



RESEARCH ARTICLE

THE ROLE OF VITAMIN D DEFICIENCY IN SINUS TACHYCARDIA

*Ahmed Basher, M.

Department of Internal Medicine, College of Medicine, Wasit University, Wasit, Iraq

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ABSTRACT

A sinus tachycardia is an accelerated sinus rate that is a physiological response e.g., to fever, anxiety, pain, exercises hyperthyroidism or cardiac disease. Heart rate is more than 100 bpm and rhythm is usually regular and P waves are present. 31 cases (8 male and 23 female) has been diagnosed with sinus tachycardia according to the clinical feature and ECG assessment, ages between (19-34) years old, age mean \pm SD (23.7097 \pm 3.98492). Assessment of electrocardiography (ECG) to conform the sinus tachycardia, also assessment of Echocardiography has been done to exclusion others cardiac disease diseases. Laboratory investigations has been done, free serum vitamin D (25-dihydroxyvitamin D [25(OH) D]) has been evaluated by ELISA, this type provides the single best assessment of vitamin D status and thyroid functions (T3, T4, and TSH). Our results suggested that there is an association between the vitamin D deficiency and patients diagnosed with sinus tachycardia by assessment the free serum vitamin D (25-dihydroxyvitamin D [25(OH) D]). Also the results showed strong evidence among patients whose received treatment with vitamin D3 (300000 IU/month for 3 Consecutive months) and showed a good response according to statistical analysis (P = 0.005). In conclusion, the deficiency of vitamin D effect on regulation of the heart beats; also the poster of vitamin D 3 in certain dose for certain period can be treating the disturbance of the heart beats.

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INTRODUCTION

The primary sinus tachycardia is the most abandoned rhythm disturbance suffered in clinical practice. The main reason for this is that although effort is expended in investigating and eliminating secondary causes, the primary entity remains clinically perplexing (Levine, 1997). In humans, a substantial and indisputable body of epidemiologic data after adjustment for other risk factors, associates higher heart rates with increased mortality, not just in patients with underlying cardiovascular disease but also in the population at large (Habib, 2001). Although tachycardia-induced cardiac disease may be seen as secondary due to well-defined causal cardiovascular factor, this disorder ranks among cardiac disease also in the current definition and classification of cardiac disease (Elliott *et al.*, 2008; Maron *et al.*, 2006). Vitamin D deficiency is one of the most frequently seen micronutrient disorders (Ozder, Eker, and Bilginc, 2015). Actually there are two way to obtaining vitamin D, first way by synthesis in the human skin upon exposure to the UV light of the sun and the second way by intake from the diet (Bendik *et al.*, 2014). Also Vitamin D deficiency is associated with various diseases.

The most known of them are bone diseases and osteoporosis mostly commons. On the other hand the association between vitamin D levels and a number of autoimmune diseases and many different cancers has been mentioned previously (Okazaki, 2014). Some of researches discussed the effects of vitamin D on cardiovascular system. So a numbers of clinical trials revealed association between low vitamin D levels and cardiovascular disorders such as hypertension and coronary artery disease (Abbasi F and GM, 2015; Boyuk B and V, 2015; Li *et al.*, 2015; Messa *et al.*, 2014; Siasos *et al.*, 2014). In spite of researches that discussed the association of vitamin D and cardiovascular disease, the arrhythmogenic potential of vitamin D insufficiency remains to be unclear. So our aims of this study to detection the association of vitamin D insufficiency and sinus tachycardia.

MATERIALS AND METHODS

Cases selection

31 cases (8 male and 23 female) has been diagnosed with sinus tachycardia according to the clinical feature and ECG assessment, with an ages between (19-34) years old, age mean \pm SD (23.7097 \pm 3.98492), were enrolled in this study and recruited at Al-zahraa teaching hospital, Wasit, Iraq. The ethics

*Corresponding author: Ahmed Basher, M.

Department of Internal Medicine, College of Medicine, Wasit University, Wasit, Iraq.

committees of participating universities and university hospitals approved the study, and informed consent was obtained from all participants.

Assessment of electrocardiography (ECG)

A 12-lead electrocardiogram (ECG) usually confirms the presence of sinus tachycardia and may add more information if the underlying cause is cardiac. The heart rate is greater than 100 beats per minute (bpm), the P wave may be difficult to distinguish from the previous T wave, and the QRS complex is shorter than 120 ms (three small squares on the ECG).

Assessment of Echocardiography

All cases has been undergone to Echocardiography study to prove that all cases are free another associated cardiac disease.

Laboratory investigations

Free serum vitamin D(25-dihydroxyvitamin D [25(OH) D])assessment at 8 hours fasting previously

Free serum vitamin D (25-dihydroxyvitamin D [25(OH) D]) has been evaluated by ELISA, this type provides the single best assessment of vitamin D status than Vitamin D(1,25-dihydroxyvitamin D [1,25(OH)2D]) that's consider limited, thus should be the only vitamin D3 (25-dihydroxyvitamin D [25(OH) D]) assay typically performed (Zerwekh, 2008).

Assessment of thyroid functions (T3, T4, and TSH)

The current test (T3, T4, and TSH) has been done to prove beyond a reasonable doubt, the deficiency of vitamin D of our cases doesn't due to the thyroid gland insufficiency.

Statistical analysis of data

Statistical analysis of data was done to correlate genotype distribution and allele frequencies were performed by SPSS package version 17. The frequencies of alleles, genotypes in different groups were compared using the Chi-squared test (X²), t-test were used to test the significance of results of quantitative variables. Odds ratio and 95% confidence interval (95% CIs) were calculated for different studied parameters. The confidence interval (CI) at 95% was used to describe the amount of uncertainty associated with the samples (Greenfield *et al.*, 2008; Szumilas, 2010). The significance of the results was taken at the *P* < 0.05 level of significance.

RESULTS AND DISCUSSION

Our result showed there is a strong association between the vitamin D deficiency and patients diagnosed with sinus tachycardia via above findings by assessment the free serum vitamin D (25-dihydroxyvitamin D [25(OH) D]) to the patients involved with sinus tachycardia, also the thyroids functions test (TFT) was within normal values, the (TFT) has been done to exclusion the reasons of vitamin D deficiency due to thyroids disorders.

Table 1. The frequency of ages among cases

Age	Frequency	Valid Percent (%)
Valid	19	1
	20	4
	21	8
	22	4
	23	2
	24	1
	25	2
	26	3
	27	1
	28	2
	32	1
	33	1
	34	1
Total	31	100.0

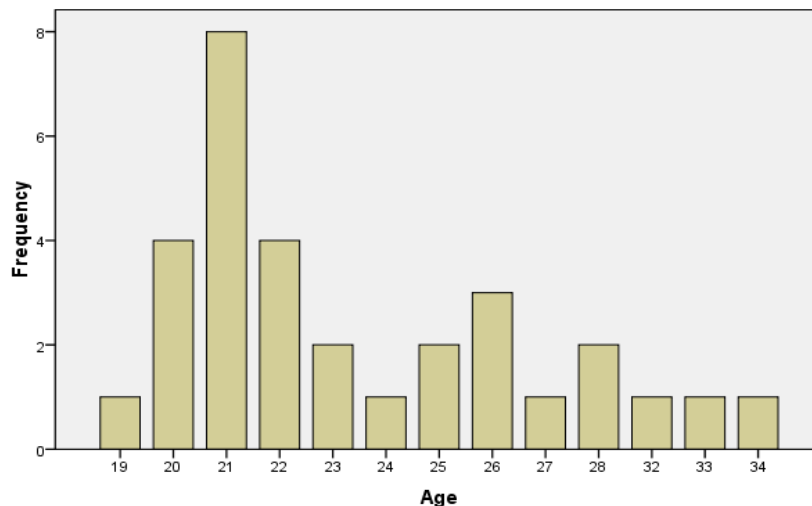


Figure 1. The frequency of ages among cases

Table 2. The relation between ages and value of free serum vitamin D assessment and frequency among cases

Age	Free serum vitamin D (25-dihydroxyvitamin D [25(OH) D]) assessment at 8 hours fasting previously, (N.V) 20-50 ng/ml					Total
	10ng/ml	13ng/ml	5ng/ml	7ng/ml	Less than 3ng/ml	
19	0	0	0	0	1	1
20	0	0	0	0	4	4
21	1	1	0	0	6	8
22	0	0	0	0	4	4
23	0	0	0	0	2	2
24	0	0	0	0	1	1
25	0	0	0	0	2	2
26	0	0	1	0	2	3
27	0	0	0	0	1	1
28	0	0	0	0	2	2
32	0	0	0	0	1	1
33	0	0	1	0	0	1
34	0	0	0	1	0	1
Total	1	1	2	1	26	31

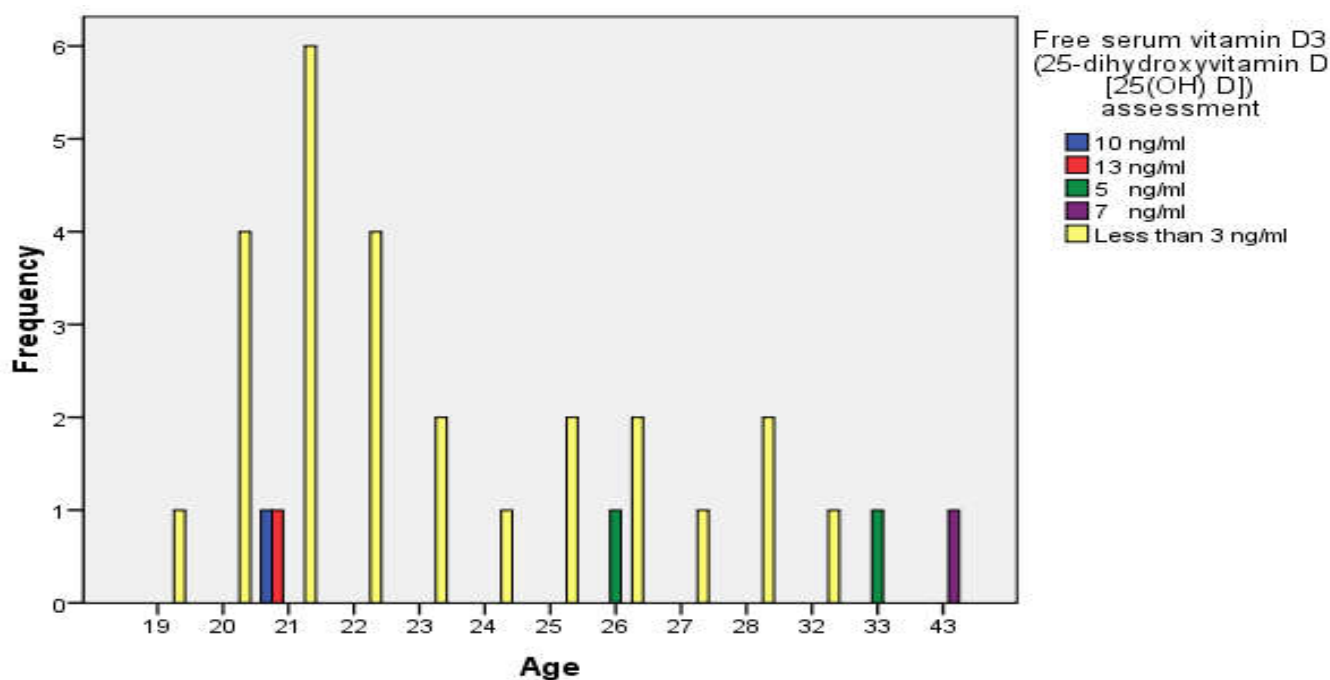


Figure 2. The relation between ages and value of Free serum vitamin D assessment and frequency among cases

Table 3. Cases response frequencies to the treatment with vitamin D3.300000 IU/month for 3 Consecutive months

The Cases respond to the treatment with vitamin D3.300000 IU/month for 3 Consecutive months		The Cases don't respond to the treatment with vitamin D3.300000 IU/month for 3 Consecutive months		Significance	OR (95% CI)
No.	%	No.	%		
6	19.3	25	80.7	X ² = 8.014 P = 0.005	(0.12 - 0.68)

X²: Chi-Square test

*significant at P≤0.05

Also the results showed the positive response of the most cases (25 from 31) to the vitamin D3 treatment (300000 IU/month for 3 Consecutive months) according to the statistical analysis when compared the cases that showed response to treatment with vitamin D3 verses cases that didn't showed the response to treatment with vitamin D3 (P = 0.005) as shown in Table 3. A vitamin D deficiency can cause an irregular heartbeat, but taking too much vitamin D can have the same effect. Vitamin D levels affect the amount of calcium your body absorbs;

calcium helps generate electronic impulses and muscle contractions that help regulate your heartbeat. Vitamin D deficiency or overdose can lead to calcium deficiency or overdose; either can cause an irregular heartbeat. The trials to understand the impact of vitamin D in cardiovascular system beside the study of vitamin D role investigated previously (Gandini *et al.*, 2014; Selmi, 2014). The low vitamin D levels have been linked to atherosclerosis, impaired endothelial function and increased vascular stiffness (Seker *et al.*,

2013). Other study demonstrated a relationship between vitamin D deficiency and non-valvular atrial fibrillation (Demir, Uyan, and Melek, 2014). In the similar study in the Chinese population showed same results (Chen *et al.*, 2014). Otherwise the results found no association between vitamin D deficiency and the type or complications of atrial fibrillation (Qayyum *et al.*, 2012; Rienstra *et al.*, 2011). On the other hand, previously research showed the serum vitamin D levels do not have any impact on the current arrhythmic status and the risk of developing arrhythmia (ZEKI YÜKSEL GÜNAYDIN and KARA, 2016). As is seen, studies scoping arrhythmia are far limited compared to other issues in cardiovascular research area. Our conclusion that vitamin D levels have an impact on the heart beats and the risk of developing arrhythmia. Beside the questioned value of vitamin D in general cardiovascular outcomes.

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