



AUDIOVESTIBULAR EVALUATION IN PATIENTS PRESENTING WITH DIZZINESS: AN OBSERVATIONAL STUDY

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ABSTRACT **Background:** Dizziness and vertigo are common clinical complaints with significant diagnostic complexity. While vertigo is often peripheral in origin, it can also reflect serious central or systemic disorders. Audiovestibular evaluation is essential for localizing pathology, differentiating peripheral from central causes, and formulating targeted management plans. **Objective:** To assess the frequency and pattern of audiovestibular symptoms in patients presenting with dizziness and to analyze audiometric and vestibular findings using standardized clinical tests. **Methods:** This observational cross-sectional study enrolled 100 patients complaining of rotatory vertigo at a tertiary care hospital. All patients underwent detailed clinical evaluation, pure tone audiometry (PTA), and vestibular testing including Head Impulse Test (HIT), Romberg test, Nystagmus evaluation, Dix-Hallpike maneuver, and Caloric test. Findings were analyzed descriptively. **Results:** Among the 100 patients evaluated, the most common clinical presentation was rotatory vertigo associated with imbalance (67%), followed by tinnitus (38%) and sensorineural hearing loss (35%). PTA revealed sensorineural hearing loss in 48% of cases, mixed loss in 14%, and normal hearing in 38%. Dix-Hallpike was positive in 40% of cases, suggesting BPPV. Head impulse test was positive in 34% of cases. Romberg's test was positive in 51% of patients, and spontaneous or positional nystagmus was noted in 47%. Caloric test revealed unilateral canal paresis in 22% and bilateral hypofunction in 8%. **Conclusion:** Audiovestibular testing plays a pivotal role in the evaluation of patients with vertigo. Detailed history, clinical examination, and simple bedside tests such as Dix-Hallpike and audiometry provide valuable information in identifying peripheral vestibular pathologies such as BPPV and Meniere's disease. A systematic approach improves diagnostic accuracy and guides appropriate management.

KEYWORDS :

INTRODUCTION

Vertigo, often described as a sensation of spinning or movement when no such motion exists, represents a significant diagnostic challenge in otolaryngologic and neurological practice. Affecting nearly 20-30% of the general population at some point in their lives, vertigo is more than a transient discomfort-it is a symptom that can severely impair daily functioning, induce anxiety, and signal serious underlying pathology if not properly investigated.

Vertigo is a subset of dizziness, which itself is a broader symptom complex including imbalance, lightheadedness, and presyncope. True vertigo typically results from disorders of the vestibular system-either peripheral (inner ear, vestibular nerve) or central (brainstem, cerebellum). Among the peripheral causes, Benign Paroxysmal Positional Vertigo (BPPV), vestibular neuronitis, and Meniere's disease are most prevalent. Central causes, although less common, include posterior circulation stroke, demyelinating diseases like multiple sclerosis, and tumors of the cerebellopontine angle such as vestibular schwannoma. Systemic contributors such as diabetes mellitus, hypotension, and drug toxicity further complicate diagnosis.

The overlap of auditory and vestibular symptoms-such as tinnitus, hearing loss, aural fullness, and imbalance-makes audiovestibular evaluation a cornerstone in the assessment of patients with vertigo. A detailed clinical history, physical examination, and bedside tests including the Dix-Hallpike maneuver, Head Impulse Test (HIT), and caloric testing aid in localizing the lesion. Pure tone audiometry (PTA) can uncover associated sensorineural hearing loss, while tests such as videonystagmography (VNG) and Romberg's test assess vestibular function.

Despite the availability of advanced neuroimaging and electrophysiological techniques, simple office-based audiovestibular tests remain highly sensitive in identifying vestibular dysfunction. Particularly in resource-limited settings, reliance on these tools is indispensable. Given the high prevalence, variable presentations, and disabling nature of vertigo, this study aims to characterize the audiovestibular profile of patients presenting with dizziness and investigate the utility of clinical tests and PTA in identifying vestibular pathology.

MATERIALS AND METHODS

Study Design And Setting:

This was a descriptive, observational cross-sectional study conducted in the Department of ENT at Rama Medical College Hospital and Research Centre, Kanpur, from August 2022 to April 2024.

Study Population:

A total of 100 patients presenting with complaints of rotatory vertigo to the ENT outpatient department were enrolled after obtaining informed written consent. Ethical clearance was obtained from the institutional review board.

Inclusion Criteria:

- Patients aged 18 years and above
- Presenting with complaints of rotatory vertigo or dizziness
- Willing to provide informed consent

Exclusion Criteria:

- Patients refusing consent
- Patients with known central nervous system disorders
- Patients with active middle ear infection or otorrhea at the time of evaluation

Data Collection Tools and Protocol:

Each Patient Underwent:

1. Detailed Clinical History: Including onset, duration, frequency of vertigo, triggering factors, associated symptoms (hearing loss, tinnitus, nausea, falls, diplopia), history of systemic illness, and medication use.

2. General and Neurological Examination: Including cranial nerve assessment, cerebellar signs, gait analysis, and mental status.

3. Otorhinolaryngological Examination: Otoscopy, tuning fork tests (Rinne's, Weber's), and cranial nerve evaluation.

4. Audiological Assessment:

- Pure tone audiometry (PTA) using standard protocols (frequencies 0.5, 1, 2, 4 kHz)
- Assessment of type and severity of hearing loss based on WHO grading

5. Vestibular Function Tests:

- o **Dix-Hallpike Maneuver:** To assess for BPPV
- o **Head Impulse Test (HIT):** To evaluate the vestibulo-ocular reflex (VOR)
- o **Romberg Test:** For balance and proprioception
- o **Nystagmus Evaluation:** Observed with and without fixation in multiple gaze directions
- o **Caloric Test (Fitzgerald-Hallpike):** To identify canal paresis or bilateral weakness

6. Additional Testing (as required):

- o MRI/CT scan of the brain
- o Blood investigations for diabetes, thyroid dysfunction, or autoimmune disease if systemic cause was suspected

Data Analysis:

All data were tabulated and analyzed using descriptive statistics. The frequency of various clinical findings, audiometric patterns, and vestibular test abnormalities were calculated. Correlation between audiometric findings and vestibular signs was noted.

RESULTS

A total of 100 patients with complaints of vertigo were evaluated. The findings are organized into demographic data, clinical features, audiometric profiles, and vestibular test outcomes.

1. Demographic Profile:

Age Distribution:

The majority of patients were in the age group of 41–60 years (54%), followed by 21–40 years (29%). Elderly patients (>60 years) constituted 13% and young adults (<20 years) made up 4%.

o **Mean Age:** 45.2 years

Gender Distribution:

- o **Male:** 44%
- o **Female:** 56%

The slight female preponderance was consistent with existing literature indicating hormonal influences and migraine association.

2. Clinical Symptomatology:

Symptom	Number of Patients	Percentage
Rotatory vertigo	100	100%
Imbalance while walking	67	67%
Tinnitus	38	38%
Sensorineural hearing loss	35	35%
Nausea/Vomiting	32	32%
Aural fullness	28	28%
Recurrent falls or near-falls	21	21%
Headache or visual disturbances	18	18%
Ear pain or pressure	11	11%

3. Audiometric Findings (Pure Tone Audiometry):

Out of 100 patients:

- **Sensorineural hearing loss (SNHL):** 48%
- **Normal audiogram:** 38%
- **Mixed hearing loss:** 14%
- **No patients had purely conductive hearing loss**

Hearing Threshold Status (WHO Grade)	Number of Patients	Percentage
Normal hearing	38	38%
Mild SNHL (26–40 dB)	25	25%
Moderate SNHL (41–60 dB)	17	17%
Severe SNHL (>60 dB)	6	6%
Mixed hearing loss	14	14%

In Meniere's disease (n=11), the classic low-frequency SNHL was noted in 8 cases.

4. Vestibular Function Test Results:

Test Performed	Positive Finding	Number of Patients	Percentage
Dix-Hallpike Test	BPPV-type nystagmus	40	40%
Head Impulse Test	Corrective saccades seen	34	34%
Romberg Test	Instability with eyes closed	51	51%

Spontaneous Nystagmus	Horizontal/torsional	47	47%
Caloric Test	Unilateral canal paresis	22	22%
	Bilateral hypofunction	8	8%

5. Diagnosis Distribution Based on Clinical and Test Findings:

Diagnosis	Number of Patients	Percentage
Benign Paroxysmal Positional Vertigo (BPPV)	40	40%
Meniere's Disease	11	11%
Vestibular Neuritis	9	9%
Vestibular Migraine	8	8%
Central Causes (Stroke, MS)	6	6%
Systemic/Metabolic Causes	10	10%
Unclassified/Non-vestibular	16	16%

6. Association Between Audiometry And Vestibular Findings:

- Among patients with sensorineural hearing loss (n=48), 30 also had positive vestibular test findings (62.5%).
- In patients with normal audiometry (n=38), 21 had abnormal vestibular tests (55.2%).

This supports the value of combined audiological and vestibular assessment in diagnosis.

DISCUSSION

Vertigo is a multifaceted symptom with a wide spectrum of etiologies, ranging from benign peripheral vestibular disorders to serious central nervous system pathologies. The present study highlights the utility of a structured audiovestibular evaluation in differentiating these causes and streamlining patient management.

In our study population, the **most frequent diagnosis was BPPV**, accounting for 40% of cases. This is consistent with global data indicating BPPV as the most common peripheral vestibular disorder. The characteristic latency, fatigability, and reversal of positional nystagmus during Dix-Hallpike maneuver served as reliable diagnostic indicators.

Meniere's disease was the second most common cause (11%), presenting with classic triad: episodic vertigo, fluctuating SNHL, and tinnitus. Low-frequency SNHL noted in audiometry was a supportive finding. This is in agreement with the Barany Society diagnostic criteria and other Indian and international studies.

Vestibular neuronitis and **migraine-associated vertigo** together contributed another 17% of cases. Migraine-related vertigo was more common in younger females and often presented without significant hearing loss, but with recurrent vertigo and migrainous features. This subset needs careful clinical evaluation as diagnostic tests may often be normal.

Vestibular testing proved to be pivotal in diagnostic stratification:

- **Dix-Hallpike** was positive in all BPPV cases, and its diagnostic value was reaffirmed.
- The **Head Impulse Test** and **Caloric test** identified unilateral vestibular hypofunction in neuronitis cases.
- **Romberg's positivity** indicated postural instability, especially in elderly patients with multisensory deficits or bilateral vestibulopathy.

Audiometry contributed significantly in distinguishing **peripheral from central vertigo**, and in detecting **co-existing cochlear involvement**. Patients with **Meniere's disease**, for instance, demonstrated fluctuating low-frequency SNHL. Those with **central vertigo** (posterior circulation stroke, MS) often had normal audiograms but abnormal gaze-evoked nystagmus or other cerebellar signs.

Our study also draws attention to the **psychological impact and functional impairment** caused by vertigo. Many patients reported **reduced quality of life**, fear of falling, and avoidance of routine activities. While not quantified here, this underscores the need for holistic management, including **vestibular rehabilitation therapy** and mental health support.

Notably, **systemic causes** such as anemia, diabetes, and hypertension were implicated in 10% of cases. This aligns with the understanding

that **vestibular symptoms can result from multisystem involvement**, warranting interdisciplinary collaboration.

CONCLUSION

This study underscores the diagnostic importance of a thorough audiovestibular evaluation in patients presenting with vertigo. Vertigo, although a symptom, reflects a broad spectrum of pathologies, both peripheral and central, and requires a systematic approach for effective diagnosis and management.

Our findings reveal that the majority of cases are attributable to benign peripheral vestibular disorders-most commonly BPPV-highlighting the utility of bedside tests like the Dix-Hallpike maneuver in routine clinical practice. Sensorineural hearing loss, as detected by pure tone audiometry, was frequently associated with vestibular pathology, particularly in conditions such as Meniere's disease and vestibular neuronitis. Central and systemic causes, though less common, mandate careful exclusion via history, examination, and selective imaging.

Simple, cost-effective vestibular tests like Head Impulse, Romberg, and Caloric stimulation, when used in conjunction with audiometry, provide significant diagnostic yield. In resource-constrained settings, these tools remain essential for appropriate triage, diagnosis, and referral.

The interdisciplinary management approach-including ENT, neurology, audiology, and physiotherapy-plays a vital role in improving outcomes. Furthermore, patient education and reassurance are key components in mitigating the functional impact of chronic vertigo on quality of life.

This study reinforces the role of ENT specialists not only in diagnosing but also in guiding the comprehensive care of patients with dizziness and balance disorders through accurate audiovestibular profiling.

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