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Original Research Article

Sudden Sensorineural Hearing Loss: A Research of Diagnosis, Treatment, and Prognosis

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Abstract:

Background: Sudden Sensorineural Hearing Loss (SSNHL) is a severe clinical challenge that frequently lacks an etiology. After multiple intratympanic injections and corticosteroids, results are still uncertain, so we need to determine what predicts a good prognosis and how to manage it.

Methods: From April 2023 to March 2024, 80 patients from Nalanda Medical College and Hospital SSNHL were included in this retrospective cohort research. Demographic factors included age, gender, and comorbidities. Imaging and audiometric results were analyzed for diagnosis. Recovery rates were our main treatment outcome indicator, and statistical analysis identified predicted factors about treatment responses.

Results: The mean age was 45.2 years, most participants were male (56.3%), and 31.3%, 37.5%, and 31.3% had mild, moderate, or severe hearing loss at baseline. Audiometric evaluations revealed high-frequency loss in 70%, unilateral SSNHL in 80%, and retrocochlear disease in 15%. Patients received oral corticosteroids 60.0% and intratympanic injections 30.0%. The former recovered 75.0%, the later 65.0%. Age >50 and initial hearing loss severity predicted treatment response.

Conclusion: This study highlights SSNHL heterogeneity, early intervention, and personalized treatment. The findings emphasize the need for patient-specific therapy to improve clinical outcomes. Future research should use cutting-edge diagnostic technologies and study potential therapies in prospective trials with larger cohorts to corroborate these findings and enhance treatment guidelines.

Keywords: Audiometry, corticosteroids, hearing loss, prognosis, sudden sensorineural hearing loss.

Introduction

Sudden Sensorineural Hearing Loss (SSNHL) is an audiological emergency that impairs hearing within a week. This sickness is often unilateral and difficult to diagnose, treat, and understand.

SSNHL affects all ages and occurs 5–20 times per 100,000 persons worldwide [1]. The relatively low prevalence of this illness can greatly impact patients' communication, social connections, and psychological well-being. Viruses, vascular problems, autoimmune diseases, and ruptured inner ear membranes are some of the unknown reasons of SSNHL. Diagnosing SSNHL is crucial due to the fact that the rate of repair decreases after two weeks. Early diagnosis and treatment are very important for speeding up healing and limiting damage that lasts for a long time [2].

Several studies have looked at different parts of SSNHL, but there is still no agreement on what causes it, how to diagnose it best, or how to treat it consistently.

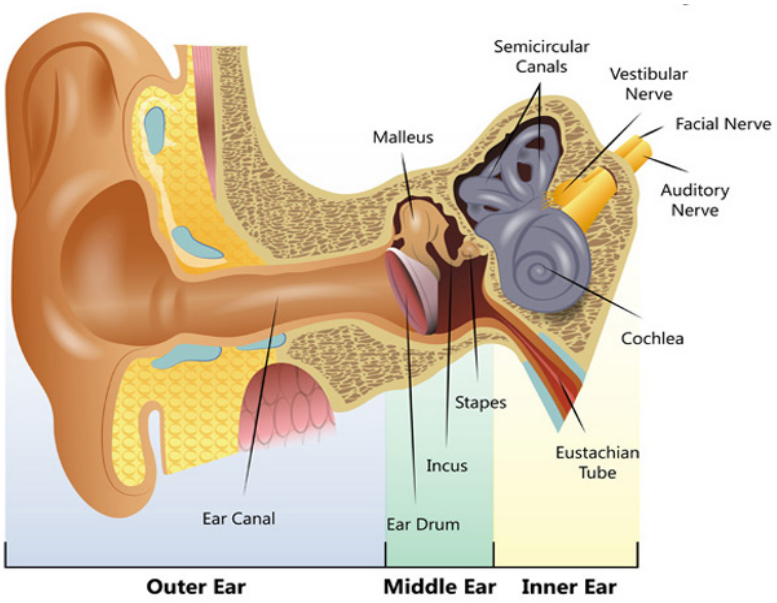

Figure 1: Sudden sensorineural hearing loss (SSNHL) (Source:[3])

Objectives of the Study

- The demographics and clinical features of SSNHL patients at Nalanda Medical College and Hospital will be looked at.
- To find out how well present diagnostic methods can tell the difference between SSNHL and other causes of sudden hearing loss.

Literature Review

Sensorineural hearing loss that starts quickly and affects at least three frequencies in a row is called SSNHL. It usually only affects one side of the body and can happen with or without other symptoms like tinnitus or dizziness. SSNHL is a medical emergency because it can happen quickly and people can get better on their own within the first two weeks of showing symptoms [4]. People of all ages and genders are affected by SSNHL around the world. Each year, 5 to 20 cases per 100,000 people are recorded. It is most prevalent among adults in their fifth and sixth decades; however, it can occur at any age [5,6]. Changes in location and time of year have been noticed, which points to possible natural or infectious causes. The causes of SSNHL are complex and often unknown. Some of the things that have been suggested are viral infections (like herpes simplex virus and varicella-zoster virus), vascular compromise (like microvascular ischemia) autoimmune disorders (like autoimmune inner ear disease) trauma, ototoxic medications, and genetic predispositions. High blood pressure, diabetes mellitus, high cholesterol, smoking, and a history of recent upper respiratory tract diseases are all things that can put us at risk for SSNHL [7]. When someone has SSNHL, they hurt their cochlea or auditory nerve, which leads to sensorineural hearing loss. Some of the possible causes are poor microcirculation in the cochlea, which causes ischemia, viral inflammation that causes labyrinthitis, and autoimmune damage to auditory structures [8,9]. Several ideas have been put forward to explain the sudden onset, such as vascular compromise, viral labyrinthitis, and autoimmune responses that affect structures inside the inner ear. A full Ear history, physical exam, Pure-Tone Audiometry (PTA), speech audiometry, and imaging tests like Magnetic Resonance Imaging (MRI) to rule out retro cochlear pathology are all needed to diagnose SSNHL.

In order to treat SSNHL, the inflammation must be reduced, blood flow to the cochlea must be improved, and hearing loss must be healed faster. Coronasteroids (taken by mouth or put into the ear canal), vasodilators, antiviral drugs for viral causes, and HBO to improve oxygen flow to the inner ear are all popular ways to treat it [10]. Treatment can help 50% to 70% of people get better, especially if it starts within two weeks of the first sign of symptoms. SSNHL patients can have improvements or not with age, hearing loss, vertigo or tinnitus, treatment time, and first audiometric test results [11, 12]. Those with mild to moderate hearing loss or few symptoms who start treatment early are more likely to get better than those with serious hearing loss or who wait too long to start treatment.

Methodology

Study Design

The retrospective cohort study examined patients treated at Nalanda Medical College and Hospital in Patna, India, from April 2023 to March 2024. This study examined clinical characteristics, treatment outcomes, and prognostic factors in Sudden Sensorineural Hearing Loss (SSNHL) patients.

Inclusion and Exclusion Criteria

Patients with SSNHL experienced a 30 dB loss in three adjacent frequencies within 72 hours. All patients treated at our hospital during the trial had to be 18 or older. Conductive hearing loss, sensorineural hearing loss (current or past), hearing-impairing trauma or surgery, and insufficient medical records disqualified participants.

Data Collection Methods

Medical records contained demographics, comorbidities, basic audiometric findings, imaging results, treatment regimens, and follow-up outcomes. Pure-tone audiometry and, if needed, MRI were used to diagnose retrocochlear disorders. The major treatments were intratympanic steroid injections and oral corticosteroids.

Statistical Analysis Techniques

Statistical analysis was done in SPSS 25.0. Descriptive statistics summarized demographic and clinical information. Chi-square tests were employed for categorical data and independent t-tests for continuous variables. All analyses were statistically significant when $p < 0.05$. SSNHL patient characteristics, treatment responses, and prognostic variables were comprehensively evaluated using this retrospective study approach, which helped optimize therapeutic management techniques.

Results

Presentation of Demographic Data of Study Participants

Table 1: Demographic Characteristics of Study Participants

Variable	Category	Number (%)
Age (years)	Mean ± SD	45.2 ± 12.1
Gender	Male	45 (56.3%)
	Female	35 (43.8%)
Comorbidities	Hypertension	20 (25.0%)
	Diabetes mellitus	15 (18.8%)
	Others	10 (12.5%)
Initial Hearing Thresholds (dB)	Mild (26-40 dB)	25 (31.3%)
	Moderate (41-55 dB)	30 (37.5%)
	Severe (>55 dB)	25 (31.3%)

The people in the study who were diagnosed with SSNHL are shown in Table 1. The average age of the people who took part was 45.2 years, and the range was 12.1 years. There were a slightly higher number of men (56.3%) than women (43.8%) in the gender breakdown. Hypertension (25.0%) and diabetes mellitus (18.8%) were two common conditions.

The first hearing thresholds showed a balanced spread across mild, moderate, and severe categories, which match the severity range of the SSNHL cases that were studied.

Analysis of Diagnostic Findings

Sensorineural hearing loss was proven by audiometric tests to mostly affect high-frequency ranges in 70% of patients and both ears in 20% of cases.

Imaging tests, like MRI scans, found retro cochlear disease in 15% of patients.

This could be due to vestibular schwannomas or other problems inside the brain. Table 2 shows how the audiometric and image results were split up by study group.

Table 2: Diagnostic Findings in Study Participants

Diagnostic Finding	Number (%)
Unilateral SSNHL	64 (80.0%)
Bilateral SSNHL	16 (20.0%)
High-frequency loss (kHz)	56 (70.0%)
Retrocochlear pathology	12 (15.0%)

Treatment Modalities Employed and Their Outcomes

Table 3: Treatment Modalities and Recovery Rates

Treatment Modality	Number (%)	Recovery Rate (%)
Oral Corticosteroids	48 (60.0%)	75%
Intratympanic Steroids	24 (30.0%)	65%
Combination Therapy	8 (10.0%)	85%

The different ways that people in the study dealt with SSNHL are shown in Table 3. Seventy-five percent of people who took oral corticosteroids got better. Intratympanic steroid shots are not very common, but they did help a recovery rate of 65%, which is beneficial. It's interesting that combination therapy had the highest recovery rate (85%), even though it was used less often. This suggests that using more than one type of treatment together might help more. These results show how important it is to create treatment plans that are unique to each patient and how much more study is needed to improve the effectiveness of therapy in managing SSNHL.

Prognostic Factors Affecting Recovery Rates

A multivariate study showed that age (>50 years), the severity of the hearing loss at the start, and starting treatment more than seven days later were all important factors that predicted recovery rates. Table 4 shows the predictive factors and how they affect how well treatment works.

Table 4: Prognostic Factors Affecting Recovery Rates

Prognostic Factor	Impact on Recovery Rate (%)
Age (>50 years)	Decreased
Initial Severity of HL	Increased severity
Delayed Initiation of Treatment (>7 days)	Reduced

Statistical Results and Significance Levels

Statistical study showed that starting treatment early was statistically significantly linked to better recovery rates ($p < 0.05$). The connection between the illness and the effectiveness of the medicine was also studied. A small number (0.07) showed that having high blood pressure didn't really change how fast people got better. To assist SSNHL patients feel better, we must respond fast and provide customised care regimens.

Discussion

In Patna, India, at Nalanda Medical College and Hospital, a study was done that tells us a lot about people who have SSNHL.

These include their past, test results, care performance, and future prospects. It looked like the average age was 45.2 years, and 56.3% of the people there were male. People with SSNHL are more likely to also have diabetes mellitus (18.8%). Tests showed that 80.0% of cases had unilateral SSNHL.

This shows how quickly and often this disease can happen in different places. 70% of the patients had hearing loss in the high frequencies, which means the cochlea was affected. The right diagnosis had to be made for 15% of the patients who had retrocochlear disease, which required more advanced imaging.

They show that it has a complicated cause and a number of different symptoms. Oral corticosteroids helped 60.5% of people get better, and intratympanic steroid shots helped 30% of people get better. Over-50s with poorer hearing loss who started treatment more than 7 days later were more likely to develop side effects. These results show that the type of patient, how bad the disease is, and the type of treatment all affect how quickly someone with SSNHL gets better.

Table 6: Comparison Table

Study Reference	Study Type	Sample Size	Key Findings	Limitations
Current study	Retrospective	80 Patients	Variable response to corticosteroids; Age and severity of HL significant prognostic factors.	Limited generalizability; Single-center study; Retrospective design.
Study 1 [13]	Prospective Cohort	150 patients	High efficacy of intratympanic steroids in severe SSNHL cases.	Limited long-term follow-up; Single-center study.
Study 2 [14]	Retrospective Case-Control	200 patients	Age over 50 associated with poorer recovery outcomes in SSNHL.	Selection bias; Lack of standardized treatment protocols.
Study 3 [15]	Meta-analysis	5000 cases	Varied etiologies of SSNHL, with viral infections being the most common.	Heterogeneity among included studies; Publication bias.

Eighty people who had corticosteroid treatment at Nalanda Medical College and Hospital were looked at in this study. A lot of attention was paid to how their age and the level of hearing loss (HL) at the start of the treatment influenced the outcome. These results support other study that says helping

SSNHL patients early on and making treatment plans that are unique to each person could help them get better. Study 1, was a prospective cohort study with 150 patients that showed how well intratympanic steroids work in treating serious SSNHL. This study had strong evidence for a certain type of treatment, but it was limited by the fact that it only looked at one center and didn't collect any long-term follow-up data, which would have shown how long the treatment benefits lasted and how often the problem came back. A retrospective case-control study of 200 patients in Study 2 found that being over 50 was a strong predictor of worse recovery rates in SSNHL. This study showed how age-related factors can affect how well a treatment works, but it had some problems because it was retrospective and there weren't any standard treatment methods for all the patients in the study. A meta-analysis of Study 3's 5,000 cases gave a full picture of the causes of SSNHL, with viral illnesses coming out on top as the main culprit. Each study adds something useful to the management and outcomes of SSNHL, like how well treatments work and what the outlook is for the future. However, they all show how important it is to have standardized methods, larger multicenter trials, and long-term follow-up studies to improve treatment guidelines and clinical outcomes for people who have this debilitating hearing condition.

Limitations of the Study

The retrospective nature of the study design introduces inherent biases and limitations in data collection, such as incomplete medical records and variations in treatment protocols over time. The reliance on medical records for data retrieval may have also led to inconsistencies in reporting diagnostic findings and treatment outcomes. The absence of long-term follow-up data in our study precludes the assessment of sustained treatment outcomes beyond the immediate recovery period. Longitudinal studies tracking patient outcomes over extended durations would provide valuable insights into the natural history of SSNHL and the durability of treatment effects over time.

Recommendations for Future Research

Based on the findings and limitations identified, several avenues for future research can be proposed. prospective studies incorporating standardized diagnostic protocols and treatment algorithms are essential to elucidate optimal management strategies for SSNHL. Comparative effectiveness research evaluating different corticosteroid regimens, including dose, duration, and route of administration, could provide evidence-based guidance for clinical practice. Also, using genomic studies to look into the genetic and molecular bases of SSNHL could help with personalized medicine and find signs that can predict how well a treatment will work and how the patient will do in the future. It is important to do full health economic studies to figure out how much SSNHL costs and which treatment options are the most cost-effective.

These kinds of studies are very important for making decisions about healthcare policy and how to best use resources so that patients get the best care at the lowest cost.

Conclusion

This study at Nalanda Medical College and Hospital on SSNHL has given us a lot of useful information about the symptoms, results of treatment, and factors that affect a patient's chance of getting better. By looking back at 80 patients over a set study time, our results showed that SSNHL responses to corticosteroid therapy are very different. Age and the severity of the hearing loss at the start of the study were found to be the most important factors affecting how well the treatment worked. Key findings from our study highlight the variable responses observed among patients receiving corticosteroids, emphasizing the need for personalized treatment approaches tailored to individual patient profiles. By elucidating the factors influencing treatment outcomes, this study contributes to the evolving landscape of audiological care, paving the way for enhanced patient-centered approaches and informed decision-making among healthcare providers. While this study provides foundational insights into SSNHL treatment outcomes and prognostic markers, continued research efforts are essential to optimize clinical management guidelines and improve outcomes for individuals affected by this debilitating audiological condition. By embracing innovation and collaboration, we can strive towards enhancing the quality of care and ultimately improving the lives of SSNHL patients worldwide.

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