

**ORIGINAL RESEARCH****Evaluation of auditory functions in vestibular migraine patients****<sup>1</sup>Dr. Puneet Maheshwari, <sup>2</sup>Dr. Shivendra Pandey, <sup>3</sup>Vijeta Maheshwari, <sup>4</sup>Salwa Salam**<sup>1,2</sup>MBBS, MS (ENT), Associate Professor, Department Of ENT, Hind Institute Of Medical Sciences, Safedabad, Barabanki, U.P., India<sup>3</sup>Assistant Professor, Department of Anaesthesiology, Career Institute of Medical Sciences and Hospital, I.I.M., Ghaila, Lucknow, Uttar Pradesh, India<sup>4</sup>Junior resident, Department Of ENT, Hind Institute Of Medical Sciences, Safedabad, Barabanki, U.P., India**Correspondence:**

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**Email:**[dr.shivendrapandey@gmail.com](mailto:dr.shivendrapandey@gmail.com)**Abstract****Background:** Vestibular migraine (VM) is defined as vertigo or dizziness caused by migraine. The present study was conducted to assess and evaluate the auditory functions in vestibular migraine patients.**Materials & Methods:** 156 patients of vestibular migraine of both genders underwent pure tone audiometry (PTA), impedance audiometry, brainstem evoked response audiometry (BERA), and distortion product otoacoustic emissions (DPOAE). Parameters such as type of hearing loss, duration of attack and site of attack was recorded**Results:** Out of 156 patients, males were 96 and females were 60. Duration of attack was 0-1 hours in 84, 1-2 hours in 48 and >2 hours in 24. Site was front in 78, back in 48 and both sides in 30. PTA was abnormal in 120 and normal in 36. BERA was abnormal in 114 and normal in 42. DPOAE was abnormal in 129 and normal in 27. Common symptoms were double vision in 102, tinnitus in 135, zigzag spots in 84, hearing loss in 36 and darkness in field of vision in 132. The difference was non-significant ( $P > 0.05$ ).**Conclusion:** Common symptoms in patients with vestibular migraine were tinnitus followed by double vision, zigzag spots, hearing loss and darkness in field of vision.**Key words:** hearing loss, vestibular migraine, tinnitus**Introduction**

Vestibular migraine (VM) is defined as vertigo or dizziness caused by migraine. Approximately, 10% of the population has migraine headaches and one third of these patients experience dizziness, so the prevalence of VM can be estimated as approximately 3% of the population.<sup>1</sup> Vestibular symptoms can be surrounding rotatory type, head rotatory type, light-headedness, and imbalance. They can also present with auditory complaints such as tinnitus, aural fullness, decreased hearing, and phonophobia. There are reports of sudden, permanent, and fluctuating hearing loss associated with migraine. However, the incidence of hearing loss in migraine is low.<sup>2</sup>

Rotational vertigo or other illusory sensations of motion indicate vestibular symptoms, whereas a sensation of light-headedness, giddiness, unsteadiness, drowsiness, or impending faint implies dizziness of non-vestibular origin.<sup>3</sup> However, even though vertigo and dizziness may reflect a distinction between vestibular and non-vestibular symptoms, patients often use

these terms interchangeably, and few physicians other than otoneurologists clearly differentiate between the two. VM is essentially a diagnosis of exclusion. Physical examination is likely to be normal.<sup>4</sup> Various investigations that could be done include imaging of the brain, otoacoustic emissions, auditory brain stem evoked response, and audiometry in order to exclude other pathological conditions.<sup>5</sup>

Migraine is also one of neurological diseases which leads to SNHL in adults. It's known that, several hearing disorders may be seen in prodromal phase of migraine with aura. They are usually more common especially in basilar migraine types.<sup>6</sup> SNHL, tinnitus, sound and speech distortions, intolerance to high noises are the most common symptoms. Hearing loss is bilateral in the half of the patients. Usually, hearing loss holds low-frequencies and shows fluctuation. Vasospasm of labyrinthine arteries might explain all of these inner ear symptoms. From this aspect, it may be confused with Meniere disease (MD).<sup>7</sup>The present study was conducted to assess and evaluate the auditory functions in vestibular migraine (VM).

### Materials & Methods

The present study comprised of 156 patients of vestibular migraine of both genders. The consent was obtained from all patients.

Data such as name, age, gender etc. were recorded. All patients underwent pure tone audiometry (PTA), impedance audiometry, brainstem evoked response audiometry (BERA), and distortion product otoacoustic emissions (DPOAE). Parameters such as type of hearing loss, duration of attack and site of attack was recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

### Results

#### Table I Distribution of patients

Total- 52		
Gender	Male	Female
Number	96	60

Table I shows that out of 156 patients, males were 96 and females were 60.

#### Table II Assessment of parameters

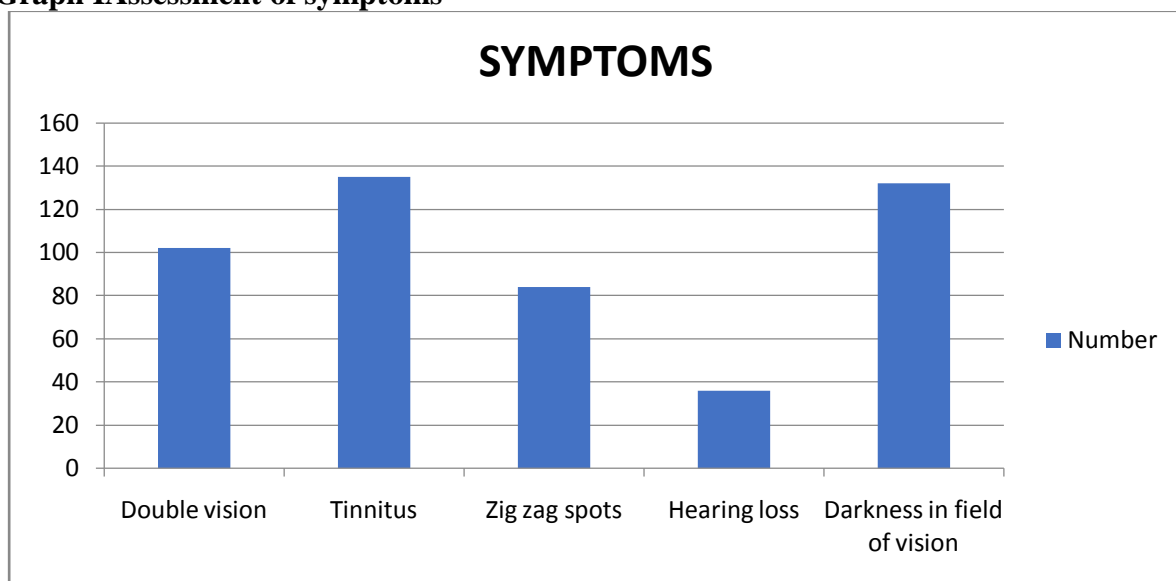
Parameters	Variables	Number	P value
Duration of attack	0-1 hours	84	0.03
	1-2 hours	48	
	>2 hours	24	
Site	Front	78	0.05
	Back	48	
	Both	30	
PTA	Abnormal	120	0.02
	Normal	36	
BERA	Abnormal	114	0.01
	Normal	42	
DPOAE	Abnormal	129	0.01
	Normal	27	

Table II shows that duration of attack was 0-1 hours in 84, 1-2 hours in 48 and >2 hours in 24. Site was front in 78, back in 48 and both in 30. PTA was abnormal in 120 and normal in 36. BERA was abnormal in 114 and normal in 42. DPOAE was abnormal in 129 and normal in 27. The difference was significant (P< 0.05).

**Table III Assessment of symptoms**

Symptoms	Number	P value
Double vision	102	0.11
Tinnitus	135	
Zigzag spots	84	
Hearing loss	36	
Darkness in field of vision	132	

Table III, graph I shows that common symptoms were double vision in 102, tinnitus in 135, zigzag spots in 84, hearing loss in 36 and darkness in field of vision in 132. The difference was non-significant ( $P > 0.05$ ).

**Graph I Assessment of symptoms**

## Discussion

Migraine is a primary, chronic, episodic headache, known for thousands of years, which is accompanied by neurologic, gastrointestinal and autonomic changes in various combinations, and of which aural neurologic symptoms seen in one-third (1/3) of the cases are known as the characteristic features.<sup>8,9</sup> The most common form of migraine is "migraine without aura" and 90% of the patients with migraine have this type of migraine.<sup>10</sup> In the rest of the cases, migraine attacks with aura occur alone or together with migraine attack without aura. Migraine disease induces a series of neurologic symptoms such as vertigo, dizziness, hearing loss, tinnitus and aural ache in addition to the most common auditory symptom, phonophobia.<sup>11</sup> The present study was conducted to assess and evaluate the auditory functions in vestibular migraine (VM).

In present study, out of 156 patients, males were 96 and females were 60. Karadaget al<sup>12</sup> included patients who were diagnosed as migraine. In all patients, hearing levels were measured at baseline and after treatment by using high-frequency audiometry, transient otoacoustic emission and acoustic reflex tests. In the present study, hearing thresholds measured in the right ear was normal in migraine patients with or without aura at baseline, while mild hearing loss was detected in right ear at the frequency of 500 Hz after treatment when hearing thresholds at different frequencies were compared. When hearing thresholds in right ear at baseline and after treatment was compared, mild hearing loss was detected at the

frequency of 250 Hz in migraine patients with aura. This difference was significant. In migraine patients with aura, hearing was normal in all patients at baseline, while in both ears mild hearing loss was detected in 2 patients (8.7%) after treatment.

We found that common symptoms were double vision in 102, tinnitus in 135, zigzag spots in 84, hearing loss in 36 and darkness in field of vision in 132. The difference was non-significant ( $P > 0.05$ ). Mathew et al<sup>13</sup> evaluated eighty consecutive patients who were diagnosed with vestibular migraine and determined the frequency of auditory dysfunction in these patients. The second part was a prospective case control study in which we compared the audiological parameters of thirty patients diagnosed with VM with thirty normal controls to look for any significant differences. Results: The frequency of vestibular migraine in our population is 22%. The frequency of hearing loss in VM is 33%.

Neuhauser et al<sup>14</sup> proposed diagnostic criteria for definite and probable VM. The pathophysiology of VM, despite intense study, is still poorly understood but migraine has been conceptualized as a disorder of impaired sensory modulation. Migraine sufferers are more sensitive to numerous unpleasant sensory inputs and these inputs trigger a threshold which causes a cortical event followed by a brainstem event causing more input to be perceived as noxious resulting in headache. Thus, the brain of migraine sufferers is hyper excitable. Similar mechanisms are proposed for VM. The cortical spreading depression may play a role in patients who are having short attacks. This mechanism can produce vestibular symptoms when the sensory cortical areas at the posterior insula and temporoparietal junction are involved.

Pathophysiology of hearing symptoms is probably related to vasospasm of small arterioles found in the cochlear or labyrinth. However, the certain mechanism linking migraine and SNHL is not known. The trigeminal sensual innervation of cochlear blood vessels in a way to change blood flow and permeability of vessels and vasospasm of internal auditory artery channels and even migrainous infarcts are suggested as the potential mechanism of cochleovestibular dysfunctions related to migraine headaches.<sup>15</sup>

## Conclusion

Authors found that common symptoms in patients with vestibular migraine were tinnitus, double vision, zigzag spots, hearing loss and darkness in field of vision.

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