Original Article

Prevalence of Vestibular Schwanoma in Adult Patients with Unilateral Sudden Sensorineural Hearing Loss

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ABSTRACT

Objective: The objective of the present study was to determine the prevalence of vestibular schwanoma in adult patients with unilateral sudden sensorineural hearing loss.

Study Design: Cross-sectional Study

Place and Duration of Study: This study was conducted at the Department of ENT, Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan from January 2013 to December 2023.

Methods: Eight hundred and sixty five Adult (>19 years) patients with unilateral Sudden Sensorineural Hearing Loss were selected through consecutive sampling technique. All patients underwent routine otoscopy, tuning fork tests, pure tone audiometry and contrast enhanced MRI at the time of presentation. All patients were given systemic corticosteroids as primary treatment. Two follow up audiograms were obtained in each patient, first after completion of the treatment and second 2 months after the treatment.

Results: Out of 865 patients with unilateral Sudden Sensorineural Hearing Loss 530 were males (61.30%) and 335 (38.70%) females. Mean age of the patients was 44.10±8.12 years (range 20-70 years). The prevalence of vestibular schwanoma in unilateral Sudden Sensorineural Hearing Loss was 31/865 (3.60%). The prevalence of vestibular schwanoma was higher 21/865 (2.43%) in male. The model age group in patients with vestibular schwanoma was 51-60 years (11/865 (1.27%).

Conclusion: The prevalence of vestibular schwanoma in adult patients with unilateral sudden sensorineural hearing loss is high. Importance of routine magnetic resonance imaging (MRI) screening of patients with unilateral sudden sensorineural hearing loss should be stressed due to the high prevalence of vestibular schwanoma.

Key Words: Vestibular Schwanoma; Sudden sensorineural hearing loss; Audiometry.

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INTRODUCTION

Vestibular schwanoma (VS) is a benign tumor arising from the vestibular nerves, mostly from superior vestibular nerve. Approximately 1% cases of sudden sensorineural hearing loss (SSNHL) are due to retro-cochlear lesions like neoplasms, demyelinating diseases, or stroke. Hearing loss on the affected side may be the most common and early symptom of this benign tumor. Although hearing loss is usually gradual, but a sudden hearing loss can occur in 7-20% of the cases at some stage in these neoplams.[1] The prevalence of VS in patients suffering from SSNHL is about 1.9% to 10.2%.[2,3]

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The investigation of choice for the diagnosis of VS is contrast enhanced magnetic resonance imaging (MRI). Early MRI helps patients both in seeking early treatment as well as functional preservation of the auditory and facial nerves.[4]

The objective of the present study was to determine the prevalence of vestibular schwanoma in adult patients with unilateral sudden sensorineural hearing loss.

METHODS

Design, Setting, Duration & Approval: This cross-sectional study was carried out in the Department of ENT, Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan, Pakistan from January 2013 to December 2023. An informed consent was taken from each patient after explaining the benefits and risks involved during the study. A written Ethical approval for the present study was obtained from Institutional Ethical Committee of the hospital.

Population & Sapling: A sample of 865 adult (>19 years) patients of sudden sensorineural hearing loss (SSNH) was selected from the outdoor Department of ENT, Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan, Pakistan through consecutive sampling technique.

Inclusion criteria: All adult (>19 years) patients with unilateral Sudden Sensorineural Hearing Loss were eligible for inclusion.

Exclusion criteria: All adult patients with bilateral sudden sensorineural hearing loss were excluded. Cases without a follow-up audiometric assessment were also dropped from the study.

Procedure: Sudden sensorineural hearing loss was defined as sudden onset of hearing loss of >30 dB over three consecutive frequencies in pure tone audiometry, which happened progressively over few days.

A detailed history with special emphasis on hearing loss, tinnitis and vertigo was obtained. All patients underwent routine otoscopy with a standard otoscope, tuning fork tests and pure tone audiometry at the time of presentation. In each patient the hearing level was assessed on Pure tone audiometry for the speech frequencies i.e (500, 1000, 2000, and 4000 Hz).

A contrast enhanced magnetic resonance imaging (MRI) of 1.5 Tesla of the internal acoustic meatus and brain was performed in all patients at the initial consultation. All the images were reviewed and reported by a consultant radiologist. The tumor size was classified into 5 grades on the size picked on MRI according to the New and Modified Reporting Systems from the Consensus Meeting on Systems for Reporting Results in Vestibular Schwanoma Classification as follows: grade 1 (1-10 mm), grade 2 (11-20 mm), grade 3 (21-30 mm), grade 4 (31-40 mm) and grade 5 (> 40 mm).

Systemic oral corticosteroids as primary treatment was given to all patients, tapered over 10-14 days (60mg of prednisone daily for 4 days which was tapered by 10mg every 2 days). Two follow up audiograms were obtained in each patient, first after completion of the treatment and second 3 months after the completion of treatment.

Data Collection Plan: For each patient a written Performa was used comprising of the following variables. All variables were entered into the data editor of SPSS 16 (SPSS.Inc,Chicago,Illinois,USA).

Data was collected for demographic variables: sex, age in years and age groups. Sex had two attributes of males and females. Age groups had four attributes: >19-40 years, 41-50 years, 51-60 years, and >60 years.

Research variables were history of unilateral sudden hearing loss, side involved, prevalence of vestibular schwanoma in unilateral SSNHL and size of the tumor.

Age group was ordinal; age in years was a numeric data while all the rest were nominal data.

Data Analysis Plan: Nominal and ordinal data was expressed as count and percentage for the sample (sample statistics). Population parameters were expressed as 95% confidence interval of proportion using Wilson score interval method through an online statistical calculator "Statistic Kingdom" (https://www.statskingdom.com/proportion-confidence-interval-calculator.html).. Numeric data was expressed as mean, minimum, maximum, range and standard deviation. Keeping in view the objectives and design of the study, no further analysis was applicable.

RESULTS

Demographics: Out of 865 patients with Sudden Sensorineural Hearing Loss (SSNH) 530 were men (61.30%) & 335 (38.70%) women. Mean age of the patients was 44.10±8.12 years (range 20-70 years). The modal age group was 51-60 years. Out of 865 patients, the age group >19-40 years included 293 (33.90%), 41-50 years included 420 (48.55%), 51-60 years included 115 (13.30%), and 61-70 years included 37 (04.25%) patients.

Prevalence of Vestibular Schwanoma in SSNH: Out of total 865 patients of sudden sensorineural hearing loss, 31 (3.58%) patients had vestibular schwanoma. (Table 1)

Table No. 1: Prevalence of Vestibular Schwanoma in Unilateral Sudden Sensorineural Hearing Loss (n=865)

Variable	Attributes	Sample Statistics		95% Confidence Interval	
		Frequency	Percentage	Lower bound	Upper bound
Presence of vestibular schwanoma in SSNH	Yes	31	03.58%	02.53	05.04
	No	834	96.42%	94.95	97.46
	Total	865	100%	Parameters estimates	

Distribution of Vestibular Schwanoma in Unilateral SSNH by sex and age groups: The prevalence of vestibular schwanoma in unilateral SSNH was higher 21/865 (02.43%) in men than 10/865 (01.15%) women. It was highest 11/865 (1.27%) in age group 51-60 years followed by 8/865 (0.92%) in 41-50 years. (Table 2)

Table No. 2: Distribution of Vestibular Schwanoma in Unilateral SSNH by sex and age groups (n=31/865)

Variable	Attributes	Sample size	Sample Statistics(n=31)		95% Confidence Interval	
			Frequency	Percentage	Lower bound	Upper bound
Sex	Men	530	21	21*100/865=02.43	01.59	03.68
	Women	335	10	10*100/865=01.15	00.62	02.11
Age groups	>19-40	293	7	7*100/865=00.81	00.39	01.66
	41-50	420	8	8*100/865=00.92	00.46	01.81

(years)	51-60	115	11	11*100/865=01.27	00.52	02.01
	61-70	37	5	5*100/865=00.58	00.24	01.34
VS in Unilateral SSNH present			31	3.58%	02.53	05.04
VS in Unilateral SSNH absent			834	96.42%	94.95	97.46
Total			865	100%	Parameters estimates	

VS: Vestibular schwanoma, SSNH: Sudden sensorineural hearing loss

Distribution of Vestibular Schwanoma in Unilateral SSNH by laterality and grade:

The prevalence of vestibular schwanoma in unilateral SSNH was higher 17/865 (1.96%) on left side than 14/865 (1.62%) right side. By tumor size, most 12/865 (1.39%) of the patients were in grade 1, followed by 9/865 (1.04%) in grade 2, 7/865 (0.81%) in grade 3, 2/865 (0.23%) in grade 4 and 1/865 (0.11%) in grade 5. (Table 3)

Table No. 3: Distribution of Vestibular Schwanoma in Unilateral SSNH by laterality and grade (n=31/865)

Variable	Attributes	Sample Statistics		95% Confidence Interval	
		Frequency	Percentage	Lower bound	Upper bound
Laterality	Left	17	17*100/865=01.96	01.04	02.89
	Right	14	10*100/865=01.62	00.77	02.45
Grade	1	12	12*100/865=01.39	00.60	02.16
	2	09	09*100/865=01.04	00.36	01.71
	3	07	07*100/865=00.81	00.21	01.40
	4	02	02*100/865=00.23	00.06	00.83
	5	01	01*100/865=00.11	00.02	00.65
VS in SSNH present		31	03.58%	02.53	05.04
VS in SSNH absent		834	96.42%	94.95	97.46
Total		865	100%	Parameters estimates	

VS: Vestibular schwanoma, SSNH: Sudden sensorineural hearing loss

DISCUSSION

Patients with Vestibular Schwanoma may present with sudden sensorineural hearing loss although it has several other presentations as well. In the present study the true frequency of Vestibular Schwanoma was 3.60% but literature has documented a prevalence of VS of about 1.9% to 10.2% in patients suffering from SSNHL[2,3]

a variable prevalence of VS among patients treated for SSNHL ranging from 1.9% to 10.2%.[3-5] The higher percentage (3.60%) in our study may be attributed to higher average age of the patients in our study & secondly due to use of MRI in all patients presented with unilateral sudden hearing loss.[6]

The age range (20-70 years) of the patients in the present study is similar to that in a local and international studies.[7,8,10] Contrary to our results, a retrospective study of 542 patients included patients of 28 to 57 years.[9]

Our study revealed male preponderance like other two other studies.[5,7] But two other international studies have reported female preponderance in their studies.[9,10] The higher incidence in men in our study is more likely because of our dominant male society who seek earlier treatment for audio vestibular symptoms.[7]

Almost matching with the results of the current study (54.85%), another study has also reported VS more on left side.[5] Contrary to these reports another international study reported an equal involvement on both sides.[11]

We recommended contrast enhanced MRI in all patients with unilateral sudden SNHL for screening VS in these cases due to its high accuracy and easy availability. On the other side non-contrast screening protocols have been developed to reduce the cost, contrast reactions and patient screening time but false negatives occur in very small tumors especially when the tumor size is less than <4mm.[12]

In our study majority of the patients (54.85%) had grade1 tumors (1-10mm). These findings are in agreement with those reported by Song M and his colleagues.[13] Almost similar results were also reported by Jeong KH and his colleagues.[14] However another study found that size of the tumor has no effect on sudden sensorineural hearing loss. Keeping in view the slow growth of these tumors, the hearing loss should also be progressive. But hemorrhage or cystic degeneration in these tumors lead to sudden increase in the size of the tumor causing compression of the cochlear nerve leading to sudden hearing loss.[15] Early detection of these tumors may be addressed well by hearing preservation surgery or even only by radiation treatment.[16]

CONCLUSION

The prevalence of Vestibular Schwanoma in adult patients with unilateral sudden sensorineural hearing

loss is high. Importance of routine magnetic resonance imaging screening of patients with unilateral sudden sensorineural hearing loss should be stressed due to the high prevalence of Vestibular Schwanoma.

Limitation: The main limitation of our study was a small sample size with point prevalence. A cohort study with a larger sample size over a long duration should be carried out.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Muhammad Ismail Khan
Drafting or Revising Critically:	Muhammad Ismail Khan
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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