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Correlation between vitamin D3 level and frequency of vestibular migraine attacks: a prospective cross-sectional study

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Abstract

Introduction: Vestibular migraine (VM) is considered to be the second most common cause of vertigo and most common cause of spontaneous episodic vertigo. Keeping in mind the global health burden of low vitamin D level and its effect on pain and balance. **Objective:** This study aiming at determining the effect of vitamin D on VM. **Methods:** A prospective, cross-sectional study conducted in Basrah hearing and balance center with 37 patients diagnosed with VM. Female to male ratio were 4.3:1. Mean age of 37.622 +/- 14.36 years. **Results:** It was found a significant relation between the frequency of VM attacks and the level of vitamin D as patients with low or sub optimal level have more frequent attacks than those with normal vitamin D level (p-value = 0.0012). **Conclusion:** These findings suggest that assessment of vitamin D level may be important in patients suffering from vestibular migraine. Vitamin D supplementation may serve as a simple and cost-effective adjunct in the management of these patients.

Keywords: Vestibular migraine. Vitamin D. VNG. cVEMP. Basrah.

Introduction

Vestibular migraine (VM) is considered to be the second most common cause of vertigo and most common cause of spontaneous episodic vertigo. the duration of attacks varies from seconds to days, and they mostly occur independently of headaches **[1,2]**. Labyrinthine abnormalities occur in 80% of patients with migraine with aura using quantitative vestibular test **[3]**. The vestibular symptoms occurring with VM can mimic inner ear disorder providing a challenge for clinicians in establishing diagnosis **[4]**. Recent diagnostic criteria for VM proposed by a joint committee of the Barany society and the International Headache Society provide an important standard for clinical diagnosis **[5]**.VM is associated with varying sensation of dizziness ranging from floating to spinning to simply motions sensitivity **[5-7]**.

One of the ways that VM can present is a positional vertigo which can make it similar in history to BPPV **[8-10]**. The prevalence of co-occurrence of both BPPV and VM is three times greater than anticipated **[2,11]**. It should be remembered that both BPPV and VM may be present in same patient at same time. Nowadays, vitamin D deficiency has been determined as a global health problem **[12]**, some study improve the reduction of recurrence of BPPV by treating sever vitamin D deficiency **[13]**. Other study reveals vitamin

D deficiency common in patients with chronic migraine [14], and vitamin D therapy should be considered in the treatment of migraine headache [15], also vitamin D supplementation may be useful in decreasing frequency of headache attacks among patients with migraine [16].

But no local study explores the relations between vitamin D deficiency and VM. The correlation between the frequency of VM and vitamin D level is discussed in this article.

Subjects and Methods

Study Design and Settings

A prospective, cross-sectional study was done at Hearing and Balance Center in Basrah teaching hospital, Basrah, Iraq during the period from January 2025 to January 2026. Thirty-seven (37) consecutive patients with Vestibular Migraine consulting the center during the period of study. Socio-demographic and clinical information were inquired about, using a special questionnaire designed for the purpose of the study. Otologic, vitamin D level and audio-vestibular evaluation was done including otoscopy, tympanometry, PTA, vHIT, Oculomotor tests, positional test, cVEMP and oVEMP. Audiometry was done using the audiometer Ittera 2 device (manufactured by GN otometrics Madsen-Denmark, Serial Number 183422 with specifications arranged according to American National Standards Institute for measurements (ANSI s3.6 1996) [17].

The tympanometry performed using otoflix 100 tympanometer manufactured by GN otometrics Madsen Company – Denmark, Serial Number 183423. vHIT System used Otosuite Vestibular software version 300 build 1007 with feature monocular video frenzel, oculomotor test, positional test. Lateral, RALP and LARP Head Impulse System goggles SN: 183420. The cVEMP and oVEMP performed using Eclips manufactured by Interacoustics\ Denmark, SN 0943354.

This study was reported in compliance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline [18].

Ethical Approval and Informed Consent

Verbal consent from all patients had been taken to share and discuss their findings. Approval from ethical committee (154 / 2025).

Statistical Analysis

Data analysis was done using Statistical Package for Social Sciences version 26. Data were tabulated. Frequencies and proportions were calculated for categorical data. Means and standard deviations were calculated for continuous variables. Chi-square test, Fischer exact test, t-test were used to examine differences or association. In all statistical analysis, level of significance (p-value) set at ≤ 0.05 and the results were presented in tables and/or graphs.

Results

Thirty-seven patients with age range (15-67 years), mean is 37.622 +/- 14.36 years were enrolled in this study. Female patient predominates (30 female patients representing 81.1%, while male patients were 7, constitute 18.9%) with female to male ratio = 4.3:1 (Figure 1).

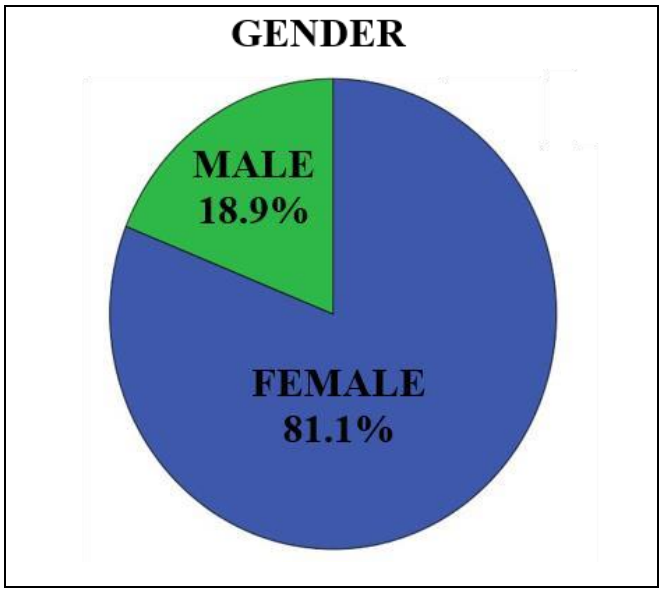

Figure 1. Gender distribution. Source: Own authorship.

Family history of similar migraine or migrinous vertigo was noted in 29 patients (78.4%), while 8 patients (21.6%) had negative family history of MV or migraine (Figure 2).

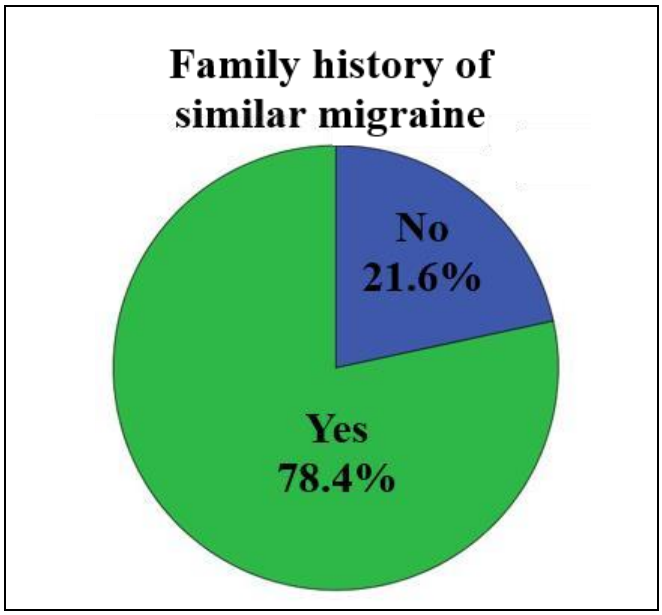

Figure 2. Family history of MV or migraine distribution. Source: Own authorship.

Only 3 patients (8.1%) had chronic illness (diabetes mellitus - DM, Hypertension - HTN or both), while the vast majority of our patients (91.9%) were free of these medical conditions (Figure 3).

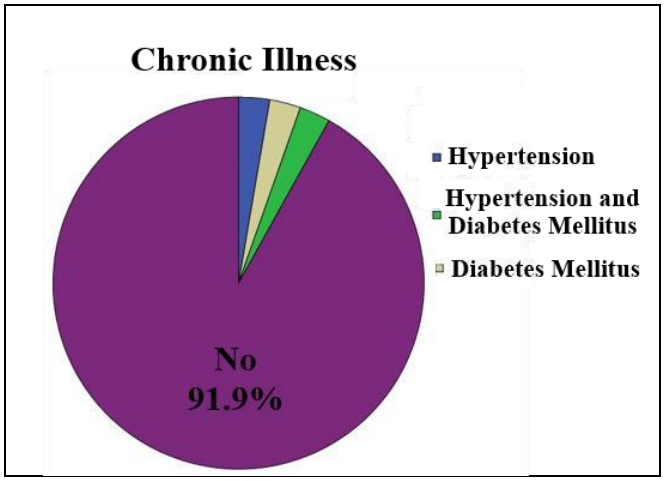

Figure 3. History of chronic illness distribution. Source: Own authorship.

The frequency of MV attacks was documented, correlated with vitamin D level assessment and the age of the patient. Most patients with low or suboptimum level of vitamin D noted to have frequent attacks (24 patients had low or sub optimal vitamin D level had 8 or more attack per year). (p-value = 0.0012). this is shown in Figure 4. The frequency of attacks of MV were high in young adults (below 40 years) with p-value = 0.012.

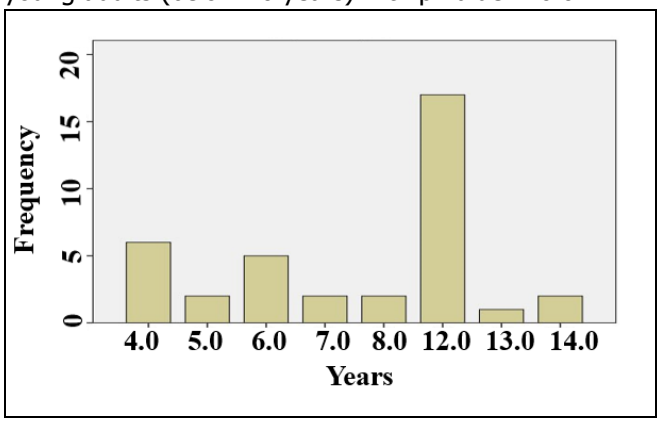

Figure 4. Frequency of MV attacks per year distribution. Source: Own authorship.

Discussion

The relation between migraine and vertigo is complex. The occurrence of Spontaneous episodic vertigo is more obvious in benign paroxysmal positional vertigo, Meniere's disease and vestibular neuritis **[19]**. Diagnosis of VM depends on the Neuheuser criteria for classifying dizziness related to migraines **[20]**.

In this study, the mean age of patients was 37.622 +/- 14.36 years with female predominance. This finding is generally noted in patients with migraine or MV as main age of MV is between 37 to 43 years with marked female predominance **[18,21-23]**. Low vitamin D level is generally noted in patients with migraine and had been managed for years with regular supplement of vitamin D alone or with calcium supplement **[24-27]**.

Vitamin D affect vestibular function noted especially in patients with BPPV **[28,29]**, while its role in VM has not been discussed fully in other literatures despite its obvious role in management of migraine or vertigo in general. In this study, we found a highly significant relationship between the frequency of VM and the level of vitamin D level. Patients with low (< 20 ng/mL) or sub optimal (20-30 ng/mL) had more frequent attacks (8 or more per year) with p- value (0.0012). this finding matches Hac et al **[30]** and Hannigan et al **[31]** whom stated the potential benight of using non prescriptive medications and supplements in decreasing the severity of VM attacks.

Limitation

Limitation includes low sample size due to the new established center.

Conclusion

This study demonstrates a significant association between low serum vitamin D levels and increased frequency of vestibular migraine attacks. These findings suggest that assessment of vitamin D level may be important in patients suffering from vestibular migraine. Vitamin D supplementation may serve as a simple and cost-effective adjunct in the management of these patients. Further large-scale studies are recommended to confirm these findings and to determine the therapeutic role of vitamin D supplementation in vestibular migraine management.

CRediT

Author contributions: **Conceptualization; Data curation**; **Formal Analysis**; **Investigation**; **Methodology**; **Project administration**; **Supervision**; **Writing - original draft,** and **Writing-review & editing-** All authors.

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Ethical Approval

Verbal consent from all patients had been taken to share and discuss their findings. Approval from ethical committee (154 / 2025).

Informed Consent

It was applicable.

Funding

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Data Sharing Statement

All referenced sources are accessible through the respective journals or public repositories.

Conflict of Interest

The authors declare no conflict of interest.

Similarity Check

It was applied by Ithenticate®.

Application of Artificial Intelligence (AI)

Not applicable.

Peer Review Process

It was performed.

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