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ORIGINAL ARTICLE

Trait Anxiety, Depression, and Insomnia Among Benign Paroxysmal Positional Vertigo Cases: A Multidisciplinary Cross-Sectional Study

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Abstract

Background: Benign paroxysmal positional vertigo is the most common peripheral vestibular disease and is often associated with psychiatric conditions, including anxiety, depression, and insomnia. Studies evaluating trait anxiety in benign paroxysmal positional vertigo cases are limited. Our study aimed to assess trait anxiety, depression, and insomnia levels among those cases to investigate and emphasize the clinical value of evaluating psychiatric comorbidities.

Methods: Individuals who applied to an otorhinolaryngology outpatient clinic and were diagnosed with benign paroxysmal positional vertigo were consecutively invited to participate. An extensive psychiatric assessment, Beck Anxiety Inventory, Beck Depression Inventory, Insomnia Severity Index, and Penn State Worry Questionnaire, was applied.

Results: Of 35 benign paroxysmal positional vertigo patients (21 females, 14 males, mean age: 51), almost half were diagnosed with anxiety disorders, and one-third were diagnosed with depressive disorders. 34.3% (n = 12) of the sample had mild anxiety, whereas 28.6% (n = 10) had moderate and 31.4% (n = 11) had severe anxiety. 25.7% (n = 9) of the cases reported mild depressive symptoms, while 22.9% (n = 8) had moderate, and 11.4% (n = 4) had severe depression scores. 77.1% (n = 27) of the patients had mild to severe insomnia severity. All 35 participants in the study showed higher trait anxiety levels than the cut-off values of the scale.

Conclusions: Evaluating benign paroxysmal positional vertigo cases for psychiatric conditions could contribute to the practical and integrated treatment of the disease, reduce its triggering causes, and increase the quality of life of the patients.

Keywords: Benign paroxysmal positional vertigo, anxiety, depression, nervousness, insomnia

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INTRODUCTION

Diagnosed in almost one in four patients with vertigo, benign paroxysmal positional vertigo (BPPV) is the most common peripheral vestibular disease (1). BPPV is characterized by an abrupt onset, recurrent episodes of dizziness and nystagmus triggered by the positions of the head, resulting in decreased functionality and quality of life (2,3). Apart from dizziness, the most common symptoms of BPPV include fatigue, impaired balance, and intolerance of motion (4).

As the most accepted mechanism, calcium carbonate crystal particles known as otoliths in the inner ear's semicircular canals cause abnormal endolymph stimulation, thus precipitating BPPV symptoms (5). BPPV is diagnosed by examining the patient's medical history with provocation tests such as the Dix-Hallpike maneuver. Spontaneous remissions are frequent; however, recurrence rates are reported as high as 56% (6).

The association of various mental health conditions with BPPV is a clinically significant topic that is often unaddressed. Sudden episodes of vertigo caused by this condition may trigger anxiety and worry among patients, along with depressive mood or insomnia (7). Particularly, vestibular vertigo may lead to increased levels of anxiety through the activation of common neural pathways (8).

Studies evaluating the relationship between BPPV and psychiatric disorders demonstrate high rates of comorbidity that appear to be bidirectional. Few studies have related BPPV and varying levels of anxiety symptoms (9,10). Kozak et al. (2018) reported a 39.1% prevalence rate for mood or anxiety disorders in BPPV cases (11). Meanwhile, poor sleep quality and dizziness symptoms were associated in patients with BPPV (12). In a recent systematic review and meta-analysis, Yeo et al. (2024) found a 3-fold increased risk of anxiety among patients with BPPV and recommended further studies to confirm these associations (13). On the other hand, individuals with anxiety disorders were at two times higher risk of developing BPPV (14). Numerous studies endorsed the impaired neuroendocrine response and neural inflammation in cases of anxiety and depression, which are suspected to be crucial elements in the disease mechanism of BPPV (14).

Current treatment algorithms for BPPV primarily involve vestibular rehabilitation to reposition particles with specific maneuvers or surgical interventions. However, in clinical work, there is limited attention to detecting and treating highly comorbid psychiatric conditions (13). Raising awareness about the importance of psychiatric evaluation in patients with BPPV is needed to reduce the disease's triggering causes and symptoms, thus increasing the quality of life. Our study aimed to assess anxiety, depression, and insomnia among patients with BPPV, with a specific focus on trait anxiety. First, we hypothesized that the anxiety and depression scores of patients would be higher than the cut-off values. Second, we thought that the insomnia severity scores of the BPPV cases would be higher. Finally, we expected to see high trait anxiety levels in BPPV patients.

MATERIALS AND METHODS

Participants and procedure

Individuals aged 18 years and over who applied to the otorhinolaryngology outpatient clinic of a public hospital with dizziness between January and December 2022 and were diagnosed with BPPV after a clinical examination and received maneuver treatment within the last year were consecutively invited to participate in the study. Written informed consent was obtained from all the voluntary participants. Details about patients' age, gender, the presence of type 2 diabetes mellitus, the presence of hypertension, the presence of thyroid disorders, and other otorhinolaryngologic diseases such as chronic rhinosinusitis were recorded. Participants were asked if they had made any sudden movements in the previous two weeks. Then, as part of the initial screening, participants were assessed about whether they had stress, insomnia, or depressive symptoms such as depressed mood or loss of interest and whether they experienced anxiety. A psychiatric examination was recommended for each patient, regardless of psychological symptoms, to evaluate the effects of triggering factors such as stress and insomnia. Thirty-five out of 69 patients (50.7%) diagnosed with BPPV within one year agreed to receive a psychiatric interview. A comprehensive psychiatric assessment was performed for each participant, as detailed below, and if necessary, appropriate treatment

was recommended by the psychiatrist. Patients with a severe mental disorder diagnosis that might affect their capacity to provide informed consent and complete the self-report questionnaires (i.e., psychotic disorders, acute manic episodes, major neurocognitive disorders, or substance use disorders) were excluded from the study. After 15 days, participants were invited to attend the otorhinolaryngology and psychiatry outpatient clinics for control appointments.

Psychiatric clinical assessment

Along with an extensive psychiatric evaluation based on DSM-5 descriptive criteria, Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI), Insomnia Severity Index (ISI), and Penn State Worry Questionnaire (PSWQ) were applied to the participants (15). BAI and BDI are 21-item, 4-Likert-type scales developed by Beck et al. (1961; 1988) (16,17). ISI consists of 7 items in the 5-Likert type and aims to evaluate insomnia severity (18). PSWQ is a 16-item 5-Likert-type scale developed to assess the trait of anxiety in adults (19). All the assessment tools were validated for the Turkish population (20,21,22,23). Previously identified cut-off values for all the scales were applied during the psychiatric evaluation: For BAI (8-15 mild, 16-25 moderate, and 26-63 severe), for BDI (10-16 mild, 17-29 moderate, and 30-63 severe), for ISI (8-14 mild, 15-21 moderate, and 22-28 severe) and PSWQ (16-39 mild, 40-59 moderate, and 60-80 severe).

Statistical analysis

Numerical data with normal distribution were presented with mean and standard deviation (SD) values. Kolmogorov-Smirnov test was used to test normality. Normally distributed numerical data were analyzed using the Student t-test and Pearson correlation. Numerical data that failed the normality tests were assessed with the Mann-Whitney-U test and Spearman correlation. Categorical data were analyzed using Chi-square and one-way analysis of variance tests. Statistical analysis was performed using SPSS version 25.0. A p-value of $< .05$ was considered significant.

Ethical considerations

Ethical approval for the study was obtained from the local ethics committee of Süleyman Demirel University for clinical research on 06.01.2022 with decision number 1/13. The Declaration of Helsinki principles were followed throughout the study (24). Each patient provided written informed consent to participate in this study. The study's patient recruitment process was conducted between January and December 2022.

RESULTS

The mean age of 35 patients who were diagnosed with BPPV and who agreed to attend the psychiatric interview was 51.77 (±12.73). Twenty-one (60%) of the patients were female, and 14 (40%) were male. BPPV was left-sided in 57.2% (n = 20) and right-sided in 42.8% (n = 15) of the patients. Two patients (5.7%) had lateral canal BPPV, and 33 (94.3%) had posterior canal BPPV. Fifteen (42.8%) patients had at least one chronic disease, such as type 2 diabetes mellitus, arterial hypertension, or hypothyroidism. Four patients (11.4%) were diagnosed with an anxiety disorder and used psychiatric medication. After the psychiatric assessment in the study process, a total of 16 (45.7%) patients, including four previously diagnosed, were diagnosed with anxiety disorders according to DSM-5 (15). Among those, four patients (25%) were diagnosed with both anxiety disorder and depressive disorder. Of new diagnoses, seven patients (58.3%) were diagnosed with generalized anxiety disorder, while five (41.7%) were diagnosed with unspecified anxiety disorder. A total of 11 patients (31.4%) were diagnosed with depression, and two (5.7%) were diagnosed with insomnia disorder. Of 31 patients who did not previously use psychiatric medication, 21 (67.7%) were recommended a psychopharmacological treatment (Table 1).

Among 34 patients who did not agree to attend the psychiatric evaluation, 13 (38.2%) were using medication with a diagnosis of anxiety disorders, and one (2.9%) was using medicines with a diagnosis of insomnia disorder.

Table 1. Sociodemographic and Clinical Characteristics	
Age (mean ± SD)	51.77 ± 12.73
Female Gender (%, n)	60 (21)
Left-sided BPPV (%, n)	57.2 (20)
Posterior Canal BPPV (%, n)	94.3 (33)
Chronic Disease (%, n)	42.8 (15)
Anxiety Disorders (%, n)	45.7 (16)
Depressive Disorders (%, n)	31.4 (11)
Insomnia Disorder (%, n)	5.7 (2)
SD: Standard Deviation, BPPV: Benign Paroxysmal Positional Vertigo	

The mean BAI score was 21.11 (±12.09), indicating a moderate level of anxiety. 94.2% (n = 33) of the sample showed mild to severe levels of anxiety accordingly (Figure 1). In detail, 34.3% (n = 12) of the patients had mild anxiety, 28.6% (n = 10) moderate, and 31.4% (n = 11) severe anxiety, while 5.7% (n = 2) had none/low levels. A mild level of depression was seen among the sample, with a mean BDI score of 15.02 (±9.44). Likewise, 60% of the sample had mild to severe depressive symptoms. Results demonstrated that 25.7% (n = 9) of the patients had mild depressive symptomatology, while 22.9% (n = 8) had moderate, 11.4% (n = 4) had severe, and 40% (n = 14) had none/low levels.

Table 2. Scale Score Distributions								
	None/Low		Mild		Moderate		Severe	
	n	%	n	%	n	%	n	%
BAI	2	5.7	12	34.3	10	26.6	11	31.4
BDI	14	40	9	25.7	8	22.9	4	11.4
ISI	8	22.9	13	37.1	11	31.4	3	8.6
PSWQ	-	-	10	28.6	18	51.4	7	20
BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, ISI: Insomnia Severity Index, PSWQ: Penn State Worry Questionnaire								

Insomnia severity scores showed that 37.1% (n = 13) of the patients had mild insomnia, 31.4% (n = 11) had moderate, 8.6% (n = 3) had severe insomnia, while 22.9% (n = 8) had none/low levels. The mean ISI score was 12.08 (±6.69), pointing to a mild degree of insomnia. Only one-fifth (23%) of the sample reported the absence of insomnia. According to PSWQ scores, 28.6% (n = 10) of the patients had mild, 51.4% (n = 18) had moderate, and 20% (n = 7) had severe trait anxiety. A mean score of 48.51 (±14.58) indicated moderate levels of trait anxiety throughout the sample. All 35 of the patients showed some degree of trait anxiety, varying from mild to severe. Details regarding scale scores are summarized in Table 2.

Table 3. BAI, BDI, ISI and PSWQ Correlations

		BAI	BDI	ISI	PSWQ
BAI	r	1	0.719**	0.271	0.645**
	p		**< 0.001**	0.115	**< 0.001**
BDI	r	0.719**	1	0.425*	0.438*
	p	**< 0.001**		**0.011**	**0.008**
ISI	r	0.271	0.425*	1	0.338*
	p	0.115	**0.011**		**0.047**
PSWQ	r	0.645**	0.438**	0.338*	1
	p	**<0.001**	**0.008**	**0.047**	
	N	35	35	35	35

There was no significant difference between the anxiety, depression, insomnia, and trait anxiety scores when those with and without chronic disease diagnosis were compared. No significant difference was found between male and female patients in terms of any of the scale scores. There was also no significant difference in the scores on the scales between those who had used psychiatric medication before evaluation and those who had not. As expected, BAI, BDI, ISI, and PSWQ were positively correlated (Table 3).

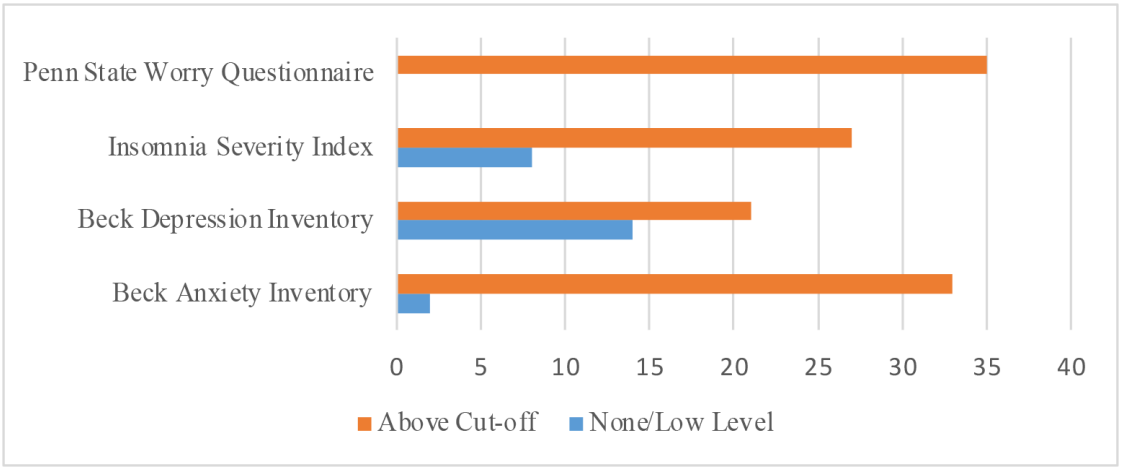

Figure 1: Scale Scores of the BPPV Sample

DISCUSSION

Our study aimed to evaluate the anxiety, depression, insomnia, and trait anxiety levels of patients diagnosed with BPPV. The results showed that anxiety, especially trait anxiety levels, were high in a large majority of the cases. Similarly, mildly increased scores were observed in depression and insomnia scales.

Almost all the patients with BPPV (94.2%) demonstrated mild to severe levels of anxiety. Moreover, a significant proportion of those (45.7%) were diagnosed with an anxiety disorder. Adjusted worldwide estimates suggest the prevalence of anxiety disorders in the general population from 5.3 to 10.4% (25). This finding is in line with the results of the meta-analysis of Yeo et al. (2024), which comprised 2902 BPPV cases from 23 studies, reporting a 3-fold increased risk of anxiety disorders (13). Even though our sample size is limited to be generalized, an anxiety disorder diagnosis in almost one in every two patients with BPPV points to clinical attention of this comorbidity.

Trait anxiety is described as anxiety that is part of an individual's personality or way of perceiving the world. Our study showed that all the patients with BPPV had some degree of trait anxiety, either mild, moderate, or severe. While BAI measures a prolonged state of anxiety, which is defined as anxiety that occurs in response to stressful situations, trait anxiety assessed with PSWQ refers to an ongoing situation of worry that might affect vertiginous symptoms in the long term. Trait anxiety appears to be involved with both hypotheses attempting to explain the association between vestibular diseases and psychiatric conditions. According to the otogenic hypothesis, vertigo may lead to various symptoms of secondary psychological distress because of its unpredictable nature, leading to persistent worry and decreased quality of life in patients with BPPV (26,27). Likewise, psychogenic theory suggests the manifestation of secondary dizziness due to pre-existing psychological distress, often related to hyperventilation and other somatic signs of anxiety and worry (28). Our results on heightened trait anxiety levels support both and could be considered a possible means to the bidirectional connection between BPPV and anxiety disorders. This finding requires further investigation.

We obtained signals of the relative importance of anxiety and trait anxiety among BPPV patients. The high risk of developing BPPV in patients with anxiety disorders was previously reported, and sudden changes in head movements were suggested to trigger fear and worry (10). The link between vestibular dysfunction and emotional processing mechanisms might be discussed in light of several explanations. Psychological distress could stimulate vestibular dysfunction by disrupting compensation mechanisms or changing somatosensory input throughout the body (29). Neuroanatomical regions and neurotransmitters that take part in emotional responses and vestibular systems are similar.

An integrated network of numerous neural components is involved in the co-existence of vertigo and anxiety, including the vestibulo-parabrachial nucleus network and afferent interoceptive information processing (30).

Almost two-thirds of our study sample demonstrated elevated levels of depressive symptoms, while one-third were clinically diagnosed with a depressive disorder. This finding supports the increased depression rates among BPPV patients (11). A recent Mendelian randomization study reported a significant association between neuroticism and mood swings as possible risk factors for BPPV (31). Psychological stress might trigger a systemic response resulting in sustained chronic inflammation that ultimately affects the functioning of balance receptors in the inner ear and promotes BPPV (32). Considering that a stable visual perception is essential for individuals with BPPV, impaired visual balance control caused by the enhancement of neural network activity due to mood swings and depression might contribute to the pathophysiology of BPPV (33). A further exploration and more profound understanding of these mechanisms would help develop more effective treatment strategies and preventive interventions for BPPV.

Poor sleep quality is a risk factor for psychiatric disorders such as anxiety and depression (34,35). Insomnia alone can increase the risk of BPPV, but it can also cause BPPV by giving rise to anxiety and depression (36). We found that more than three-quarters of patients with BPPV had insomnia to some extent. A retrospective cohort study reported that insomnia increased the risk of BPPV in male patients (37). We found no statistical difference between females and males concerning anxiety, depression, insomnia, or trait anxiety in our BPPV sample, pointing to an overall increase in insomnia regardless of gender. Considering insomnia was identified as a possible trigger for vertigo attacks, it is of clinical value to evaluate BPPV patients for sleep disorders and carry out appropriate treatments.

Cohen et al. (2004) reported that comorbid chronic diseases were more common in patients with BPPV (38). In this study, we found no difference between BPPV patients with metabolic diseases and those without in terms of the scale scores. However, a longer follow-up should be considered since the chronic processes in comorbid metabolic diseases would be more detectable.

Our study has certain limitations, such as the relatively small sample size, a cross-sectional design that does not permit causality, the lack of a control group, and the conduction of the study during the COVID-19 pandemic. Rather small sample size limits the generalizability of our findings. It was less than intended because the number of BPPV patients who applied to the outpatient clinic within one year was less than expected. This might be related to the coincidence of our study with the COVID-19 pandemic, in which worldwide physical restrictions were implemented. Patients invited to participate in the study might have been unwilling because of the expected increased time spent at the hospital. The cross-sectional assessment of psychiatric symptoms in BPPV patients did not allow us to draw associations regarding causality. Another limitation was the psychiatric assessment rates, which were in connection with the voluntariness of BPPV patients. Relying on the voluntary participation of patients might have caused voluntary response bias. Patients who did not agree to a psychiatric examination may not have benefited from psychiatric treatment before for various reasons or could not tolerate the medication. In addition, patients' observed reluctance to join a psychiatric interview could be linked with fear of confronting a psychiatric diagnosis, thus with stigmatization. The initial screening of stress might have caused a selection bias, resulting in the participation of patients with higher levels of anxiety. The lack of evaluation regarding marital status, education level, and employment status, which might contribute to anxiety disorders and depression as risk factors, constitutes another limitation. Since the cut-off values of the scales were specific and broadly accepted, a control group was not included. Moreover, we assumed that the comparison would not be homogeneous, as there may have been multifactorial causes of anxiety, depression, and insomnia in those without a BPPV diagnosis that were not evaluated. Özdilek et al. (2009) reported that anxiety scale scores were higher in BPPV patients when compared to those in the control group (10). Since a psychiatrist conducted the objective evaluation, self-report scales were preferred to observe patient ratings and insights.

A strength of our study might be the evaluation of trait anxiety in patients with BPPV, which was studied scarcely in similar studies. Due to the two-way relationship between anxiety and vertigo, it is not easy to

distinguish which one triggers the other in most clinical cases where they co-occur. However, elevated levels of trait anxiety might pave the way for vertigo and BPPV. It may appear as a symptom often not considered to apply for psychiatric consultation, but that strengthens this vicious circle and affects physical health.

Identifying individuals prone to trait anxiety through routine psychological symptom screening and directing them to further psychiatric clinical evaluation may be beneficial in terms of the recommended multidisciplinary approach in the management of BPPV cases. In the clinical care of vertigo and BPPV, it is important to keep in mind the high rates of comorbid psychiatric disorders. In this way, a comprehensive evaluation and treatment may be possible, not only regarding the BPPV symptoms but also the etiology, triggers, and high recurrence rates. Focusing on the psychological factors that play an active role in BPPV and integrating them into the treatment process may provide a key clinical benefit in alleviating the chronic burden of the disease. Therefore, a careful assessment of patients with BPPV regarding psychiatric conditions, especially anxiety disorders, is of great value to a better-integrated approach to treatment, care, and prevention of further episodes of the disease and an increased quality of life.

Evaluating BPPV patients for anxiety, particularly trait anxiety, as well as depression and insomnia, could help increase patients' awareness of the close relationship between psychiatric conditions and BPPV. Offering a psychiatric assessment as part of integrated care might have benefits for the psychological causes and triggers of the disease and in preventing possible recurrences.

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Abbreviations list

COVID-19: Coronavirus Disease 2019

BAI: Beck Anxiety Inventory

BDI: Beck Depression Inventory

BPPV: Benign Paroxysmal Positional Vertigo

DSM-5: Diagnostic and Statistical Manual of Mental Disorders 5th Edition

ISI: Insomnia Severity Index

PSWQ: Penn State Worry Questionnaire

SPSS: Statistical Package for the Social Sciences.

Ethics approval and consent to participate

This study was approved by the Local Ethics Committee of Süleyman Demirel University for clinical research on 06.01.2022 with decision number 1/13.

Consent for publication

Informed consent was obtained from all individual adult participants included in this study.

Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Competing interests

The authors have no commercial associations or sources of support that might pose a conflict of interest.

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Authors' contributions

Concept: MDÇ, HB. Design: MDÇ, HB, STK. Supervising: MDÇ, HB, STK, Equipment: MDÇ, HB, STK, Data collection and entry: MDÇ, HB, STK, Analysis and interpretation: MDÇ, HB, STK, Literature search: MDÇ, HB, STK. Writing: STK, Critical review: MDÇ, HB, STK.

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