

A Study Examining the Clinical Characteristics of Tertiary Hospitalized Patients Experiencing Acute Sensorineural Hearing Loss**Hiren Roza¹, Surabhi Naik²**¹Assistant Professor, Department of ENT, Zydus Medical College and Hospital, Dahod, Gujrat, India²Assistant Professor, Department of ENT, Zydus Medical College and Hospital, Dahod, Gujrat, India

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Conflict of interest: Nil

Abstract**Aim:** The current research set out to examine the clinical characteristics of tertiary hospitalized patients experiencing acute sensorineural hearing loss.**Methods:** The ENT department of Zydus Medical College and Hospital in Dahod, Gujrat, India, provided the setting for the current retrospective investigation. Two hundred case records were reviewed. This study used case records from the last three years to look at individuals who had sensorineural hearing loss that came on suddenly.**Results:** All patients were compared by recovery. The recovery rate was 40% in 80 patients and 60% in 120 individuals. 43% of patients were 41-60 years old, followed by 30% from 21-40. Patients with recovery had a significantly higher mean age (42.88 ± 8.32 years) compared to those without recovery (51.52 ± 11.79 years) ($p < 0.05$). No significant gender difference was seen among total patients or those with or without recovery ($p > 0.05$). Hypertension (35%), diabetes (20%), dyslipidemia (20%), and thyroid disease (8%) were common comorbidities. The difference in vertigo between patients with and without recovery was statistically significant ($p < 0.05$). Patients with recovery (40%) and those without recovery (60%) had similar tinnitus ($p > 0.05$). The majority of patients had flat, U-shaped, reverse U-shaped (45%), descending (40%) and ascending (15%) audiogram curves. Hearing loss was modest (8%), moderate (10%), fairly severe (20%), severe (25%), and profound (37%). A significant difference ($p < 0.05$) was seen in the incidence of individuals without recovery with increasing hearing loss severity.**Conclusion:** Individuals under the age of 40 who experience sudden sensorineural hearing loss may have a higher chance of recovery if they start therapy within 14 days of onset, do not have any other medical conditions, and have a less severe degree of hearing loss.**Keywords:** sudden onset sensorineural hearing loss, vertigo, profound hearing loss, prednisoloneThis is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Idiopathic sudden sensory neural hearing loss (ISSNHL) is defined as a sudden and unexplained loss of hearing that exceeds 30 decibels in three consecutive frequencies within a period of 72 hours. [1] According to a previous study, the occurrence of ISSNHL in the population of Western countries was estimated to be between 5 and 20 cases per 100,000 people. [2]

Despite thorough examination, 90% of sudden sensorineural hearing losses (SSNHLs) are classified as idiopathic (ISSNHL). [3] ISSNHL is a condition characterized by a variety of clinical symptoms, causes, levels of hearing loss, patterns on an audiogram, time elapsed between the start of hearing loss and treatment, and the likelihood of recovery. The presence of methodological heterogeneity and small sample sizes in the numerous studies on ISSNHL hampers the ability to conduct thorough analysis and make meaningful

comparisons of their findings. [4] To develop a diagnostic investigation and personalized treatment plan for patients with ISSNHL, it is crucial to conduct a comprehensive evaluation involving a large number of patients over an extended period. This evaluation should include the analysis of clinical and audiometric profiles, as well as the correlation between these profiles and the prognosis of hearing. Regarding age distribution, Rauch's study revealed that ISSNHL was most commonly observed in individuals between the ages of 43-53 years. [5] Sudden sensorineural hearing loss (SSNHL) was first attributed to Dekleyn in 1944. [6] It typically manifests as sudden hearing loss occurring within 72 hours and is a critical condition that necessitates prompt medical intervention. Sudden sensorineural hearing loss (SSNHL) is characterized by a rapid decrease in hearing sensitivity of 30 dB or more in one or both ears,

across at least three consecutive frequencies during audiometry, within a timeframe of 72 hours or less. Hearing loss can vary from a slight hearing impairment to a complete loss of hearing, and it can be either temporary or permanent. [7] The estimated occurrence of sudden sensorineural hearing loss (SSNHL) normally varies from 2 to 20 cases per 100,000 individuals per year. [8,9] Sudden sensorineural hearing loss (SSNHL) can manifest at any age, however it predominantly impacts individuals between the ages of 43-53 years. Furthermore, it is equally prevalent among males and females. Seeking medical attention promptly and initiating treatment early enhances the outlook for the restoration of hearing. The primary objective is to identify a curable or specific cause of the abrupt hearing loss. [1] The causes of sensorineural hearing loss include idiopathic, infective (viral, bacterial), noise-induced, trauma (temporal bone fracture), ototoxic drugs, autoimmune (SLE, Cogan syndrome, ulcerative colitis), tumors (vestibular schwannoma, leukemia, myeloma), vascular (cerebrovascular diseases, sickle cell disease), perilymphatic fistula, barotraumas, neurological (multiple sclerosis, cerebrovascular accident, migraine), and others (diabetes mellitus, sarcoidosis), as well as non-organic hearing loss. [6] While there is no definitive test for sudden sensorineural hearing loss (SSNHL), the diagnosis relies on the following examinations: tuning fork tests, pure-tone audiometry (PTA), and impedance audiometry. The audiometry includes the Short Increment Sensitivity Index (SISI), Speech Reception Threshold (SRT), and Speech Discrimination Score (SDS). [9]

The objective of this study was to examine the clinical characteristics of patients who experienced abrupt onset sensorineural hearing loss at a tertiary hospital.

Materials and Methods

The Present study was single-center, retrospective study, conducted in Department of ENT at Zydus Medical College and Hospital, Dahod, Gujrat, India

for one year . We studied total 200 case records. Case records of patients with sudden onset sensorineural hearing loss examined from last three years were considered for present study.

Methodology

The diagnosis of all the patients had been made by experienced Otolaryngologists. Patient's demographic data, onset, and duration of hearing loss, associated symptoms, presence of cardiovascular risk factors and other co-morbid factors, findings of clinical examination, initial diagnosis were noted. Findings of various blood investigations such as complete haemogram, serum electrolytes, thyroid function tests, findings of initial audiogram, treatment received were documented. As per standard medical treatment, Tapering dose of oral prednisolone for fourteen days was administered (60 mg/day for 5 days, followed by 50 mg/day for 3 days, followed by 40 mg for 2 day, followed by 30 mg for 1 day, followed by 20 mg for 1 day, followed by 10 mg for 1 day, and followed by 5 mg for 1 day), with oral pentoxifylline 400 mg twice per day. In all cases, the hearing assessment was done by pure tone audiometry on the day of presentation and weekly after treatment initiation until one month. The hearing improvement was evaluated based on the change in hearing threshold from the pre-treatment to the 1-month follow-up audiogram. Recovery was considered when post-treatment PTA that was $\geq 50\%$ of the reference hearing level.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables was tested using chi- square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

Results

Table 1: General characteristics

Characteristics	Total (n=200) n	With recovery (n=80) n	Without recovery (n=120) n	P value
Age in years				
≤20	10	8	2	
21-40	60	22	38	
41-60	86	30	56	
>60	34	14	20	
Mean Age (years)	48.64 ± 12.58	42.88 ± 8.32	51.52 ± 11.79	<0.05
Gender				
Male	96	36	60	>0.05
Female	104	40	64	
Comorbidity				
Hypertension	70	24	46	>0.05
Diabetes	30	12	18	>0.05
Dyslipidemia	40	12	28	>0.05
Thyroid disorder	16	6	10	>0.05
Autoimmune disease	2	0	2	0.00

All patients were compared according to recovery status. Recovery was noticed in 80 patients (40%) while no or less than 50% recovery was noticed in 120 patients (60%). Majority of patients were from 41-60 years age group (43%) followed by from 21-40 years age group (30%). In patients with recovery, mean age was 42.88 ± 8.32 years as compared to patients without recovery as 51.52 ± 11.79 years and difference was statistically significant ($p < 0.05$).

Gender was comparable among total patients as well as patients with or without recovery and difference was statistically not significant ($p > 0.05$). Hypertension (35%), diabetes (20%), dyslipidemia (20%) and thyroid disorder (8%) were common comorbidities noted among patients. We compared comorbidities among patients with or without recovery and difference was statistically not significant ($p > 0.05$).

Table 2: Clinical features

Clinical features	Total (n=200) n	With recovery (n=80) n	Without recovery (n=120) n	P value
Vertigo	80	30	50	<0.05
Tinnitus	160	64	96	>0.05

Vertigo was significant in patients without recovery as compared to patients with recovery and difference was statistically significant ($p < 0.05$). Tinnitus was comparable in patients with recovery (40%) as well as patients without recovery (60%) and difference was statistically not significant ($p > 0.05$).

Table 3: Audiogram curve

Audiogram curve	Total (n=200) n	With recovery (n=80) n	Without recovery (n=120) n	P value
Ascending	30	14	16	0.024
Descending	80	32	48	
Flat, U-shaped, reverse Ushaped	90	40	50	

Audiogram curve was flat, U-shaped, reverse U-shaped (45%) in majority of patients followed by descending (40%) and ascending (15%).

Table 4: Degree of hearing loss

Degree of hearing loss	Total (n=200) n	With recovery (n=80) n	Without recovery (n=120) n	P value
Mild	16	6	10	0.019
Moderate	20	8	12	
Moderately Severe	40	16	24	
Severe	50	20	30	
Profound	74	30	44	

Degree of hearing loss was mild (8%), moderate (10%), moderately severe (20%), severe (25%) and profound (37%). Incidence of patients without recovery was increased with increase in severity of hearing loss and difference was statistically significant ($p < 0.05$).

Table 5: Time to initiate treatment

Time to initiate treatment (days)	Total (n=200) n	With recovery (n=80) n	Without recovery (n=120) n	P value
≤ 14	124	80	44	0.007
15-30	50	20	30	
>30	26	8	18	

Time to initiate treatment was ≤ 14 days (62%) in majority of patients followed by 15-30 days (25%) and >30 days (13%). Recovery was noted in early initiation of treatment and difference was statistically significant ($p < 0.05$).

Discussion

Sudden sensorineural hearing loss (SSNHL) is a medical emergency in the field of ear health. It is characterized by a decrease in hearing ability of at

least 30 decibels, affecting three or more consecutive frequencies, and happening within a period of 72 hours. The prevalence of sudden sensorineural hearing loss (SSNHL) is believed to be between 5 and 27 cases per 100,000 individuals on a yearly basis. [10] The etiology of SSNHL is a subject of ongoing discussion, with various hypotheses put forth, including circulatory abnormalities, viral infections, autoimmune disorders, changes of inner ear membranes,

cerebellopontine angle tumors, or a combination of these factors. [11]

The patients were compared based on their recovery condition. Recovery was observed in 80 patients, accounting for 40% of the total, whereas no or less than 50% recovery was observed in 120 patients, making up 60% of the total. The majority of patients belonged to the age range of 41-60 years, accounting for 43% of the total, followed by the age group of 21-40 years, which accounted for 30%. The average age of patients who had recovery was 42.88 ± 8.32 years, while the average age of patients who did not experience recovery was 51.52 ± 11.79 years. This difference in age was shown to be statistically significant ($p < 0.05$). The gender distribution was similar among all patients, including those with and without recovery, and the difference was not statistically significant ($p > 0.05$). The prevalence of hypertension was 35%, diabetes was 20%, dyslipidemia was 20%, and thyroid disease was 8% among the patients. Comorbidities were examined between individuals with and without recovery, and the observed difference was not statistically significant ($p > 0.05$). The occurrence of vertigo was more pronounced in patients who did not experience recovery, as opposed to patients who did recover. This difference was shown to be statistically significant, with a p-value of less than 0.05. The incidence of tinnitus was similar in individuals who experienced recovery (40%) and those who did not (60%), and the difference was not statistically significant ($p > 0.05$). The majority of patients exhibited a flat, U-shaped, or reverse U-shaped (45%) audiogram curve, followed by a descending (40%) and ascending (15%) curve.

The cause of ISSNHL is still unidentified. The most commonly proposed cause of its development is a combination of impaired microcirculation and infection. In a study conducted by Purushothaman G et al. [12], it was shown that out of the 122 patients examined, 58% experienced total recovery while 28% experienced partial recovery. The mean pre-treatment pure tone average (PTA) was 78.3 ± 16.9 dB, while the mean post-treatment PTA was 47.0 ± 20.8 dB. This indicates a statistically significant improvement ($t = 24.89$, $P \leq 0.001$). The study revealed that the presence of tinnitus ($P = 0.005$) and initial lesser hearing loss ($P = 0.005$) were important predictors for hearing recovery. Conventional steroid treatments for ISSNHL result in a higher rate of recovery compared to the natural rate of spontaneous recovery. Adriana P et al. [13] conducted a study on idiopathic sudden sensorineural hearing loss (ISSNHL) in a group of 186 patients. The majority of these patients were aged between 41 and 60 years. Univariate analysis showed that vertigo, severe or profound initial hearing loss, flat, U-shaped, and falling audiogram curves, and commencing treatment after 15 days

were associated with poorer hearing recovery. Nevertheless, the multivariate logistic model indicated that only severe or profound hearing loss (odds ratio, 6.634; 95% CI, 2.714-16.216; $P = .001$) and delayed treatment initiation after 15 days (odds ratio, 0.250; 95% CI, 0.102- 0.610; $P = .008$) were identified as independent risk factors for a poorer prognosis in terms of hearing recovery. The degree of hearing loss ranged from light (8%), moderate (10%), fairly severe (20%), severe (25%), to profound (37%). The occurrence of patients who did not experience recovery was shown to be higher as the severity of hearing loss grew, and this difference was determined to be statistically significant ($p < 0.05$).

The majority of patients (62%) began treatment after 14 days, followed by 25% who started treatment between 15 and 30 days, and 13% who initiated treatment after more than 30 days. An early start to treatment was shown to result in recovery, and this difference was found to be statistically significant ($p < 0.05$). According to an updated Cochrane systematic review that analyzed 3 randomized controlled trials, as well as another recent study, both studies reached the conclusion that the role of steroids in the treatment of ISSNHL is still uncertain. [14,15] Despite varying outcomes recorded, steroid therapy has demonstrated efficacy and is considered as one of the viable treatment alternatives. A study conducted by Lee HS et al. [16] found that initiating treatment more than 14 days after the onset of hearing loss was identified as a separate factor contributing to poorer hearing recovery. Several previous research have indicated that a delayed initiation of treatment is associated with a bad prognosis. [17] This observation can be attributed to the potential alteration of the sequence of cell death caused by inflammation in sudden sensorineural hearing loss (SSNHL) when corticosteroids are used. Additionally, there is a proposition that corticosteroids provide the most notable improvement within the initial two weeks. The notion of blood circulation disturbance may be the cause of certain cases of idiopathic sudden sensorineural hearing loss (ISSHL). Young individuals without vascular risk factors typically experience a temporary decrease in blood pressure, which can lead to cochlear ischemia and reversible hearing loss, followed by recovery. [17] Extended periods of one-sided hearing or simulated hearing can result in a decline in auditory function in the stronger ear. In cases of asymmetrical or unilateral hearing loss, cochlear implantation should be prioritized over alternative therapeutic methods to prevent recurrence.

Conclusion

The current study came to the conclusion that characteristics related with recovery in individuals with sudden onset sensorineural hearing loss are age

less than 40 years, the absence of comorbidities, a reduced degree of hearing loss, and early treatment commencement (within 14 days).

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