamin D, vitamin B12 levels of individuals under 18 years of age, who are followed by the HHC unit in the southeastern region of Turkey, which is the hottest and sunniest region.

Materials and Methods

This study was designed as a retrospective single-center study in which demographic variables and the results of the examinations obtained from the patients who applied to the hospital for routine control between January 1, 2022, and December 31, 2022, were evaluated in the HHC Unit of Batman province of Turkey. The data were collected from the HHC unit's files. IBM-SPSS version 24 was used for analysis. Patients were grouped according to age. The standard deviations and arithmetic means of the results were analyzed.

Ethics committee approval of the study was obtained from the Mardin Artuklu University Non-Interventional Clinical Research Committee from the numbers 94155. The study sample consisted of 416 patients, aged 1 to 17 years, who were registered at the Batman Province Home Health

Services Unit between January 1, 2022, and December 31, 2022, in accordance with the inclusion criteria of the study sample.

Patient inclusion criteria for the study are:

- Children between the ages of 1 and 17,
- Patients receiving home health care services.

Patient exclusion criteria from the study:

- Patients over the age of 17,
- Patients with insufficient or incomplete information in their files.

Statistical analysis

It was done using SPSS 24. Among the continuous variables, those with a nonparametric distribution were expressed as median (IQR) and those with a parametric distribution were expressed as mean standard deviation (SD). Categorical variables were stated as absolute values and percentages.

Results

The study's 416 child patients in home health care had an average age of 10.38 ± 4.36 years; 43.8% were female and 56.2% were male. The mean vitamin D levels of the patients were 18.47 ± 5.41 ng/mL, vitamin B12 levels were 480.30 ± 190.38 , ferritin levels were 34.90 (33.08) mcg/L, and hemoglobin levels were 12.79 ± 1.87 g/dL. The diagnoses of the patients were: 76.7% cerebral palsy, 12.0% hydrocephalus, microcephaly, meningomyelocele, 3.8% bone deformities, 3.6% metabolic diseases, 2.6% muscle diseases, and 1.2% congenital heart diseases. The Table shows the basic characteristics, hematological parameters, and follow-up diagnoses of home care patients (Table 1).

Table 1. Characteristics, hematologic parameters and diagnosis of the patients.

Age, years, mean \pm SD	10.38 \pm 4.36
Gender, n(%)	
Male	234(56.2)
Female	182(43.8)
Hematologic parameters	
Vitamin D mean \pm SD	18.47 \pm 5.41 ng/mL
Vitamin B12, mean \pm SD	480.30 \pm 190.38 ng/L
Ferritin, median(IQR)	34.9(33.08) ng/mL
Hemoglobin, mean \pm SD	12.79 \pm 1.87
Follow-up diagnosis	
Cerebral palsy, n(%)	319(76.7)
Congenital heart disease, n(%)	5(1.2)
Hydrocephaly, microcephaly, meningomyelocele, n(%)	50(12)
Bone deformities, n(%)	16(3.8)
Muscle diseases (muscular dystrophy, SMA), n(%)	11(2.6)
Metabolic Diseases, n(%)	15(3.6)

Discussion

The primary distinction between childhood and adulthood is that childhood is marked by an ongoing process of growth and development [15]. Micronutrients, which are valuable for growth and development, include vitamins and minerals needed for the maintenance of normal cellular and molecular functions. The immune system, cellular regeneration, vision, intelligence, perception, and mortality are all positively impacted by these nutrients [16].

The term "vitamin B12" refers to a class of substances known as cobalamin [17]. Red meat, especially, and other animal products are good sources of vitamin B12. In plant foods, it is very rare. The organism uses vitamin B12 as a coenzyme for the synthesis of DNA, myelination, the hematopoietic system, and the development of the nervous system [18]. The lack of vitamin B12 is a common issue. Growth retardation and appetite loss are the most typical symptoms of deficiencies. Between 5-40% of people have vitamin B12 deficiency [19]. In our study, B12 levels were low in 62 (14.9%) of 416 patients.

Iron deficiency anemia (IDA) can occur in people of any age. Inability to meet the body's requirement for iron in the diet is the leading cause of deficiency in the pediatric age group. The detection of low ferritin is the most crucial factor in the diagnosis of IDA. Acute-phase reactant ferritin can also increase in conditions that cause inflammation [20]. In our study, the average ferritin level was found to be 34.9 ng/ml.

Vitamin D is a steroid hormone. The skin is the body's primary source of vitamin D, where it is produced under the influence of sunlight. To a lesser extent, it can be taken with food. In children, abnormalities in bone metabolism are caused by vitamin D deficiency. In addition to these consequences, vitamin D deficiency contributes to the development of numerous undesirable issues in the body [21].

The 25(OH)D levels should be measured to assess a person's vitamin D level. A level of 25(OH)D greater than 30 ng/ml is considered adequate, but 40-60 ng/ml is preferred [22]. While the target ideal level of vitamin D in adults is considered to be 32 ng/ml, this value is accepted as at least 20 ng/ml in children [23,24]. To achieve this, daily intake of at least 800-1000 IU of vitamin D is recommended [25]. In our study, 131 (31.5%) of 416 patients had 25(OH) vitamin D levels lower than 20 ng/ml (vitamin D deficiency) and 133 (32%) patients had levels between 20 and 30 ng/ml (vitamin D inadequacy). Deficiency or inadequacy was detected in 63.5% of home health care patients. The ideal range of vitamin D should be 40-60 ng/mL in this group with chronic diseases, most of whom use drugs.

Conclusion

Children in this group who reside in the sun-drenched region of Turkey, do not leave the house except in cases of necessity, and cannot benefit from sunlight sufficiently were found to have a high rate of vitamin D insufficiency and deficiency. In this group, where most care is provided at home, vitamin D-enriched foods or vitamin D supplements are crucial for bone health and boosting immunity. We think that patients should be given vitamin D prophylaxis and children with chronic illnesses receiving home

health care should be regularly checked for vitamin deficiencies. To support this conclusion, additional research is required.

Limitations of the study

The study was conducted in a hospital in Batman province and cannot be generalized to the whole population.

Statement of contribution of researchers

All authors declare that they have contributed to the article equally. ÖO, MS contributed to statistical analysis, the design of the study, and preparation of the article.

Support/acknowledgment statement

No financial support was received from any institution or person related to the study.

Conflict statement

There are no potential conflicts of interest in this study.

Ethical approval

Mardin Artuklu University Non-Invasive Clinical Research Ethics Committee, Date: 19.04.2023, Decision no: 94155.

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