

The relationship between Benign Paroxysmal Positional Vertigo and vitamin D deficiency

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ABSTRACT

Introduction: Benign Paroxysmal Positional Vertigo (BPPV) is considered the most common cause of Chronic vertigo (1), BPPV is most commonly primary with no secondary causes like head trauma (4), BPPV is caused by otoconia that moves freely in the semicircular canals(5), Calcium has an important role in the metabolism of these otoconia (6).

Objective: We performed our Research to study the relationship between serum Vitamin D levels and the occurrence of BPPV, it's relationship with bilateral BPPV involvement, and it's relationship with the number of repositioning maneuvers required to cure the patient with BPPV.

Methods: A case control retrospective study was done on 106 patients in the Royal Medical Services , Who were divided into two groups ; the first one was 53 patients diagnosed to have BPPV ,aged (31-81) years, the second was the control group with 53 patients with no BPPV, aged (30-82) years, BPPV was diagnosed by the presence of nystagmus with special characteristics in the positioning tests.

Results: Patients with BPPV had statistically lower serum vitamin D levels compared to the control group, patients with bilateral BPPV involvement had lower serum vitamin D levels compared to patients with unilateral BPPV that were statistically insignificant, finally patients with BPPV who needed more than one repositioning maneuver to cure had statically lower serum vitamin D levels than the patients with BPPV who needed only one repositioning maneuver to cure.

Conclusion: BPPV is associated with low serum vitamin D levels, in addition, patients with BPPV who require more than one repositioning maneuver to cure have lower serum vitamin D levels.

Keywords: Benign Paroxysmal Positional Vertigo (BPPV), otoconia, repositioning maneuvers, Nystagmus.

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Introduction

Benign paroxysmal positional vertigo is considered the most common cause of chronic vertigo, in which the patient presents with recurrent attacks of vertigo that is induced by changes in position , with nausea and vomiting, it is diagnosed by dix- hall pike maneuver in which there is a nystagmus with specific characteristics (1), BPPV affects about 3.4% of the people aged above 60 years, females have double the incidence of males, with postmenopausal females being affected more than premenopausal females(2). The risk of BPPV increases with age (3).

BPPV can be idiopathic or primary in 50-70% of the cases, where there is no known etiology, or secondary, in which head trauma or vestibular neuritis are the commonest known causes(4).

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BPPV is caused by otoconia moving freely in the semicircular canal (canalithiasis), or adherent to the cupula (cupulolithiasis) in any semicircular canal (5). Otoconia are made of Calcium Carbonate , Calcium metabolism is important for the synthesis and absorption of otoconia, Research was done to correlate between BPPV and vitamin D deficiency , and resulted in that abnormal calcium metabolism may cause BPPV(6).

Many studies were done that showed a correlation between low serum 25 hydroxy vitamin D levels and the occurrence and recurrence of BPPV(6,7, 8, 9), There are other studies that showed that low vitamin D serum levels doesn't correlate with the occurrence or recurrence of BPPV(10, 11 ,12). So there is debate about the relationship between BPPV and vitamin D deficiency.

The aim of the present study is to study serum 25 (OH) vitamin D levels in Jordanian patients with idiopathic BPPV and to investigate the possible relationship between the occurrence and recurrence of BPPV and low 25(OH) D levels , we also studied the relationship between serum vitamin D levels and the risk of bilateral BPPV involvement, in addition to that we tried to correlate a relationship between low vitamin D serum levels and the increase in the number of repositioning maneuvers required for patients' cure .

Methods

Between February 2019, and October 2019, 53 patients with 38 female patients, and 15 male patients, (31-81 years) seen with BPPV at the Department of Otolaryngology in the Royal Medical Services in Jordan, we performed the present study. All patients who visited our dizziness clinic in our department and were diagnosed to have BPPV were included in our study, so there were no favorable criteria used for including patients in this research, The BPPV diagnosis was based on a characteristic history and observation of typical nystagmus during the Dix-Hallpike maneuver and Supine Roll tests. The patients gave a history of recurrent attacks of positional vertigo and the exact etiology was unknown. All patients with secondary causes of BPPV like head trauma or vestibular neuritis were excluded from the study by history.

A control group of 53 patients with no BPPV symptoms, with 40 females and 13 males (30 - 82 years), that match the age and sex of the study group was used in this research, this study was performed in the Royal Medical Services in Jordan after being approved from the Medical Committee in the Royal Medical Services.

For each patient the age, sex, type of BPPV, (posterior, horizontal {canalithiasis, cupulolithiasis}), site, and type and number of repositioning maneuvers performed for each patient were included.

The serum samples were retrospectively drawn from the antecubital vein. After centrifugation, the samples were immediately stored and Serum level of 25(OH) D was measured.

The 25(OH) D levels are therefore used to classify the vitamin D status into vitamin D deficiency (<20 ng/ml), vitamin D insufficiency (20–29 ng/ml) and vitamin D sufficiency (≥ 30 ng/ml) [17].

Statistics

Results were expressed as percentages for categorical variables and as medians. Univariate data on demographic and clinical features were compared by *t*-test as appropriate. Correlations among continuous variables were assessed by the Spearman rank-correlation coefficient. (Were positive)

All statistical analysis was performed with STATA for Windows, version 13.0 (STATA Corp). Statistical significance was defined as $P < 0.05$.

Result

In our study, 53 patients with BPPV and the same number (53) controls were included, we noticed that the average serum levels of vitamin D in our study group were lower than those controls (15.12ng/ml) vs (30.9ng/ml) the p value was (p= 0.000), which is less than (0.05) which is considered statistically significant [table I], In the study group 40 patients were diagnosed to have vitamin D deficiency , with a prevalence of 75%, on the other hand 8 patients of the control group had vitamin D deficiency, with a prevalence of 15%, which is significantly higher (figure 1).

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. ttest VitD, by ( ControlBPPV)
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Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
1	53	15.07415	1.005622	7.321036	13.05622	17.09208
2	53	30.89868	1.93586	14.09327	27.01409	34.78327
combined	106	22.98642	1.332143	13.71525	20.34502	25.62781
diff		-15.82453	2.181474		-20.15047	-11.49858

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diff = mean(1) - mean(2)                                t = -7.2541
Ho: diff = 0                                           degrees of freedom = 104

Ha: diff < 0           Ha: diff != 0           Ha: diff > 0
Pr(T < t) = 0.0000    Pr(|T| > |t|) = 0.0000    Pr(T > t) = 1.0000
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Table I: this shows the mean and standard deviations for serum vitamin D levels in group (1) who are patient with BPPV, and group (2) which is the control group.

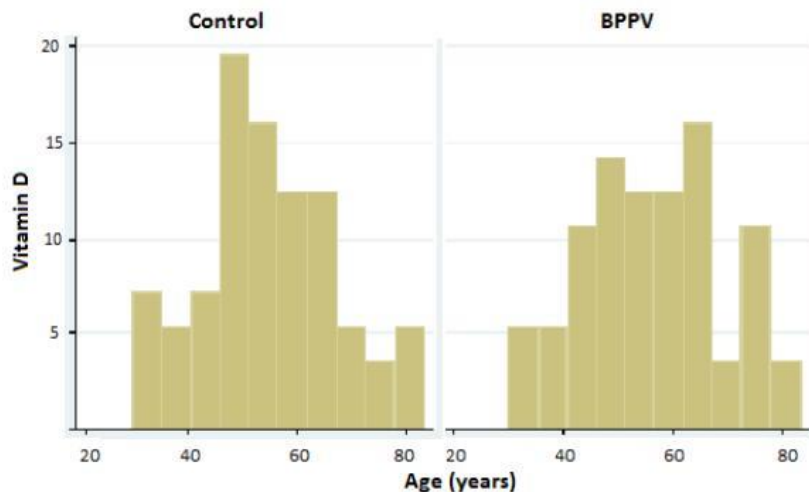


Figure 1: the chart on the left side shows the average serum vitamin D levels in different age groups in the control group, while the chart on the right side shows the average serum vitamin D levels in different age groups in patients with BPPV.

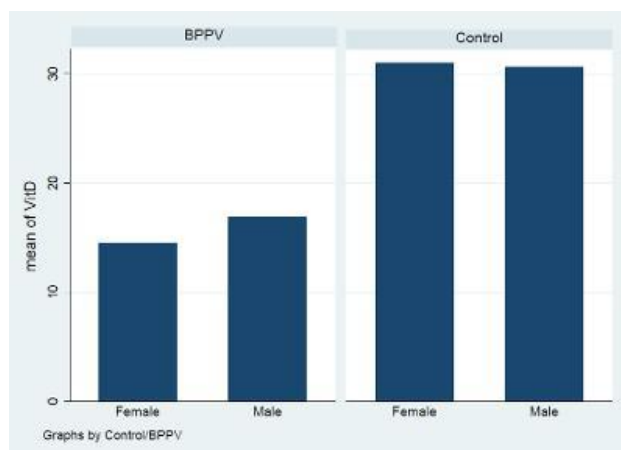


Figure 4: the graft on the left side shows the relation between serum vitamin D and the male and female groups in the patients with BPPV, on the right side shows the relation between serum vitamin D and the female and male group in the control group.

In our study only 2 patients who were diagnosed to have BPPV were diagnosed to have osteoporosis, both had low serum vitamin D levels, 3 patients were diagnosed by the neurologist to have migraine, they also had low serum vitamin D levels, one patient was diagnosed by the neurologist to have epilepsy and had low serum vitamin D levels, and two patients had otosclerosis with one with BPPV in the operated side, and both had low serum vitamin D levels.

Discussion

Many papers were done to study the relation between serum vitamin D levels and BPPV, some concluded that vitamin D deficiency is associated with BPPV and others showed no relation between both, in our study we concluded that 1) the occurrence of BPPV is associated with lower serum vitamin D levels, 2) the patients with BPPV who need more than one repositioning maneuver to recover have lower serum vitamin D levels than the patients with BPPV who recover from one repositioning maneuver, we tried to study the relationship between low serum vitamin D levels and bilateral involvement of BPPV but difference between serum vitamin D level in patients with unilateral and bilateral BPPV involvement was statistically not significant.

In our study there were no significant differences between serum levels of vitamin D in patients with posterior canal BPPV and horizontal canal BPPV, there was also no significant difference between serum vitamin D levels between males and females in both control groups and BPPV patients.

Many studies in the literature correlate with our study, some show a relationship between low serum vitamin D levels and the occurrence of BPPV, others show the relationship between vitamin D deficiency and recurrence of BPPV, others show the relation between vitamin D deficiency and BPPV in postmenopausal women (6, 7, 8), Zhang ZY and his colleagues considered vitamin D deficiency with high PTH and decreased bone mineral density risk factors for BPPV (16).

Rhim GI studied the long effect of serum vitamin D on BPPV and found that serum vitamin D levels significantly affected the recurrence of BPPV (17).

Wu Y and his colleagues tried to assess the bone metabolism in male patients with BPPV and found that decreased serum vitamin D levels is a risk factor for BPPV, in addition to that he found that the level of bone turnover among male patients with BPPV was lower than among healthy controls (18).

On the other hand other studies failed to confirm the relationship between vitamin D deficiency and the BPPV (13), , these differences may be due to differences in the clinical settings including the patients age, gender, geographic distribution, other associated medical illnesses.

In our study we added the relationship between lower serum vitamin D levels and bilateral BPPV involvement but it was statistically not significant, and the association between the numbers of repositioning maneuvers required for patients with BPPV to recover and low serum vitamin D levels.

The exact etiology of the relation between vitamin D deficiency and BPPV is not well known, but it could be contributed to the expression of some Ca²⁺ binding proteins regulated by vitamin D receptors in the epithelial cells of the inner ear (14), and this was also confirmed in another study that established the relationship between BPPV and abnormal calcium metabolism in the inner ear (15).

The limitation in our study include the small number of the study group (53 patients) which should be larger, the short period of follow up which was less than 1 year, and lack of studying the effect of normalization of vitamin D levels on BPPV recurrences.

The effect of vitamin D supplements on patients with BPPV was studied by Sheikhzadeh M and his colleagues who concluded in their study that normalization of serum vitamin D significantly reduces BPPV recurrences (19). Sheikhzadeh M with his colleagues performed another study that showed that correction of vitamin D deficiency in BPPV provides additional benefit to rehabilitation therapy (Epley maneuver) regarding duration of improvement. These findings suggest serum 25-OH D measurement in recurrent BPPV. (20).

So our study in correlation with other studies signifies the practical importance of measuring serum vitamin D levels in patients diagnosed to have BPPV, especially in patients with recurrence of symptoms, or in patients who need more than one repositioning maneuver to recover.

Conclusion

In our study we confirmed the relationship between low serum vitamin D levels and the presence of BPPV , and we found that patients with BPPV who need more than one repositioning maneuver to recover have lower serum vitamin D levels than the patients with BPPV who recover from the first repositioning maneuver, this signifies the importance of measuring serum vitamin D levels in patients with BPPV and treating them with vitamin D supplements, especially in patients who need more than one repositioning maneuver to recover.

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