

The Clinical Characteristics of Individuals Who Had Sudden Sensorineural Hearing Loss: A Retrospective EvaluationSumit¹, Namira Azmi², Indrajeet Kumar³, Satyendra Sharma⁴¹Senior Resident, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India²Senior Resident, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India³Assistant Professor, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India⁴Professor and HOD, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India

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Corresponding author: Dr. Namira Azmi

Conflict of interest: Nil

Abstract**Aim:** The aim of the present study was to study clinical profile of patients with sudden onset sensorineural hearing loss at a tertiary hospital.**Methods:** This retrospective study, conducted in Department of ENT. We studied total 200 case records. Case records of patients with sudden onset sensorineural hearing loss examined from last two years were considered for present study.**Results:** 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. 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 ($p > 0.05$). Audiogram curve was flat, U-shaped, reverse U-shaped (45%) in majority of patients followed by descending (40%) and ascending (15%). 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 ($p < 0.05$).**Conclusion:** In patients with sudden onset sensorineural hearing loss age less than 40 years, no comorbidities, lesser degree of hearing loss, early (<14 days) initiation of treatment are factors associated with recovery.**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 characterized as an abrupt hearing loss of more than 30dB in three contiguous frequencies within 72 hours. [1] An earlier study reported that the incidence of ISSNHL in the Western countries' population was estimated to 5–20 per 100,000 inhabitants. [2]

Despite extensive investigation, 90% of the SSNHLs are deemed idiopathic (ISSNHL). [3] ISSNHL is a heterogeneous disorder in terms of clinical symptoms, etiology, degree of hearing loss, audiogram configuration, time between hearing loss onset and treatment, and recovery prognosis.

Although many studies concerning ISSNHL have been published, their methodological heterogeneity and small sample sizes undermine proper analysis and comparison of their results. [4] Further systematic evaluation with a large number of patients who are followed for a long period, including analysis of clinical and audiometric profiles and their correlation with hearing prognosis, is critical to allow the development of a pathophysiology-oriented diagnostic investigation and personalized treatment plan for patients with ISSNHL. Regarding age distribution, Rauch demonstrated that ISSNHL most frequently occurred in 43 to 53 years old patients. [5]

Sudden sensorineural hearing loss (SSNHL) is first ascribed to Dekleyn in 1944. [6] It commonly presents as acute hearing loss occurring within 72 hours and is an emergency condition requiring immediate medical attention. Sudden sensorineural hearing loss (SSNHL) is defined as a hearing loss of 30 dB or more in one ear or both over at least three contiguous frequencies in audiometry, over a period of 72 hours or less. Hearing loss can range from mild hearing impairment to a total loss of hearing, and may be temporary or permanent. [7] Estimated incidence of SSNHL typically range from 2 to 20 per 100,000 people per year. [8,9] SSNHL can occur at any age, but most commonly affects patients 43 to 53 years of age and is equally distributed among males and females. Early presentation to a physician and early institution of treatment improves the prognosis for hearing recovery. The immediate goal is discovering a treatable or defined cause of the sudden hearing loss.¹ There are a number of causes of sensorineural hearing loss such as 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), others (diabetes mellitus, sarcoidosis), non-organic hearing loss.⁶ Though there is no gold standard test for SSNHL, the diagnosis depends on the following investigations: tuning fork tests, pure-tone audiometry (PTA) and impedance audiometry. Short increment sensitivity index (SISI), speech reception threshold (SRT), speech discrimination score (SDS) also form an important part of the audiometry. [9]

The aim of the present study was to study clinical profile of patients with sudden onset sensorineural hearing loss at a tertiary hospital.

Materials and Methods

The Present study was a retrospective study, conducted in Department of ENT at Nalanda Medical College and Hospital, Patna, Bihar, India. We studied total 200 case records. Case records of patients with sudden onset sensorineural hearing loss examined from last two years were considered for present study.

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 an otologic emergency defined as sensorineural hearing loss 30 dB that affects at least 3 consecutive frequencies and occurs within a 72-hour window. The incidence of SSNHL is estimated at 5 to 27 per 100,000 people annually.¹⁰ The physiopathologic mechanisms involved with SSNHL are still under debate, as several theories have been proposed: circulatory disturbances, viral infections, autoimmune disorders, disruptions of inner ear membranes, cerebellopontine angle tumors, or a combination of processes. [11]

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 ($p > 0.05$). 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 ($p > 0.05$). Audiogram curve was flat, U-shaped, reverse U-shaped (45%) in majority of patients followed by descending (40%) and ascending (15%).

The etiology of ISSNHL remains unknown. Its pathogenesis is most often suggested to be due to a disturbed microcirculation and infection. Purushothaman G et al., [12] studied 122 patients, 58% had complete recovery and 28% had partial recovery. The average pre-treatment PTA was 78.3 ± 16.9 dB whereas post-treatment average was 47.0 ± 20.8 dB, showing statistically significant improvement ($t = 24.89$, $P < 0.001$). The factors such as presence of tinnitus ($P = 0.005$) and initial milder hearing loss ($P = 0.005$) were found to be significant predictors for hearing recovery. Conventional steroid regimes produced a recovery rate in

ISSNHL, which exceeds the spontaneous recovery rate. Adriana P et al., [13] studied idiopathic sudden sensorineural hearing loss (ISSNHL) among 186 patients, majority patients were between 41 and 60 years of age. Univariate analysis revealed that vertigo; presence of severe or profound initial hearing loss; flat, U-shaped, and descending audiogram curves; and initiating treatment after 15 days were correlated with worse hearing recovery. However, the multivariate logistic model revealed that only the presence of severe or profound hearing loss (odds ratio, 6.634; 95% CI, 2.714-16.216; $P = .001$) and initiating treatment after 15 days (odds ratio, 0.250; 95% CI, 0.102- 0.610; $P = .008$) were independent risk factors for worse hearing recovery prognosis. 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 ($p < 0.05$).

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 ($p < 0.05$). In an updated Cochrane systematic review based on 3 randomized controlled trials, as well as another recent review, both concluded that the importance of steroids in the treatment of ISSNHL remains unclear. [14,15] Even though, inconsistent results regarding the treatment success have been reported, steroid treatment is one of the treatment options that has shown efficacy In study by Lee HS et al., [16] starting treatment after 14 days of hearing loss onset was an independent factor for worse hearing recovery. Many preceding reports described a delayed start to treatment as a negative prognostic factor. [17] This finding may be explained by the possible modification of the inflammatory cell death cascade in SSNHL with the use of corticosteroids, as well as the suggestion that corticosteroids offer the most remarkable recovery in the first 2 weeks. The theory of blood circulation disturbance might be the etiology of some cases of ISSNHL. A transient reduction in blood pressure values, commonly occurs in young subjects without vascular risk factors, which may cause cochlear ischemia and reversible hearing impairment, and restoration. [17] A prolonged period of unilateral hearing or pseudo hearing can lead to hearing deterioration in the better ear. To avoid the same, cochlear implantation has to be considered over other management options in asymmetrical or unilateral hearing loss cases.

Conclusion

In patients with sudden onset sensorineural hearing loss age less than 40 years, no comorbidities, lesser degree of hearing loss, early (< 14 days) initiation of treatment are factors associated with recovery.

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