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Effects of vitamin D supplementation (oily form) in patients with thalassemia

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Abstract

Background. *Thalassemia is congenital disease case by mutation effect to synthesis of beta globin chain of hemoglobin result in combination of metabolic and endocrine disorder. Bone disease is a not rare complication in thalassemia due to malabsorption of calcium, the secondary chronic renal disorder with low vitamin D (VD), as well as many endocrine risk factors.*

Aim. *Evaluation of vitamin D treatment (oily form) in patients with thalassemia.*

Method. *Post Marketing Surveillance (PMS) in 26 patients with Thalassemia in Ibn Al-Atheer Hospital. All patient take vitamin D oral vial oily form with dose 50000 IU, this PMS continued in 4 weeks, every week the patient take one vial. The Parameter for the level of VD.*

Result. *The total number of patients was 26; mean age was 13.5 years, between 3-41 years, with 53.8% were males and 46.2% were females. mean serum level of vitamin D was statically significantly very lower in thalassemia patients than in than normal level; (89%) of cases had deficient VD (≤ 20 ng/ml), (7%) of cases had insufficient vitamin D (21–29 ng/ml), and (4%) of cases had deficient VD optimal vitamin D (more than 30 ng/ml), our study showed that 4 weeks of VD supplementation significantly increased the serum level of VD.*

Conclusion. *VD (Oily based oral vial) "High D" significantly raise the VD level in serum in majority of thalassemia patients, the result was sustained regardless of age, gender and existence of other comorbidities.*

Keywords: thalassemia, VD, oily form, VDD

INTRODUCTION

Thalassemia is the most common human genetic disorder found in almost every nation and mostly in the Mediterranean regions, hence it is called [1].
β-thalassemia major refers to patients with homozygosis or compound heterozygosis for beta thalassemia who are blood transfusion dependent for survival beyond early childhood [2].

Very common bone complication is include bone deformities, osteoporosis and pathologic fractures of the spine and the hip [3]. Furthermore, the VD receptor "VDR" Bsm1 and Fok1 polymorphisms were found to be risk factors for bone low bone mineral density, mineral damage, and short stature in prepubertal and pubertal patients [4]. However, different genetic studies of polymorphisms have given contradictory viewpoints [5]. Includes elements of the pathological body itself that making ineffective hematopoiesis with progressive bone marrow expansion and several secondary factors like endocrine malfunction, iron overload and chelation therapy, vitamin deficiencies, and decreased patient physical activity [6,7]. In particular, VD deficiency (VDD)

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are common among adolescents [8]. Male gender, lack of spontaneous puberty and diabetes represent high risk factors for osteoporosis, whereas trans-fusional history, chelation and strict erythropoietic activity do not [9].

VD is necessary for calcium (Ca) homeostasis and for mineralization of the skeleton, especially through periods of rapid growth. VD lead to rickets (mineralization defect at growth of the epiphyseal plates and bone tissues) and bone tissues mineralization defect [10]. It is a common comorbidity in cases with thalassemia. However, both its prevalence and its severity vary greatly in different populations and selective evidences are insufficient to conclude whether VD supplementation is also improves bone mineral [11].

The bioavailability of a supplement is partially dependent on the solubility of the supplement tablets or capsules which increase its absorption. The coating of the supplements and the solubility of the supplements formulation contribute to its dissolution. The formulation of the supplement include the active ingredients and the expedients like the vehicle and fillers. Vehicle is inactive substances that function to stabilize the active ingredient of a supplement, VD may "Vehicles" in absorption when solubilized in oil, lactose powders and cellulose powders or ethanol [12].

METHOD

This study performed a prospective randomized study on population consisted of PMS in 26 cases with thalassemia between May 2023 and July 2023 at Ibn Al-Atheer Hospital, Mosul, Iraq.

All taken VD oral vial oily form (Cholecalciferol 1.25 mg (high D)) with dose 50000 IU, this PMS continued for 4 weeks (treatment duration in AACE should be at least 6 weeks), every week the subject taken one vial.

The parameter for the level of VD (Optimal – Deficient – Insufficient) where taken from American Association of Clinical Endocrinologists 2019 [13-16].

Inclusion criteria

- Patients with thalassemia and VDD
- All patients have thalassemia with different ages and genders
- Other comorbidities (Obesity, Diabetes Mellitus, Delay in the Growth, Hypertension, Smoking, Heart Disease, Splenomegaly).

Exclusion criteria

- Patients who have not complete or take the treatment.

Procedure

Venous blood (3 millilitter) was drawn under aseptic conditions (two time before and after treatment with VD oral vial oily form) put in plain test tubes without anticoagulants. All samples were allowed to clotted at room temperature for about 30 min and then centrifuged for 15 min at 1000×g. The serum was drawn and levels of 25-hydroxyvitamin D quantitative measurement was carried out using VIDAS® 25 OH VD Total (automated quantitative test for the determination of 25-hydroxyvitamin D Total) in human serum or plasma using the ELFA (Enzyme Linked Fluorescent Assay) technique.

Statistical analysis

Statistical analysis carried by using the SPSS version 24. (IBM, Chicago, US). The Chi- square test was used to show the differences between the studied variables. The frequencies and percent described qualitative variables whereas mean and SD used for quantitative variables. Statistical significance was considered with P-value ≤0.05.

RESULT

Totally, 26 cases with thalassemia with the mean age was (13.5 years), ranged between (3-41) years, with 53.8% (14 patient) males and 46.2% (12 patients) were females. Complication of disease showed 15.4% growth delay, 3.8% heart disease, 34.6% splenomegaly and 11.5% osteoporosis (Table 1).

TABLE 1. Variables in the study

Variable		No.	%
Age (years)	Mean (range)	13.5 (3-41)	
Gender	M	14	53.8
		12	46.2
Clinical complication	Growth delay	4	15.4
	Heart disease	1	3.8
	Splenomegaly	9	34.6
	Osteoporosis	3	11.5
Premature Trial Medication Discontinuation	Yes	24	92.3
	No	2	7.7

TABLE 2. VD levels in thalassemia before and after treatment

Parameters	Before	After	Paired independent t-test	P-value
Mean±SD	13.5±7.15	34.5±11.8	-10.227	0.0001
Median	12.3	35		
Range	8.10-42	10.5-55.8		

Mean of vitamin level D before treatment was 13.5 ng/ml while after 4 week of treatment with VD oral vial oily form was 34.5 ng/ml with a high statically difference (P<0.0001) (Table 2).

About 89% of patient had VDD before treatment and 19% after treatment, as show in Figure 1.

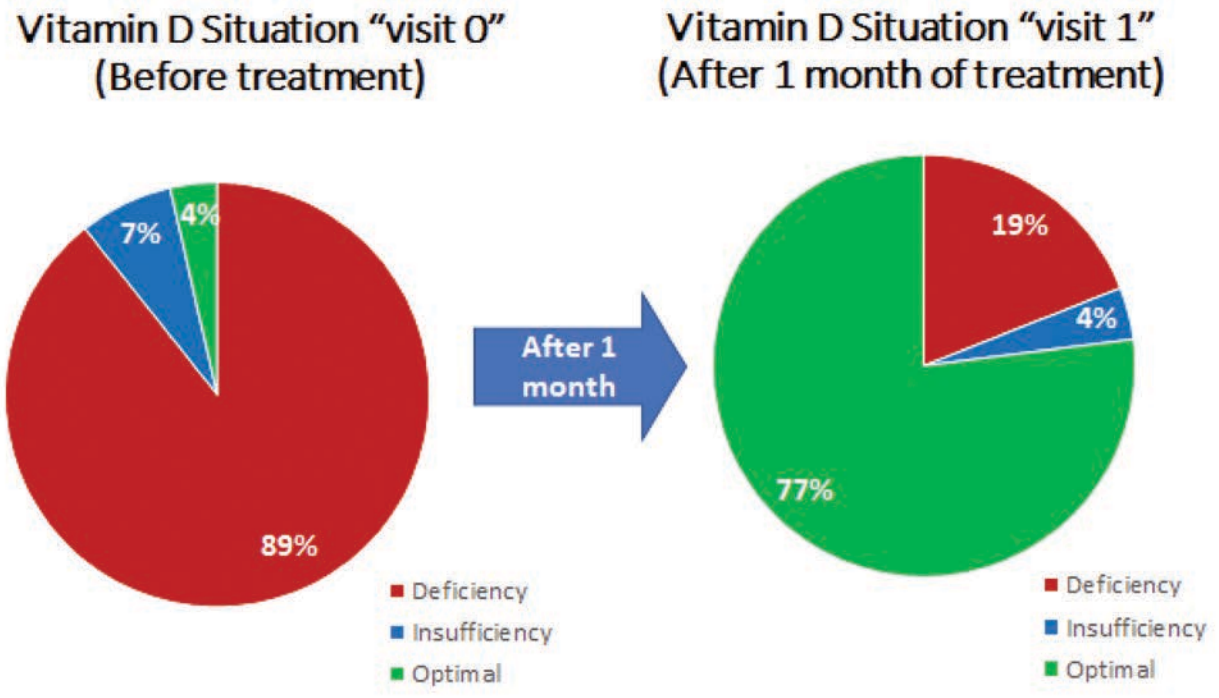

FIGURE 1. The percentage of deficiency, insufficiency and optimal VD status before and after treatment

DISCUSSION

The total number of patients was 26; the mean age was 13.5 years, range between (3-41) years. This is agreement to mean age of a previous two studies in Iraq, which show that the mean age is 14.5 and 13 years [17,18].

Males were slightly more than females with a M:F ratio of 1.6:1. This is agree with Hama Salih et al. [19] agreement with this studies by M:F ratio but disagreement with other two Iraqi studies [17,18]. This discrepancy may be due to different in size of sample.

In our study, the mean serum level of 25-OH-VD was statically significantly very lower in thalassemia than normal level; although, (89%) of cases had deficient VD (≤ 20ng/ml), (7%) of case had insufficient VD (21–29 ng/ml), and (4%) of cases had deficient VD optimal VD (more than 30 ng/ml) and this results are consistent with Agrawal et al. [20], Abdelmotaleb et al. [21] and Merchant et al. [22] studies found that the mean serum level of VD was statically significant lower in patients with thalassemic than in controls and 98% of thalassemia had VDD.

VDD in thalassemia may be due to malabsorption of VD along with insufficient dietary consumption [23]. Another interested explanation is hepatic malfunctions which result lead to imbalance in hydroxylation of VD leading to reduce in level [24]. Different authors have mentioned that VDD may be caused by hepatic iron-overload [25].

Our study showed that 4 weeks of VD supplementation lead to significantly increase the serum level of VD. This result is consist with previous studies that demonstrated the effectiveness of VD-3 in thalassemia, and showed a significant improvement in VD level in majority of patients [19,26].

Grossmann et al, finally reported that combined oil-soluble vehicles produced the greatest rate of

change in mean serum 25(OH)D per 100000 IU, followed by powder-based vehicles and VD dissolved in ethanol (4.05, 2.75, 0.5 nmol/L per 100 IU/day, respectively [27], which agreement with our study.

According to the population, it is important to consider how different compounds affect the vehicles to bioavailability of VD. Vehicles such as Oils, powders and ethanol can be used to support VD, however, there has been little research into the most effective vehicle. Holick et al. [1] was suggested vehicle to have an effect on the bioavailability of VD supplements.

CONCLUSION

VD (Oily based oral vial) "High D" significantly raise the VD level in serum in majority of thalassemia patients, the result was sustained regardless of age, gender and existence of other comorbidities.

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