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RESEARCH ARTICLE

PROFILE OF PURE TONE AUDIOGRAM IN THE ELDERLY POPULATION COMPLAINING OF HEARING LOSS WITH INTACT DRUM

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Abstract

INTRODUCTION: 360 million people have disabling hearing loss. Hearing loss can be of diverse etiologies including congenital, hereditary, infectious, inflammatory, metabolic or traumatic. Hearing loss is psychological and social problem for elderly people compromising the quality of life because it impairs the person's capacity to effectively engage in communication leading to isolation and reduced socialization. Pure tone audiogram can be used for screening of individuals hard of hearing. MATERIAL AND METHODS: The study was conducted in 300 patients visiting the Department of Otorhinolaryngology, P. D. U. Medical College, Rajkot presenting with hearing loss having intact drum. Audiograms were evaluated for degree, type and pattern of hearing loss. RESULTS: This study includes 188(62.67%) males and 112(37.33%) females. The results from the audiological evaluations as to the type of hearing loss were: Auditory thresholds within normal limits in 46(7.67%); sensorineural hearing loss in 277(46.17%); mixed hearing loss in 225(37.5%) and conductive hearing loss in 52(8.67%). The level varied between normal to profound. 17(5.67%) had normal, 58(19.33%) had mild, 60(20%) had moderate, 89(29.67%) had moderate-severe, 64 (21.33%) had severe and 12(4%) had profound hearing loss. 34(11.33%) of the people had unilateral hearing loss and 266(88.67%) had bilateral hearing loss. Audiogram curve pattern seen was as: 179(29.83%) flat, 135(22.5%) slow descending, 134(22.33%) steep descending and 152(25.33%) mix pattern curves. CONCLUSIONS: We found a greater prevalence of sensorineural hearing loss and the degree of the hearing loss varying from mild to profound. Majority of patients are male. Flat audiological curve is the most common audiological curve pattern. This evaluation will help in identifying and grading patients with hearing loss and rehabilitating them properly reducing stress and improving life.

Introduction

Over 5% of the world's population – 360 million people – has disabling hearing loss (328 million adults and 32 million children). Approximately one-third of people over 65 years of age are affected by disabling hearing loss. The prevalence in this age group is greatest in South Asia, Asia Pacific and sub-Saharan Africa. A large percentage of people living with hearing loss may benefit from early identification, intervention and appropriate management. People with hearing loss may benefit from the use of hearing devices such as hearing aids, assistive

listening devices and cochlear implants. They may also benefit from speech therapy, aural rehabilitation and other related services (WHO).

Hearing loss can be of diverse etiologies including congenital, hereditary, infectious, inflammatory, metabolic or traumatic. Treatment hinges on identification of the underlying etiology, age and individual need (Mohamed Hamid and Aristides Sismanis). This change can affect any age range. Hearing loss is psychological and social problem for elderly people compromising the quality of life because it impairs the person's capacity to effectively engage in communication leading to isolation and reduced socialization (Tatiana Marques Guerra et al. (2010), Sugawara et al (2011), and Smit JH (2009)). It starts earlier than other physical problems commonly seen in elderly but is unnoticed in early phase because of aid of visual and sign language.

If we know the changes occurring in audiogram in persons with hearing loss, in future by audiological evaluation hearing loss may be picked up and managed earlier. Pure tone audiogram can be used for screening of individuals hard of hearing.

MATERIALS AND METHODS:

This study was approved by the Institutional Ethics Committee. The study was conducted in 300 elderly (above 40 years of age) visiting the department of Otorhinolaryngology, P. D. U. Medical College and Hospital, Rajkot. Pure tone audiometry was done after full ENT, Head and Neck examination in two room set up sound proof audiometry room with elkon pure tone audiometer by ASHA method (Clinical Audio-Vestibulometry, Anirban Biswas). Pure tone audiometry was done at frequencies 0.25, 0.5, 1, 2, 3, 6 and 8 KHz. Participants were asked to hear tones at each of the above frequencies and various intensities. The intensity was reduced in 10 dB steps after each detection response and intensity was raised by 5 dB after each lack of response. They have to raise the hand on the side they hear tone. Threshold for frequency was marked when person gives 3 consecutive positive responses for particular intensity. Calculation of average hearing threshold was done as per following formula. Sum of hearing threshold at 0.5, 1, 2, 3 KHz frequencies divided by 4 gives hearing threshold of each ear.

Combined threshold of hearing = 5 × Better ear threshold + Poor ear threshold / 6.

300 pure tone audiograms were evaluated for degree and pattern of hearing loss. These include 600 audiogram events.

RESULT AND ANALYSIS:

We had studied 300 pure tone audiograms of patients having hearing loss with intact drum. The interpretation involves determining the type, degree and configuration of hearing loss. This study includes 188(62.67%) males and 112(37.33%) females. Males approximately make 2/3 of all.

The results from the audiological evaluations as to the type of hearing loss as shown in Table I were: Auditory thresholds within normal limits in 46(7.67%); sensorineural hearing loss in 277(46.17%); mixed hearing loss in 225(37.5%) and conductive hearing loss in 52(8.67%) persons.

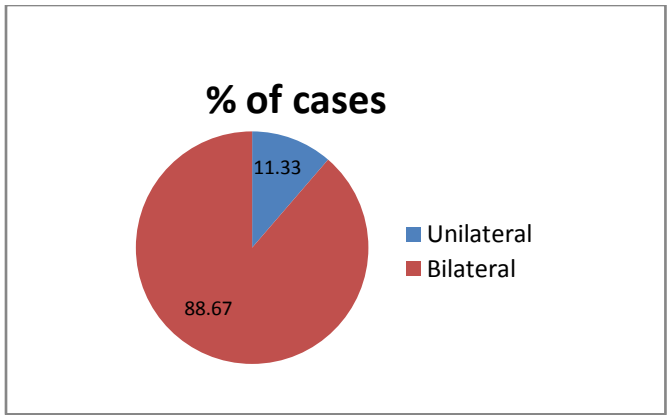
The level of hearing varied between normal to profound as shown in Table II. 17(5.67%) had normal, 58(19.33%) had mild, 60(20%) had moderate, 89(29.67%) had moderate-severe, 64 (21.33%) had severe and 12(4%) had profound hearing loss.

Graph I shows that 34(11.33%) of the people had unilateral hearing loss and 266(88.67%) had bilateral hearing loss.

As shown in graph II audiogram curve pattern seen was: 179(29.83%) flat, 135(22.5%) slow descending, 134(22.33%) steep descending and 152(25.33%) mix pattern curves.

TABLES AND GRAPHS:

Graph I: % of cases according to lateralization.



Graph II: No. of type of Audiogram curve pattern event

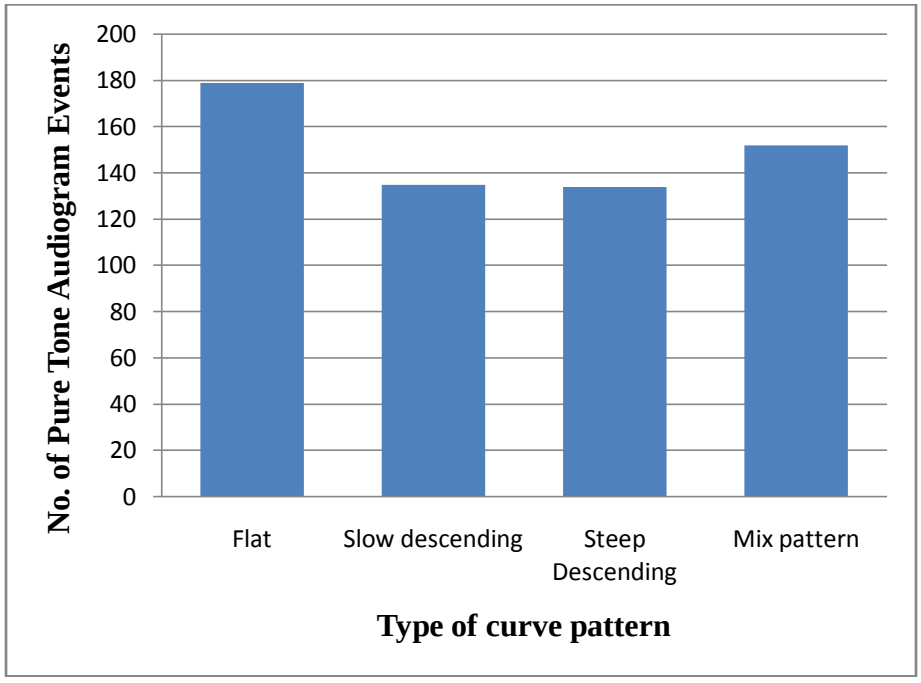


Table I: No. and % of Pure Tone Audiogram events according to type of hearing loss

Type of Hearing loss	No. of Pure Tone Audiogram events	% of Pure Tone Audiograms
Normal threshold	46	7.67 %
Sensorineural hearing loss	277	46.16 %
Mixed hearing loss	225	37.5 %
Conductive hearing loss	52	8.67 %
Total	600	100 %

Table II: No. and % of cases according to degree of hearing loss.

Degree of Hearing loss	No. of cases	% of Cases
Normal/Slight	17	5.67
Mild (26 – 40 dB)	58	19.33
Moderate (41 – 55 dB)	60	20
Moderately – Severe(56 – 70 dB)	89	29.6
Severe (71 – 90 dB)	64	21.33
Profound (> 90 dB)	12	4
Total	300	100

DISCUSSION:

In this study males approximately make 2/3 rd of all. Males are more commonly involved because of hereditary factors and occupational hazards (Sung Hee kim et al., 2010). Also females prefer less to go for consultation. Men were affected more than women in various studies like Isabella Monteiro de Castro Silval et al. (2006), Ankur et al. (2013) and Sung Hee kim et al. (2010). These findings are consistent with findings of our study.

Auditory thresholds within normal limits in 46(7.67%); sensorineural hearing loss in 277(46.17%); mixed hearing loss in 225(37.5%) and conductive hearing loss in 52(8.67%) persons. In a study done by Tatiana Marques Guerra et al. auditory thresholds was found within normal limits in 22.28%; sensorineural hearing loss in 60.62%; mixed hearing loss in 14.70%, conductive hearing loss in 2.40%. Sensorineural hearing loss is more common. Old age, noise, drugs, viral infection etc. may lead to sensorineural hearing loss. Mix loss also includes sensory component. At higher degree of hearing loss or due to technical limitations, sensorineural hearing loss may appear as mix loss. Conductive loss in patients with intact tympanic membrane may be due to ossicular pathology, eustachian tube dysfunction, tympanosclerosis etc. (Scott- Brown's Otorhinolaryngology, Head & Neck surgery). They were referred for impedance audiometry.

The level varied between normal to profound. 17(5.67%) had normal, 58(19.33%) had mild, 60(20%) had moderate, 89(29.67%) had moderate-severe, 64 (21.33%) had severe and 12(4%) had profound hearing loss. The degree of hearing loss for both ears is counted as combined threshold according to the formula. So in patients with mild hearing loss on one side, combined threshold comes normal. Level of intervention will depend upon degree of hearing loss. Mild loss, not disturbing routine work can be managed conservatively. Half of the people have moderate to moderate-severe hearing loss (41 – 70 dB). These people require hearing aid to cope up with the life. Severe the hearing loss poorer is the response with hearing aid. However the problem of recruitment (Discomfort hearing) can be solved with multichannel programmable digital hearing aids. Pure tone audiogram is required for prescription of hearing aid. Profound hearing loss not responding to digital hearing aid can be managed with cochlear implant. Hearing loss is a progressive event. Age related hearing loss progressively worsens (Scott-Brown's Otorhinolaryngology, Head & Neck surgery). If patient with severe and profound hearing loss had visited the clinic early, intervention both therapeutic and preventive might have been applied early easing the life.

In our study 34(11.33%) of the people had unilateral hearing loss and 266(88.67%) had bilateral hearing loss. Majority of people have bilateral hearing loss. In a study done by Tatiana Marques Guerra et al 1.76% of the patients had unilateral hearing loss and 98.24% had bilateral hearing loss. Age related hearing loss is bilateral. People with unilateral hearing loss will mostly adjust with normal ear. However for quality of sound and sound localization bilateral hearing is must (Ganong's review of medical physiology).

Audiogram curve pattern seen was as: 179(29.83%) flat, 135(22.5%) slow descending, 134(22.33%) steep descending and 152(25.33%) mix pattern curves. Audiogram curve patterns seen are almost equal. Flat curve pattern is little commoner. In a study done by Kelly Demeester et al (2009), 'Flat' audiograms were most dominantly represented (37%) followed by 'High frequency Gently sloping' audiograms (35%) and 'High frequency Steeply sloping' audiograms (27%). 'Low frequency Ascending' audiograms, 'Mid frequency U-shape' audiograms and 'Mid frequency Reverse U-shape' audiograms were together making less than 1%. These findings are consistent with the observations in our study. Curve pattern indirectly suggests level or underlying pathology. Flat curve is seen in case of atrophy of stria vascularis. Basilar membrane stiffness will produce descending curve. Mix curve pattern includes combination of different curve patterns seen in combined pathologies. Less common curve pattern

which are not present in our study includes ascending curve seen in early endolymphatic hydrops and trough shaped curve seen in congenital sensorineural deafness (Clinical Audio-Vestibulometry, Anirban Biswas).

CONCLUSION:

We found a greater prevalence of sensorineural hearing loss. The degree of the hearing loss varies from mild to profound. But moderate to moderate severe (41 – 70 dB) hearing loss is the most common. Majority of patients are male. Flat audiological curve is the most common audiological curve pattern. This evaluation will help in identifying and grading patients with hearing loss and rehabilitating them properly, reducing stress and improving life.

CONFLICT OF INTEREST: We declare that we have no conflict of interest.

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