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Associated Factors of Unilateral Sensorineural Hearing Loss among Sudanese Patients

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Abstract

Background: Hearing loss is a leading cause of disability worldwide and it is a significant public health problem.

Objectives: To determine the associated factors of unilateral sensorineural hearing loss among different age groups in Sudanese patients.

Methods: 115 Sudanese patients presented to Khartoum state ENT hospitals complaining of unilateral hearing loss were included.

Results: In this study 115 patients were included. Male to female ratio 1:1.3, 49 patients (42.6%) were from Khartoum state and the rest were from different areas in Sudan. The most frequent age group was from 1-15 years representing (38.3%) with a mean age of 24.48 ± 1.5 . The commonest associated factor in this study was mumps and it was found in 47 of patients (40.9%), tinnitus was the commonest presenting symptoms in unilateral Sensorineural hearing loss 81 patients (70.4%) were assessed audiotically with pure tone audiometry and 34 patients (59.1%) assessed by Auditory Brain Stem Response (ABR).

Conclusion: Unilateral Sensorineural hearing loss commonly presents during school-age. Mumps is the most common associated factor. Pure tone audiometry and auditory brain stem response are suitable method for the assessment and the diagnosis.

Introduction

Hearing Loss (HL) is a leading cause of disability worldwide and it is a significant public health problem in Sub-Saharan Africa and other developing countries. From 278 million people with HL worldwide, more than two thirds of them live in developing countries in whom, over 180,000 babies have a significant hearing loss are born annually [1,2]. Unilateral sensorineural hearing loss is defined as average pure-tone air conduction thresholds (0.5, 1, 2, 4 kHz) ≥ 30 dB in the impaired ear with an average air-bone gap no greater than 10 dB at the same frequencies and normal hearing (≤ 15 dB from 0.5 to 4 kHz) in the good ear [3]. There are a wide variety of causes of unilateral sensorineural hearing loss; it may result from either endogenous or exogenous causes and are significantly more frequent among men than women [4]. Sensorineural hearing loss may be congenital or acquired [5]. Mumps is thought to be the most common cause of unilateral acquired sensorineural hearing loss in children and it is usually sudden in onset.

Unal et al. found that mumps accounts for approximately 2% of childhood hearing loss; 80% to 95% of these cases are unilateral sensorineural hearing loss [6]. Roizen prospectively followed 58 premature (≤ 32 weeks) infants until 5 years of age. They found approximately 5% of these infants had permanent unilateral sensorineural hearing loss [7]. Baldwin et al. mentioned that bacterial meningitis may lead to bilateral or unilateral sensorineural hearing loss and was the cause of unilateral hearing impairment in 7% of their patients [8]. Niskar et al. found approximately 10% of all children in the United States have noise induce hearing loss; approximately 20% of them are unilateral sensorineural hearing loss [9].

Patients and Methods

Type of study

It is a prospective hospital based descriptive study. Study conducted between January 2014 and December 2015. Study was done in 115 Sudanese patients in Khartoum state ENT hospitals, Sudan.

Inclusion criteria

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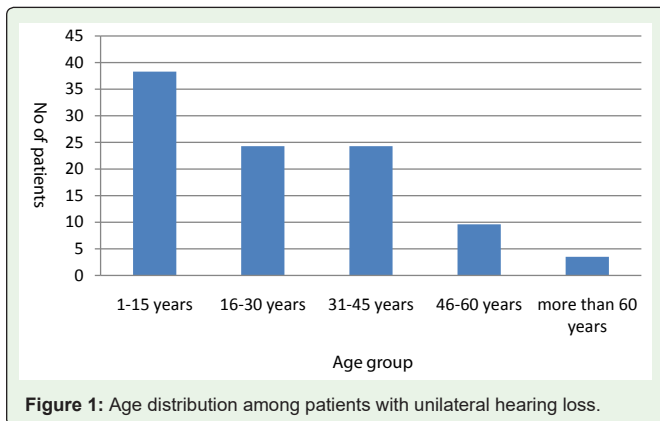


Table 2: The degree of hearing loss among the studied group.

Degree of hearing loss	Frequency	Percentage
Mild	4	3.5
Moderate	52	45.2
Severely moderate	8	7.0
Severe	6	5.2
Profound	45	39.1
Total	115	100

Figure 1: Age distribution among patients with unilateral hearing loss.

Both males and females of all age groups with unilateral sensorineural hearing loss proved by investigations.

Exclusion criteria

Patient with conductive hearing loss or mixed hearing loss.

Data collection

Data was collected using a well-constructed questionnaire to fulfill the require data.

Study tools

Otoscopes, Tuning fork (512 Hz), Pure tone audiometry, tympanometry and auditory brain stem response.

Ethical consideration

Informed written consent was obtained from patients enrolled in the study.

Statistical analysis

A paragraph describing how statistics were done and comparing what variables.

Results

The total number of patients involved in this study was 115 patients. General ear, nose and throat examination was negative in all cases. All these patients were seen in Khartoum state ENT hospitals. 49 (42.6%) were male while 66 (57.4%) were female, and the male: female ratio was 1: 1.3. Patients' ages ranged from 1 year to 79 years,

with a mean age of 24.48 ± 1.5 . The common age groups affected were from 1-15 year; 44 patients (38.3%), 28 patients (24.3%) from 16-30 year, 28 patients (24.3%) from 31-45 year, 11 patients (9.6%) from 46-60, and 4 patients (3.5%) were more than 60 (Figure 1).

The commonest associated factor in this study were Mumps and it was found in 47 of patients (40.9%) followed by Meniere's disease in 39 (33.9%), congenital factors in 17 (14.8%), head trauma in 6 (5.2%) and premature birth in 4 (3.5%). Other causes were vascular "sudden Sensorineural Hearing Loss" 1 (0.9%), cerebellopontine angle tumors 1 (0.9%), (Table 1). Regarding the degree of hearing loss, 4 (3.5%) were presented with mild hearing loss, 52 (45.2%) with moderate, 8 (7%) with severely moderate, 6 (5.2%) with severe and 45 patients (39.1%) presented with profound hearing loss (Table 2).

Clinically, there were some associated symptoms like Tinnitus which was found in 51 of patients (44.3%) and Vertigo was found in 49 of patients (42.6%) (Table 3).

Regarding the methods of assessment 81 patients (70.4%) were assessed audiotologically with pure tone audiometry and 34 patients (29.6%) assessed by auditory brain stem response (Figure 2). In relationship between the age groups and commonest associated factors, Mumps were common in (1-15) age group, were Meniere's disease was common in (16-30) age group, Premature birth manifest only at (1-15) age group, both congenital factors and head trauma were found in different age groups. At last cerebellopontine angle tumors found only in more than 60 age group and sudden Sensorineural Hearing Loss on (31-45) age group, shown in Table 4 with a significant *P value* (0.001).

Table 3: Symptoms of the patients (No=115).

Symptom	Frequency	Percentage
Tinnitus	51	44.3
Vertigo	49	42.6

Table 1: The associated factors of unilateral sensorineural hearing loss.

Associated factor	Frequency	Percentage
Mumps	47	40.9
Meniere's disease	39	33.9
Congenital	17	14.8
Head trauma	6	5.2
Premature birth	4	3.5
Vascular "sudden SNHL"	1	0.9
Cerebellopontine angle tumor	1	0.9
Total	115	100

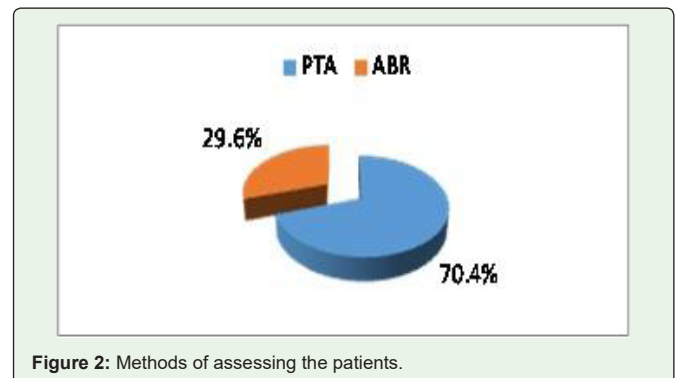


Figure 2: Methods of assessing the patients.

Table 4: Relationship between the age groups and the associated factors.

Age group	Associated factors							Total
	Mumps	Meniere's disease	Congenital	Premature birth	Head trauma	Sudden SNHL	Cerebellopontine angle tumor	
1-15 years	31	3	5	4	1	0	0	44
16-30 years	1	24	3	0	0	0	0	28
31-45 years	11	9	7	0	0	1	0	28
46-60 years	4	2	2	0	3	0	0	11
More than 60 years	0	1	0	0	2	0	1	4
Total years	47	39	17	4	6	1	1	115

P value = 0.001 < 0.05 significant relationship, using chi square test

Table 5: Relationship between the associated factors and the degree of hearing loss.

Associated factor	Degree of hearing loss					Total
	Mild	Moderate	Severely moderate	Severe	Profound	
Mumps	0	11	4	1	31	47
Meniere's disease	4	32	0	3	0	39
Congenital	0	8	4	0	5	17
Premature birth	0	0	0	0	4	4
Head trauma	0	1	0	1	4	6
Sudden SNHL	0	0	0	1	0	1
Cerebellopontine angle tumor	0	0	0	0	1	1
Total	4	52	8	6	45	115

P value = 0.001 < 0.05 significant relationship, using chi square test

Table 5 show relationship between the associated factors and degree of hearing loss, in which mumps commonly causes profound Sensorineural Hearing Loss (SNHL), both of Meniere's and congenital factors found to cause moderate SNHL. Profound SNHL also found in premature birth, head trauma, sudden SNHL and cerebellopontine angle tumors, with a significant *P value* (0.001).

Discussion

The protocol for the evaluation of a unilateral SNHL is confirmed audiometrically. The audiometric evaluation consists of a repeat pure tone audiometry with the special attention to masking. Auditory brain stem response test is also included.

Auditory Brain Stem Response (ABR) test was not carried out routinely on patients with profound hearing loss because the results would be equivocal and of a little diagnostic benefit.

Auditory brain stem response used when considered necessary e.g. below the age of 3 years, uncooperative child and frequencies above 2000 Hz beginning in the neonatal period.

Among five age groups included in this study, the mean age of affected patients was 24.48 years and the most frequent age group was from 1-15 years represented (38.3%). All of Tarkkanen and Aho [10], Marttila [11] and Vartiainen [12] reported the same that is unilateral SNHL is most frequent found in school aged children.

Female were more affected than male with a male to female ratio of 1:1.3, this was compatible with Bess and Tharpe et al. who reported

females predominance over males [13]. In contrast to what Everberg mentioned about male predominance [14], that is to say we couldn't find the reason for this gender difference.

Mumps was the commonest associated factor in this study, and this is compatible to Unal et al. [15] and Everberg [14] who delineates Mumps as the commonest associated factor of unilateral SNHL. This is in contrast to all of Marschalch [16] and Kinney [17] which explained other inflammatory factors like measles and meningitis are the commonest associated factors of unilateral SNHL.

In this study, hundred fifteen of the patients (100%) presented with unilateral sensorineural hearing loss. One hundred patients (86.4%) presented with tinnitus and vertigo. The same percentage of tinnitus was reported by Axelsson [18] and the same percentage of vertigo was reported by Bisdorff [19].

In this study clinical assessment of patients presented with unilateral sensorineural hearing loss revealed that; right ear was most frequently affected, and this is similar observation that is reported by Bess and Tharpe [13]. In contrast to what Everberg [14] reported that left ear is commonly affected, that is to say we couldn't find the reason for the affected side difference.

Majority of the patients presented with moderate degree of hearing loss 52 (45.2%) followed by profound HL. This is similar observation reported by Everberg [14] due to the commonest associated factor: Mumps.

Eighty one patients (70.4%) were assessed audiologically with pure tone audiometry and 34 patients (59.1%) assessed by auditory brain stem response and they were also the suitable method of assessment applied by all of Kumar [20], Tos and Thompson [21] and Roizen [7]. Noder and kinney [17] do not recommend auditory brain stem response for assessment of cerebellopontine angle tumor with severe hearing loss due to abnormal results on the contralateral ear.

The single reported case of cerebellopontine angle tumor was a case report in Omdurman Military Hospital, Neurosurgery department, referred to ENT department. She was an old lady of 66 years old, presented with left ear decrease hearing, tinnitus and vertigo for 7 years. Diagnosis confirmed by MRI cerebellopontine angle, pure tone audiometry showed left moderate SNHL.

The 6 reported cases developed unilateral SNHL after sustaining head trauma. Most of them (4 cases) developed profound unilateral SNHL. Diagnosis confirmed especially on these cases by radiological investigation using high resolution CT scan temporal bone which showed transverse fracture. Majority of them assessed by auditory brain stem response (4cases) and the rest were assessed by pure tone audiometry.

The author reported a case of sudden SNHL, who was an old man of 75 years old, known by hypertensive and atherosclerotic for 20 years, on regular medications and follow up, he had a history of transient ischemic attack after that he immediately developed unilateral SNHL, pure tone audiometry revealed left profound SNHL, this is similar to Oh et al. [22] who explained stronger association with pre-existing conditions of hypertension and atherosclerosis for sudden SNHL.

Conclusion

Unilateral sensorineural hearing loss affects all age's group of patients from and commonly occurring in children between 1-15 years in female gender. The common associated factor in this study was Mumps followed by Meniere's disease. The common associated symptoms with unilateral sensorineural hearing loss were tinnitus and vertigo. Pure tone audiometry and auditory brain stem response are suitable method for assessment and diagnosis.

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