



OCCURRENCE OF HEARING LOSS IN MIGRAINE PATIENTS: A DESCRIPTIVE LONGITUDINAL STUDY IN A TERTIARY CARE HOSPITAL

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ABSTRACT Migraine is a common disabling primary headache disorder with high socio-economic and personal impacts. In this study 140 cases of migraine patients aged between 18-50 years for a period of 6 months were assessed for hearing loss and the effect of treatment and prophylaxis on the hearing threshold. All patients were assessed clinically and underwent pure tone audiometry (PTA) after an acute attack of migraine and at 1st, 2nd and 3rd months. 67.8% had sensorineural hearing loss (SNHL), 84.3% had right sided hearing loss with right sided headache and 69.2% had left sided hearing loss with left sided headache. On follow-up, 73.6% patients improved to normal hearing. Our study demonstrated that patients with migraine are at higher risk of developing SNHL which is mild and easily reversible if patients are given treatment and prophylaxis at an early stage of diagnosis.

KEYWORDS : Migraine, Sensorineural Hearing Loss, Pure Tone Audiometry

INTRODUCTION

Migraine is a common disabling primary headache disorder. Epidemiological studies have documented its high prevalence and high socio-economic and personal impacts. In 2010 it was ranked as third most prevalent disorder and seventh highest specific cause of disability worldwide¹.

Migraine disease induces a series of neurologic symptoms such as vertigo, dizziness, hearing loss, tinnitus and ear ache in addition to the most common auditory symptom, phonophobia. Sensorineural hearing loss (SNHL) is related to defects in sensory end organ of cochlea or in neural transmission pathway toward the central nervous system. Migraine is also one of neurological diseases that can lead to SNHL in adults. Several hearing disorders may be seen in prodromal phase of migraine with aura like SNHL, tinnitus, sound and speech distortions, intolerance to high noises. The cochlear ischemia can cause hearing loss².

Certain mechanism linking migraine and SNHL is not known. Pathophysiology of hearing symptoms is probably related to vasospasm of small arterioles found in the cochlea or labyrinth. The trigeminal sensory innervation of cochlear blood vessels in a way change the blood flow and permeability of vessels and causes vasospasm of internal auditory artery channels and even infarcts which are suggested as the potential mechanism of cochleovestibular dysfunctions related to migraine headaches².

The only histopathological proof associating migraine and SNHL was offered in 2000 that there was significant fibrosis in the stria vascularis and spiral ligament which was the characteristic finding of ischemic damage³.

In the present study, we determine the degree of hearing loss in migraine patients.

METHODOLOGY

A descriptive longitudinal study was carried out between March 2022 to August 2022 in the department of otorhinolaryngology, Mandya Institute of Medical Sciences, Mandya, Karnataka. The study was initiated after obtaining the approval from the Institutional Ethical Committee. A total of 140 patients diagnosed with migraine in accordance with the International Classification of Headache Disorder 3rd edition (ICHD-3)¹ were recruited in the study. All patients aged between 18 to 50 years, diagnosed with migraine and who gave informed written consent were included in the study. Patients with history of chronic suppurative otitis media, conductive and mixed hearing loss, cerebrovascular attacks, head injury, previous ear surgeries, SNHL due to ototoxicity and occupational exposure to

noise, congenital causes of deafness and family history of deafness were excluded from the study.

A detailed history was elicited related to headache such as the duration of the headache, laterality of the headache, any prodromal symptoms, associated aura and hearing loss. A detailed otoscopic examination was done including tuning fork tests using 250 Hz, 512 Hz and 1024 Hz frequency tuning fork for each patient. All patients were on first line treatment with NSAIDs and prophylaxis with flunarizine from the time of diagnosis of the migraine. All patients were subjected to pure tone audiometry (PTA) using instrument AD 629 audiometer calibrated in accordance with ISO standards. All patients underwent PTA after an acute attack of migraine and repeated during the follow-up at 1st, 2nd and 3rd month. The pure tone threshold between 0-25 dB was classified as normal, 26-40 dB as mild, 41-55 dB as moderate, 56-70 dB as moderately severe, 71-90 dB as severe and >90 dB as profound. PTA was done separately for both right and left ears.

Statistical Analysis

All data collected were entered in Microsoft Excel sheet and were statistically analyzed using <https://www.openepi.com/RbyC/RbyC.htm>. Analysis was done using descriptive statistics like percentage and inferential statistics like Chi Square test. p value <0.005 was considered statistically significant.

RESULTS:

A total of 140 patients were recruited for the study.

Figure-1 Shows out of total 140 patients, 59 (42.1%) females presented with SNHL whereas 36 (25.8%) males presented with SNHL.

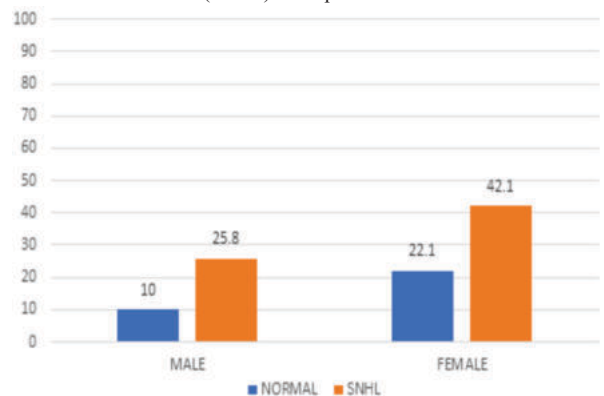


Figure-1 Gender Distribution Of SNHL

Table 1. Distribution Of Hearing Loss And Side Of Headache

Headache	Hearing Loss-Right (%)	Hearing Loss-Left (%)	p- value
RIGHT SIDE	84.4	23.1	<0.001
LEFT SIDE	9.4	69.2	
BILATERAL	6.2	6.2	

Out of 64 patients who presented with right sided headache, 54 (84.4%) patients had hearing loss on the right side, 6 (9.4%) patients had hearing loss on left side and 4 patients presented with bilateral hearing loss.

Out of 52 patients who presented with left sided headache, 12 (23.1%) patients had hearing loss on the right side, 36 (69.2%) patients had hearing loss on left side and 4 patients presented with bilateral hearing loss.

On applying Chi-square test, it was found to be statistically significant (p-value <0.001) that subjects with unilateral headache presented with hearing loss on the ipsilateral side.

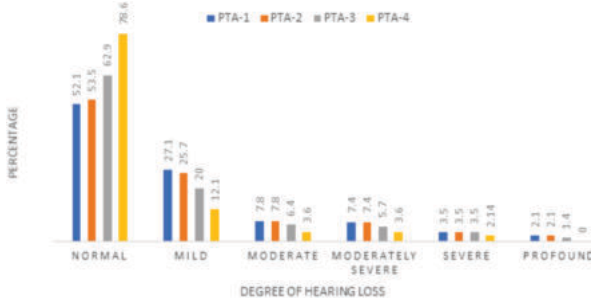


Figure-2 Comparison Of Hearing Threshold Of Right Ear Between First Visit And Follow Up Visit

On comparing the PTA of right ear on 1st visit and last follow-up visit, it was found that 37(55.2%) patients had improved to normal hearing and the change of hearing threshold was found to be statistically significant (p-value- 0.024).

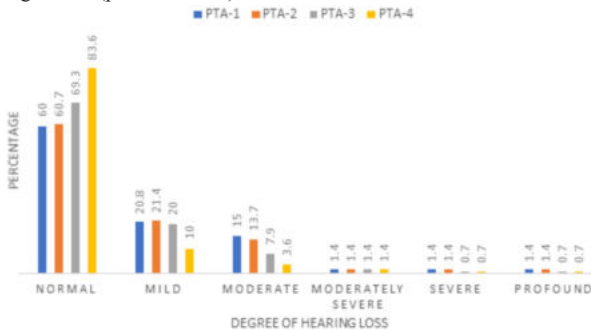


Figure-3 Comparison Of Hearing Threshold Of Left Ear Between First Visit And Follow Up Visit

On comparing the PTA of left ear on 1st visit and last follow-up visit, it was found that 33(58.9%) patients had improved to normal hearing and the change of hearing threshold was found to be statistically significant (p-value- 0.027).

DISCUSSION

This study was planned based on the hypothesis that neurovascular events that contribute in migraine pathophysiology may induce sensorineural hearing loss by altering the vascular supply to inner ear. It was first suggested by Tissot in 1778 that hearing disorders such as phonophobia and hyperacusia seen in migraine patients might be related to stress induced headache⁸. Various studies in literature suggest that migraine might induce permanent audio and vestibular dysfunctions⁶.

In our study it was found that out of all the 140 subjects evaluated, 95 subjects presented with SNHL, of which 59 (42.1%) were female and 36 (25.8%) were male. A population based study done by Chu et al. showed the incidence rates of SSNHL in female and male subgroups (81.2 vs 82.6 per 100,000 person-years) were similar. The female migraine subgroup had a higher incidence rate ratio (IRR) than the male subgroup⁵.

In 1987, Lipkin et al. first described a 62-year-old female who had recurrent hearing loss in conjunction with migraine attacks⁹. Virre and Baloh presented 13 cases with unexplained sudden sensorineural hearing loss (SSNHL) and they suspected that the disturbance of cochlear microvasculature might be the cause⁶.

A transient and reversible unilateral or bilateral hearing loss during a migraine attack and intermittent period have been mentioned in some studies^{6,9}. In a study conducted by Shi et al. showed only 6 cases (3.6%) had bilateral hearing loss and 29 (17.5%) had unilateral hearing loss¹⁰. Our data showed that 116 patients had unilateral headache and 4 patients had bilateral headache, of which 90 patients (75%) had hearing loss on the ipsilateral side of headache.

In a study conducted by Karadag et al., 50 patients diagnosed with migraine with aura and migraine without aura were included and pre-treatment and post treatment hearing thresholds were compared. When both groups were compared, the change in hearing threshold of cases in pre-treatment and post treatment was found statistically significant².

In our study, all migraine patients received NSAIDs and Flunarizine during the study period. On follow-up PTA, 37(55.2%) patients and 33(58.9%) patients improved to normal hearing on right ear and left ear respectively.

The mechanism of hearing loss in migraine remains unclear. Several studies have been proposed which shows vasospasms associated with migraine in small arterioles within the cochlea and the labyrinth¹¹. Some inflammations and neurotransmitters involved in the pathogenesis of migraine affect the inner ear and the central auditory system¹². A genetic deficiency of ion channels would be related to migraine. Furthermore, channels expressed both in the inner ear and in the brain could affect peripheral and central auditory dysfunction¹³.

The only histopathological proof associating migraine and SNHL was offered in 2000 by Lee et al. In the study they made a postmortem investigation on cochlea of a patient who had migraine for long time and developed SNHL⁷.

Chu et al. reported a 1.8-fold increase in the risk of SSNHL for patients with migraine, with a very small but detectable increase in the cumulative risk of SSNHL each year during 10 years of observation⁵. In a longitudinal follow-up study by Kim et al, migraine patients had a higher (0.9%) likelihood of SSNHL than the control groups⁴. Similar study was conducted by Mohammadi et al, which showed individuals with migraine are at higher (0.88%) risk of developing SSNHL than the non-migraineurs¹⁴. Although in our study none of the patients had SSNHL.

In a cross-sectional analysis conducted by Goshtasbi et al., migraineurs are more likely to have tinnitus and subjective hearing loss than non-migraineurs. Migraine was reported in 25.4% of patients with subjective hearing loss which suggests independent association between migraine with subjective hearing loss and tinnitus⁷.

CONCLUSION

In conclusion, our study demonstrated that patients with migraine are at higher risk of developing SNHL which is mild and easily reversible if patients are given prophylaxis at an early stage of diagnosis. Migraine is comorbid with cardiovascular disorders and most of these disorders are also associated with SNHL, therefore controlling these risk factors in migraine patients might reduce the occurrence of SNHL. Our evaluations include short time follow-ups therefore there is need for prospective studies in future. To explore the correlated factors of hearing loss in migraine patients, further studies are warranted.

LIMITATIONS

Our study still leaves much to be explored. First, patients with migraine have individual variations in clinical presentations. Second, vestibular functions were not analysed. Third, lack of resources and non-compliance on treatment.

CONFLICT OF INTEREST

None declared

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