The Egyptian Journal of Otolaryngology

ORIGINAL ARTICLE Open Access

The correlation between anxiety, depression, and vertigo: a cross-sectional study

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Abstract

Background: Dizziness, including vertigo, affects approximately 15% to over 20% of adults each year. A significant proportion of patients with vertigo develop secondary psychiatric disorders throughout their disease. On the other hand, patients with psychiatric disorders frequently report dizziness as a co-occurring symptom of their illness. The purpose of this study was to screen the prevalence of depression and anxiety indices in dizzy patients and their relation to the severity of their dizziness handicap by administering two different questionnaires: The dizziness handicap inventory (DHI) and the Hospital Anxiety and Depression Scale (HADS).

Results: Psychological assessments revealed that 49% of the study group was normal, 29% had anxiety, 7% had depression, and 15% had both anxiety and depression. Besides, vestibular neuritis was associated with a higher mean anxiety score, whereas Meniere's disease was associated with a higher mean depression score.

Conclusion: As this study has shown, there was a statistically significant positive correlation between anxiety and depression scores and physical, emotional, functional, and total DHI scores. Screening and treatment of co-morbid mental health disorders are critical for appropriate management of vertigo disability that leads to a higher quality of life and fewer complications.

Keywords: Anxiety, Depression, Dizziness, Questionnaires

Background

Dizziness, including vertigo, affects approximately 15% to over 20% of adults each year. Vestibular vertigo accounts for approximately a quarter of these cases, with a 12-month prevalence of 5% and an annual incidence of 1.4%. Prevalence increases with age and is about two to three times that of men in women [1].

Vertigo and dizziness symptoms contribute significantly to disease burden and can have daily distress activities and quality of life; peripheral vestibular disorders are the most common cause of vertigo 2; benign paroxysmal positional vertigo (BPPV), Menier's disease (MD), migrainous vertigo (MV), and vestibular neuronitis (VN) are all common causes of vertigo [2]. Throughout their disease, many patients with vestibular vertigo develop secondary psychiatric disorders [3].

Apart from causing physical and emotional distress, vestibular system disorders degrade life quality, posing a public health care problem. Clinical examination of a dizzy patient is insufficient to assess the psychological impact of dizziness, prompting numerous investigators to develop questionnaires for evaluating dizzy patients.

In 1983, Zigmond and Snaith developed the Hospital Anxiety and Depression Scale (HADS) [4], which uses two distinct subscales to assess patients' levels of anxiety and depression. Since 1987, an Arabic version of the HADS has been used and validated in Saudi Arabia, Kuwait, and the United Arab Emirates in primary-care settings. The instrument has also been validated for use in emergency care settings [5].

In 1990, Jacobson and Newman [6] developed and validated a dizziness-specific questionnaire, the Dizziness Handicap Inventory – English Version (DHI-E), with

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assets to assess patient's perception of handicap caused by dizziness, with an emphasis on the effect of rehabilitation on an individual's physical, functional, and emotional aspects of life. Alsanosi [7] introduced an adaptation of the dizziness handicap inventory in the Arab population.

A substantial number of people with vestibular vertigo acquire secondary psychological illnesses during the condition [3]. Due to the correlation between vestibular impairments and subsequent psychiatric disorders, the somatopsychic theory has been postulated. In contrast, patients with psychiatric problems frequently report dizziness as an accompanying symptom of their illness.

The purpose of this study was to determine the prevalence of depression and anxiety indices in dizzy patients and their relation to the severity of their dizziness handicap by administering two different questionnaires: The dizziness handicap inventory (DHI) and Hospital Anxiety and Depression Scale (HADS).

Methods

A cross-sectional study design was implemented to explore the prevalence of anxiety and depressive disorders among patients with dizziness at the audiovestibular clinic. This study comprised 100 dizzy patients who presented with any of the following dizzy symptoms; unsteadiness, imbalance, light-headedness, or vertigo. The study group underwent essential audiological and vestibular test batteries and filled in both questionnaires. This study was conducted for two years, from August 2019 to August 2021, at the Audio-Vestibular clinic.

Inclusion criteria

1. Dizzy patients presented with the following symptoms: unsteadiness, imbalance, clumsiness, light-headedness, or vertigo.
2. Age group between 20 and 70 years (both females and males).

Exclusion criteria

Any patient with a known psychological disorder.

1. *All subjects underwent a thorough medical history taking*: It includes a complete description of the dizziness complaint regarding frequency, duration, progression, and character. Also, precipitating and relieving factors were included. Any accompanying symptoms and medication received were documented.
2. *Dizziness handicap inventory (DHI)*[7] (Additional file 1. Appendix 1): The DHI consists of 25 items designed to assess the self-perceived level of handicap due to dizziness. The items are grouped into emotional (9 items), functional (9 items), and physical (7 items) domains. Each item has three response options (yes, sometimes, and no), which were 4, 2, and zero points, with a total score ranging from 0 to 100, with 0 indicating no perceived disability and 100 indicating the maximum perceived severity of dizziness.
3. *Hospital Anxiety and Depression Scale (HADS)* [4] (Additional file 1. Appendix 2): The HADS contains 14 items that assess anxiety (7 items) and depression (7 items), all of which are rated on a 4-point Likert scale (from 0 to 3). Each subscale's score is calculated by adding the corresponding items, with a maximum score of 21 for each. A score of 0–7 is considered normal, 8–10 is considered borderline, and 11–21 is considered to be an indication of anxiety or depression.
4. *Basic audiological evaluation*: Pure tone audiometry: air conduction thresholds were tested at frequencies between 250 and 8000 Hz at octave intervals. Speech audiometry: Speech reception threshold (SRT) [8] and word discrimination scores (WDS) [9]. Acoustic immittance testing: this included tympanometry and acoustic reflexes (ipsilateral and contralateral).
5. *Videonystagmography (VNG)*: VNG was performed using a two-channel. Calibration was mandatory for accurate nystagmus recording. VNG subtests were occulography tests (smooth pursuit, saccade, and optokinetic), spontaneous nystagmus, gaze, positional, positioning, and caloric tests. A software algorithm was used automatically to calculate unilateral weakness, directional preponderance, and total eye velocity using standard formulae. Threshold values for caloric testing according to Bárány Society Consensus document [10]: unilateral weakness greater than (20 to 25%) is significant. Average caloric responses of a total caloric response < 12°/s are diagnostic of bilateral deficiency.

Equipment

a. Audiometry: Interacoustics AC40 calibrated according to the ISO standards.
b. Immitancemeter: Interacoustics AT235 calibrated according to the ISO standards.
c. Videonystagmography: Computerized 2-channels VNG Micromedical.

Diagnostic criteria used for vestibular migraine according to The International Classification of Headache Disorders 3rd edition ICHD-3 (2018) [11].

Diagnostic criteria

(A) At least five episodes fulfilling criteria C and D. (B) A current or past history of 1.1 migraine without aura or 1.2 migraine with aura (1) (C) Vestibular symptoms (2) of moderate or severe intensity (3), lasting between 5 min and 72 h (4). (D) At least half of episodes are associated with at least one of the following three migrainous features (5): (1) headache with at least two of the following four characteristics: (a) unilateral location, (b) pulsating quality, (c) moderate or severe intensity, (d) aggravation by routine physical activity; (2) photophobia and phonophobia; (3) visual aura (E). Not better accounted for by another ICHD-3 diagnosis or by another vestibular disorder.

We required a typical case medical history and a positive finding in the Dix Hallpike maneuver to diagnose benign paroxysmal positional vertigo. Vestibular neuronitis was diagnosed based on a sudden onset of severe rotatory vertigo, spontaneous horizontorotatory nystagmus, and a lack of neurologic signs that could indicate central nervous system involvement.

For Ménière's disease (MD), we used the American Academy of Otolaryngology-Head and Neck Foundation criteria, 2014 [12].

Certain Meniere's disease

Definite Meniere's disease, plus histopathologic confirmation

Definite Meniere's disease

Two or more definitive spontaneous episodes of vertigo 20 min or longer
Audiometrically documented hearing loss on at least one occasion
Tinnitus or aural fullness in the treated ear
Other causes excluded

Probable Meniere's disease

One definitive episode of vertigo
Audiometrically documented hearing loss on at least one occasion
Tinnitus or aural fullness in the treated ear
Other causes excluded

Possible Meniere's disease

Episodic vertigo of the Meniere type without documented hearing loss, or
Sensorineural hearing loss, fluctuating or fixed, with dysequilibrium but without definitive episodes
Other causes excluded

Results

The present study used a cross-sectional design to determine the prevalence of anxiety and depressive disorders in patients with dizziness treated at an Audio-vestibular clinic. This study enrolled 100 dizzy patients who experienced any of the following symptoms: unsteadiness, imbalance, lightheadedness, or vertigo.

Table 1 summarizes the study group's demographic characteristics, clinical presentation, and clinical diagnosis. Regarding demographic characteristics, the study group's mean age was 38.7 ± 11.8 years, ranging between 21 and 70, and the mean duration of disease

Table 1 Description of demographic characters among the study group

Variables	Number ($n = 100$)	
	Mean ± SD	Range
Age (years)	38.7 ± 11.8	21–70
Disease duration (months)	24.9 ± 36.1	1–120
Sex	**No**	**%**
Male	49	49%
Female	51	51%
Tinnitus		
No	65	65%
Yes	35	35%
Hearing		
Normal	66	66%
SNHL	34	34%
Side of SNHL		
Unilateral	26	76.5%
Bilateral	8	23.5%
Severity of SNHL		
Mild	10	29.4%
Moderate	12	35.3%
Sever	8	23.5%
Profound	4	11.8%
Diagnosis		
Vestibular neurits	37	37%
BPPV	26	26%
Meniere's disease	23	23%
Vestibular migraine	11	11%
Multiple sclerosis	3	3%

was 24.9 ± l36.1 months, ranging between 1 and 120. In terms of gender distribution, 49% were males, and 51% were females. In terms of clinical presentation, 35% had tinnitus, 34% had SNHL, 76.5% had unilateral SNHL versus 23.5% bilateral, and 29.4% had mild, 11.8% profound, 35.3% moderate, and 23.5% severe SNHL. Concerning clinical diagnosis, 37% of cases had vestibular neurites, 26% had BPPV, 23% had Meniere's disease, 11% had vestibular migraine, and only 3% had multiple sclerosis.

Table 2 Assessment of vestibular and psychological symptoms among the study group

Variables	Mean ± SD	Range
DHI score		
Physical	15.8 ± 5.2	4–32
Emotional physical	13.1 ± 6.5	2–30
Functional	17.2 ± 7.6	4–32
Total DHI	44.5 ± 15.4	16–84
GAD and MDI score		
Anxiety	10.6 ± 3.5	3–18
Depression	8.01 ± 3.1	3–15
Psychological assessment	**No**	**%**
Normal	49	49%
Anxiety	29	29%
Depression	7	7%
Both anxiety and depression	15	15%

Table 2 illustrated both the mean subscores of DHI & HADS of the physical sub score of the DHI was 15.8 ± 5.2, ranging between 4 and 32; the mean of the emotional sub score of the DHI was 13.1 ± 6.5, ranging between 2 and 30; and the mean of the functional sub score of the DHI was 17.2 ± 7.6, ranging between 2 and 30 (4 and 32). The mean total DHI score was 44.5 ± 15.4, ranging between 44.5 ± 15.4 and 44.5 ± 15.4 (16 and 84). The mean GAD score was 10.6 ± 3.5, with a range of 3 to 18, and the mean MDI score was 8.01 ± 3.1, with a range of 3 to 18 (3 and 15). Psychological assessments revealed that 49% of the study group was normal, 29% had anxiety, 7% had depression, and 15% had both anxiety and depression.

Table 3 compared DHI subscales in patients with varying degrees of hearing loss and clinical diagnosis of vertigo, in addition to hearing loss severity, finding a statistically significant increase in the mean of the physical subscale in cases with severe hearing loss and a significant increase in the mean of the functional subscale in patients with profound hearing loss.

While comparing different clinical diagnoses of vertigo, Meniere's disease had a higher mean for the physical subscale. In contrast, vestibular migraine had a higher mean for the emotional, functional, and total DHI.

Table 3 Comparisons of DHI subscales in degrees of hearing loss and clinical diagnosis of vertigo

Groups	Age Mean ± SD	Physical Mean ± SD	Emotional Mean ± SD	Functional Mean ± SD	DHI Mean ± SD
Hearing					
Normal	37.1 ± 12.8	15.3 ± 4.9	12.2 ± 6.1	17.3 ± 7.8	43.1 ± 15.4
SNHL	41.9 ± 9.3	16.7 ± 5.7	**14.9 ± 7.1**	17.1 ± 7.4	47.3 ± 15.3
***p*-value**	0.06	0.2	**0.04***	0.9	0.2
Side of SNHL					
Unilateral	39.4 ± 9.2	17 ± 5.6	16.1 ± 7.1	18.1 ± 7.6	50.1 ± 14.6
Bilateral	**50.1 ± 1.8**	15.7 ± 6.6	11.3 ± 6.2	13.7 ± 5.8	38.3 ± 15.1
***p*-value**	**0.003***	0.6	0.09	0.1	0.06
Severity of SNHL					
Mild	43.1 ± 9.7	14.2 ± 4.5	17 ± 9.6	14.8 ± 6.4	41.6 ± 14.9
Profound	45 ± 0	16 ± 0	10 ± 0	**26 ± 0**	52 ± 0
Moderate	35.6 ± 10.1	16.8 ± 8.1	14.7 ± 7.3	16.4 ± 9	47.7 ± 21.8
Sever	48.3 ± 1.7	**20.3 ± 1.7**	15.3 ± 4.3	16.5 ± 4.6	51.5 ± 2.1
***p*-value**	0.06	**0.01***	0.2	**0.03***	0.3
Diagnosis					
Vestibular neuritis	35.9 ± 10.3	16 ± 3.2	13.7 ± 5	20.3 ± 6.9	46.8 ± 13
BPPV	44.3 ± 13.9	14.5 ± 5.3	7.1 ± 2.8	13.2 ± 5.2	34.5 ± 11.5
Meniere's disease	**39.3 ± 10**	**18.1 ± 6**	15.8 ± 6.2	16.9 ± 6.9	49.6 ± 15.6
Vestibular migraine	37.7 ± 11.6	16.6 ± 5.3	**19.6 ± 8.8**	**20.7 ± 9.4**	**56.6 ± 14.7**
Multiple sclerosis	24 ± 0	4 ± 0	14 ± 0	4 ± 0	20 ± 0
***p*-value**	**0.03***	**0.006***	**< 0.001***	**< 0.001***	**< 0.001***

**P*-value< 0.05 was considered as statistical significant

The DHI total score was compared to various anxiety and depression scores from the HADS in Table 4.

Regarding the various clinical diagnoses of dizziness, vestibular neuritis was associated with a higher mean of anxiety, whereas Meniere's disease was associated with a high mean of depression. On the other hand, no statistically significant difference was observed in other clinical diagnoses.

When we compared DHI subscales' scores to HADS scores, we found a statistically significant increase in the mean of physical, emotional, functional, and total DHI scores in cases of both anxiety and depression; still, no statistically significant difference in age.

When different psychological assessment results (Table 5) were compared, there was a statistically significant increase in the mean of emotional and functional functioning in cases with a high depression score; whereas, there was a statistically significant increase in the mean total DHI in patients with both anxiety and depression.

Correlating anxiety and depression scores with various variables such as age, disease duration, and total DHI scores (Table 6 and Fig. 1) revealed a statistically significant positive correlation between anxiety and depression scores and physical, emotional, functional, and total DHI scores, indicating that an increase in physical, emotional, functional, and total DHI scores is associated with an increase in anxiety and depression scores.

Additionally, there was a statistically significant positive correlation between depression and disease duration, indicating a link between increased disease duration and increased depression scores.

Analytical statistics

Sample size

The sample size was calculated using G-Power© software version 3.1.7 (Institute of experimental psychology,

Table 4 Comparisons of HADS scores and clinical diagnosis of vertigo

Groups	Anxiety Mean ± SD	Depression Mean ± SD
Diagnosis		
Vestibular neuritis	**12.5 ± 3.4**	8.4 ± 2.8
BPPV	8.1 ± 3.1	5.4 ± 1.7
Meniere's disease	11 ± 2.3	**9.8 ± 3.2**
Vestibular migraine	10.6 ± 1.9	8.4 ± 3.7
Multiple sclerosis	5 ± 0	10 ± 0
***p*-value**	**< 0.001***	**< 0.001***

**P*-value< 0.05 was considered as statistical significant

Table 6 Correlation between anxiety and depression with age, disease duration, and DHI scores

Variables	Anxiety		Depression	
	r	(*P*-value)	*r*	(*P*-value)
Age	− 0.14	0.2	0.07	0.5
Duration of disease	0.19	0.06	0.31	**0.002***
Physical	0.29	**0.003***	0.28	**0.005***
Emotional	0.32	**0.001***	0.43	**< 0.001***
Functional	0.35	**< 0.001***	0.34	**0.001***
DHI	0.38	**< 0.001***	0.45	**< 0.001***

**P*-value< 0.05 was considered as statistical significant

Table 5 Comparisons of Age & DHI subscales with HADS scores

Groups	Age Mean ± SD	Physical Mean ± SD	Emotional Mean ± SD	Functional Mean ± SD	DHI Mean ± SD
Anxiety					
No	39.2 ± 14.1	14.8 ± 5	11.8 ± 5.7	15.8 ± 7.8	40.7 ± 14.6
Yes	38.1 ± 8.5	**17.2 ± 5.3**	**14.8 ± 7.3**	**19 ± 7.2**	**49.3 ± 15.3**
***p*-value**	0.7	**0.02***	**0.02***	**0.03***	**0.005***
Depression					
No	37.9 ± 12	14.8 ± 5.1	12.1 ± 6.5	14.9 ± 6.5	40.1 ± 13.6
Yes	41.6 ± 11.2	**19.3 ± 4.5**	**16.7 ± 5.7**	**25.4 ± 5.7**	**60.3 ± 10.6**
***p*-value**	0.2	**< 0.001***	**0.003***	**< 0.001***	**< 0.001***
Psychological assessment					
Normal	38.4 ± 14.2	14.3 ± 5.2	10.8 ± 5.4	14.4 ± 7.1	38.1 ± 13.6
Anxiety	37 ± 7.3	15.8 ± 4.7	14.3 ± 7.7	15.8 ± 5.5	43.3 ± 13.2
Depression	44.3 ± 13.4	18 ± 0	**18.6 ± 3.2**	**25.7 ± 5.3**	58.9 ± 6.4
Both anxiety and depression	40.3 ± 10.3	19.8 ± 5.4	15.9 ± 6.5	25.2 ± 6.1	**60.9 ± 12.2**
***p*-value**	0.3	0.07	**< 0.001***	**< 0.001***	**< 0.001***

**P*-value< 0.05 was considered as statistical significant

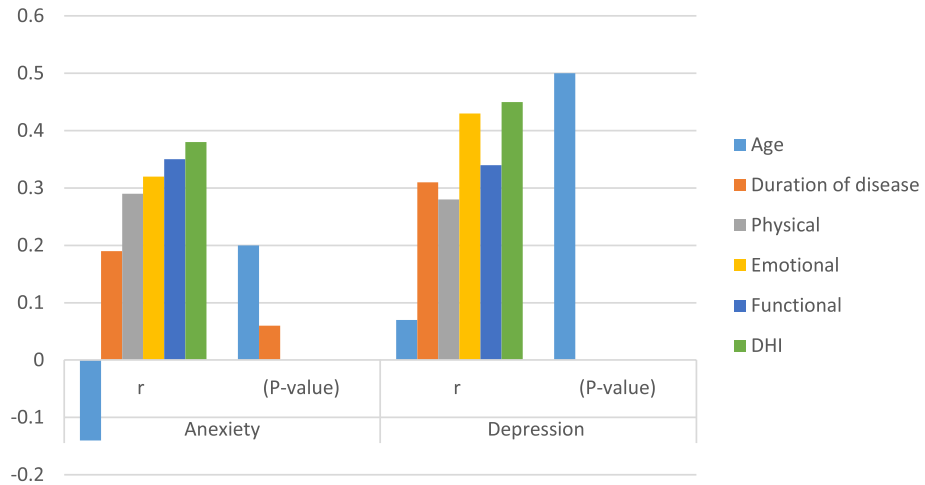

Fig. 1 Correlation between anxiety and depression with age, disease duration, and DHI scores

Heinrich Heine University, Dusseldorf, Germany). A minimal sample size of patients was 100 patients. Depending on previous research results. Two-sided (two tails) type I error 0.05 and power of 80%.

The Statistical Package for Social Science (SPSS) software version 22 analyses the data on a Windows 7 computer. Simple descriptive analysis of qualitative data in the form of numbers and percentages, arithmetic means as a measure of central tendency, and standard deviations as a measure of dispersion for quantitative parametric data. The one-sample Kolmogorov–Smirnov test was used to determine the normality of quantitative data in each study group before inferential statistics tests were chosen. To compare quantitative parametric data between two independent groups, the independent samples *t*-test was used. A one-way ANOVA test was used to compare quantitative data separately between more than two independent groups. When comparing more than two separate groups using quantitative nonparametric data, the Kruskal–Wallis test was used. When comparing two independent groups, the Mann–Whitney test is used. The chi-square test is used to compare two or more qualitative groups. Pearson's bivariate correlation test is used to determine the relationship between two variables. *P*-values less than 0.05 were considered statistically significant.

Discussion

Anxiety and dizziness have a complicated relationship. Specific individuals experience dizziness because of their anxiety, while others get dizzy and then feel anxious about it. Anxiety can cause a person to feel emotionally unsteady, resulting in a subjective sensation of dizziness. According to Staab et al., [13] having an anxious and introverted temperament increases one's risk of developing chronic subjective dizziness.

As well, dizziness may increase the risk of anxiety. When someone feels lightheaded, they may become concerned about their health or fear fainting. These concerns can contribute to or exacerbate anxiety. According to many studies, chronic dizziness has a strong correlation with both depression and anxiety, according to many authors [14].

In the current study, HADS revealed that 29% had anxiety, 7% had depression, and 15% had both anxiety and depression. Similarly, Kim et al. [15], reported that the prevalence of patients with high depression and anxiety indices were 11% and 18%, respectively, among those experiencing dizziness. These results were relatively low compared with those in some previous studies. Garcia et al. [16] observed a psychological manifestation in 63.4% of vertigo patients diagnosed with panic disorder, depressive disorder, and anxiety disorder. Also, Grunfeld et al. [17] and Ketola et al. [18] reported that over 45% of patients who have dizziness could be classified as depressed or anxious based on the self-reported instruments.

Meniere's disease had a higher mean for the physical subscale when compared to other clinical diagnoses of vertigo. In comparison, vestibular migraine had a significantly higher mean for emotional, functional, and total DHI scores. Kim et al. [15] found that patients with

vestibular migraine were more likely to have high levels of depression and anxiety and patients with high levels of psychological distress reported more vertigo symptoms. Zhu et al. [19] reported that the scores of DHI and its subscales and HADS scale in VM patients were significantly higher than those of patients with BPPV. VM was most likely to suffer from dizziness, handicap, depression, and anxiety. Even if the exact neurophysiology, endocrinological variables, or other explanations for the increased frequency of anxiety and depression in patients with MD and VM have not been conclusively established, the prevalence of anxiety and depression is significantly higher in this population.

Vertigo attacks are unpredictable, and their physical symptoms limit patients' range of motion. For example, they may purposefully avoid head movement when they go out alone [20]. The vestibular system's monoaminergic inputs mediate the effects of anxiety on vestibular function, whereas the parabrachial nucleus network regulates emotional responses to vestibular function disruption [21]. Dizziness stimulates the body's internal threat response system, heightening the patient's perception of motor stimulation [22]. These findings shed light on the inferior limbic cortex's autonomic nervous, endocrine, and emotional responses to various stimuli [23]. Similarly, Giuseppe Magliulo reported that 29.2% of BPPV patients experience clinical anxiety, and 22% require assistance walking [24]. Yardley reported that nearly 29% of vertigo patients have an anxiety symptom that can be accessed via HADS [25]. According to Goddard et al. [21], there was a significant overlap between the neuroanatomical regions and neurotransmitters involved in the vestibular system and the pathways involved in emotional states.

Anxiety, depression, and migraine may share the same genetic and environmental risk factors and interact to cause cohabitation [26]. Persistent tinnitus, fluctuating hearing loss, and hyperacusis can cause anxiety and depression [27]. Vestibular system includes the labyrinthine section of the inner ear and its connections in the brain stem and cerebellum, which has widespread cortical connections and plays a role in multimodal integration at the vestibular nucleus level [28].

Several attempts have been made to comprehend the reasons underlying the increased occurrence of anxiety and depression among vertigo patients. There have been hypothesized explanations that range from the role of disease behavior and personality traits to disorder-specific endocrinological and neurophysiological responses. Some researchers believe that vertigo is responsible for the reported psychological profile of MD, and they postulate that any illness with a symptom as severe as vertigo can develop its own type of psychopathology [29]. Behavioral characteristics of MD patients, such as being more stress-inducing than normal controls, may play a role in the development of endolymphatic hydrops, presumably via stress-related hormones [30]. In endolymphatic hydrops, including MD, plasma levels of stress-related chemicals such as antidiuretic hormones and catecholamines are high. These hormones were believed to change the fluid dynamics of the inner ear, causing auditory and vestibular abnormalities as well as the symptoms of MD [31–33].

Dizziness can be a frightening experience that exacerbates anxiety and makes people concerned about their health. In addition to that, anxiety can create a feedback loop, exacerbating dizziness symptoms. Over and above, psychological factors, such as anxiety and depression, may influence clinical presentation and therapeutic outcomes in patients with vestibular and balance complaints. It would be important to understand possible psychological and cognitive mechanisms underlying the relationship between vertigo and psychological symptoms as this would help in communication between the doctors and patients [34].

Conclusion

As this study has shown, there was a statistically significant positive correlation between anxiety and depression scores and physical, emotional, functional, and total DHI scores. Screening and treatment of co-morbid mental health disorders are critical for appropriate management of vertigo disability that leads to a higher quality of life and fewer complications.

Recommendations

Prospective studies with larger sample sizes are needed to corroborate the current findings and analyze correlations between office tests, DHI subscores, positional nystagmus, and patient compensatory levels. This would assist rehabilitative therapy, particularly for patients who need additional therapies.

Limitations

Psychiatric evaluations were conducted with self-rating instruments. Therefore, it is impossible to rule out the possibility of a false-positive mental diagnosis. However, self-assessments (valid questionnaires) provide an accurate depiction of how the patient feels and are a valid and reliable evaluation approach.

Abbreviations

BPPV: Benign paroxysmal positional vertigo; DHI: Dizziness handicap inventory; HADS: Hospital Anxiety and Depression Scale; ICHD-3: The International

Classification of Headache Disorders 3rd edition; MD: Menier's disease; MV: Migrainous vertigo; VN: Vestibular neuronitis.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s43163-022-00318-7.

Additional file 1:Appendix 1. Dizziness Handicap Inventory[36]. **Appendix 2.** The Hospital Anxiety and Depression Scale[5].

Acknowledgements
I wish to show my appreciation to Dr. Asmaa Younes, who offered valuable help in the statistics we used in our work.

Authors' contributions
All authors contributed to the design and implementation, the research, the analysis of the results, and the manuscript's writing. Dr. EM, Dr. RS, and Dr. AO were responsible for the audiological and vestibular assessment. Prof EM, Dr. MS, and Dr. RS were responsible for analyzing the results and writing the discussion. Also, the manuscript has been read and approved for submission by all authors and has not been submitted or published elsewhere.

Funding
None declared.

Availability of data and materials
All datasets used are available.

Declarations

Ethics approval and consent to participate
The study was approved by the local research ethics board of Bani Suef University; written informed consent was obtained from all patients to participate in this work.

Consent for publication
All patients obtained written informed consent to publish this work.

Competing interests
The authors declare that they have no competing interests.

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Received: 25 May 2022 Accepted: 5 August 2022
Published online: 27 October 2022

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