



ORIGINAL RESEARCH PAPER

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ROLE OF PURE TONE AUDIOMETRY IN THE EVALUATION OF HEARING LOSS

KEY WORDS: Pure tone audiometry, Conductive hearing loss, Chronic suppurative otitis media

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ABSTRACT

Background: Audiometry is the measurement of hearing acuity. If it is done by using pure tones then it is called as pure tone audiometry which is the most clinically used hearing test.

Objective: To find out the type and degree of hearing loss.

Materials and Methods: A prospective cross sectional study was carried out on 100 patients with impaired hearing and pure tone audiometry was done on all the subjects.

Results: This study revealed that hearing loss was the most common in the age group of 21-30 years with female being predominant (58%). The most common type of hearing loss was conductive type. In the right ear 50 cases (55.55%) had conductive type of deafness, 24 cases (26.66%) of mixed type of deafness and 16 cases (17.77%) of sensorineural type of deafness. In the left ear it was 54 cases (62.79%) of conductive type of deafness, 20 cases (23.25%) of mixed type of deafness and 12 cases (13.95%) of sensorineural type of deafness. This study revealed that Chronic suppurative otitis media (CSOM) (45 %) was the commonest cause of hearing loss.

Conclusion: This study concluded that commonest type of hearing loss was conductive type, commonest degree of hearing loss was mild degree and commonest cause of hearing losses was CSOM followed by otitis media with effusion. Since, these conditions are preventable and pure tone audiometry helps in early identification of hearing loss. So, appropriate measures can prevent hearing impairment in this study group.

INTRODUCTION

Pure tone audiometry is an essential diagnostic tool to identify the type and degree of hearing loss. Hearing loss can be congenital or acquired; mild, moderate, moderately severe, severe or profound in degree; conductive, sensorineural, mixed in type [1]. The testing of hearing is most often carried out by establishing the threshold of hearing [2]. Pure tone audiometry is the most basic hearing test and by far the commonest form of audiometry performed. Pure tones represent the simplest existing sound, completely characterized by one frequency value and one sound pressure level value. This simplicity provides good basis for tests with high reliability [3]. The purpose of pure tone audiometry is to determine hearing threshold levels for pure tones. The threshold of hearing is defined as the level of a sound at which under specified condition a person gives 50 percent of correct detection responses on repeated trials [4]. The normal test sound is pure tone pulses at standardized frequencies in the range of 250–8000 Hz and normal presentation mode is monaurally by means of a standardized type of earphone. The intensity of sound can be increased or decreased in 5 dB steps from -10 dB to 120 dB [5]. For normal manual procedures, as well as computer-control versions, the optimum step size is 5 dB. Larger step size reduces the accuracy of the measurement while smaller step size does not increase it because of limited resolution of the human auditory system close to threshold [5]. Pure tone audiometry has become the standard method for quantitative description of degree of hearing loss. It provides certain information regarding localization of the lesion that cause the hearing loss [6,7,8]. The amount of intensity that has to be raised above the normal level is a measure of the degree of hearing impairment at that frequency. It is charted in the form a graph called audiogram. The threshold of bone conduction is a measure of cochlear function. The difference in the threshold of air and bone conduction (A-B gap) is a measure of the degree of conductive deafness. So pure tone audiometry is a measure of threshold of hearing by air and bone conduction and this gives the degree and type of hearing loss, a record can be kept for future reference, pure tone audiometry is essential for treatment plan and prescription of hearing aids; helps to find out handicap for neurological purposes and helps to predict speech reception threshold [9]. Pure tone

audiometry is a simple diagnostic tool and easy to perform but gives valuable information regarding degree, type, configuration of hearing loss and further management planning. The aim of this study was to find out the type and degree of hearing loss by using pure tone audiometry.

MATERIALS AND METHODS

This prospective cross sectional study was carried out on 100 patients with hearing impairment who attended the outpatient department (OPD), Department of Otolaryngology and Head and Neck Surgery, Government Medical College Jammu, J and K from August 2020 to July 2021 after obtaining their informed consent and in accordance with principles of Helsinki Declaration 1964. All the patients were subjected to full history, ENT examination and pure tone audiometry (PTA). PTA determines the mean threshold levels in air conduction and bone conduction along the frequency range of 250-8000 HZ. A pure tone average refers to the average of hearing threshold levels at frequencies 500, 1000, 2000, and 4000 HZ in air conduction curve. PTA determines the type and degree of hearing loss.

According to Clark (1981), the degree of hearing loss was classified as follows [10]:

1. Minimal (15-25)
2. Mild (26-40)
3. Moderate (41-55)
4. Moderately severe (56-70)
5. Severe (71-90)
6. Profound (90)

RESULTS

The results are shown in tabulated form.

Table-I: Distribution of age among the study group (n=100)

Age (Years)	No. of Patients	Percentage
10-20	15	15
21-30	32	32
31-40	16	16
41-50	13	13
51-60	14	14
> 61	10	10
Total	100	100

Table-II: Distribution of sex among the study group (n=100)

Gender	No. of Patients	Percentage
Male	42	42
Female	58	58
Total	100	100

Table-III: Distribution of presenting complaints (n=100)

Complaints	No. of Patients	Percentage
Hearing impairment	100	100
Itching in the ear	46	46
Ear discharge	41	41
Tinnitus	39	39
Blockage in ear	22	22
Earache	11	11
Vertigo	01	01

Table-IV: Degree of hearing loss among the patients

Degree of hearing loss	Right Ear (n=92)		Left Ear (n=85)	
	No. of patients	%	No. of patients	%
Mild	46	50	54	63.52
Moderate	24	26	18	21.2
Moderately severe	10	10.9	7	8.23
Severe	8	8.7	4	4.7
Profound	4	4.4	2	2.35

From Table-IV, it is evident that 100-85=15 had only right ear hearing loss and 100-92=8 had only left ear hearing loss. So, 77 had both ear hearing loss.

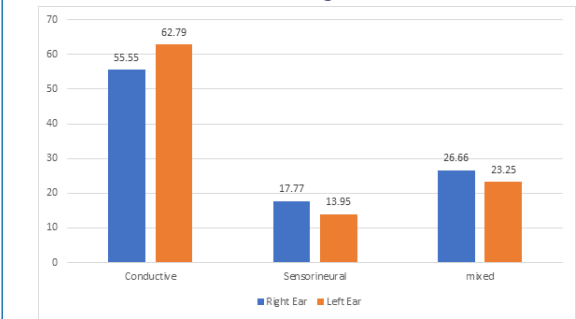


Fig-1: Bar diagram shows types of Hearing loss in percentage

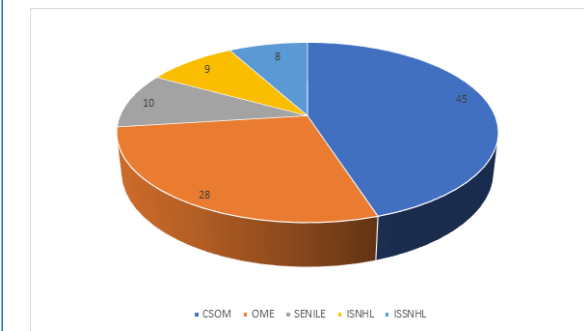


Fig-2: Causes of hearing loss in percentage. CSOM= chronic suppurative otitis media, OME= otitis media with effusion, ISNHL= idiopathic sensorineural hearing loss, ISSNHL= idiopathic sudden sensorineural hearing loss.

DISCUSSION

Accurate assessment of hearing is fundamental to diagnosis, investigation, treatment and rehabilitation. Skilled testing by trained personnel in a suitable test environment is the key to diagnose the type, degree and other aspect of hearing impairment [9]. The WHO estimated in 2005 that there were 278 million people worldwide with bilateral moderate to profound hearing loss, of whom 62 million had deafness that

began in childhood. Two-thirds of people with moderate to severe hearing loss live in the developing countries. South East Asia has the largest of hearing impairment in world and houses one-thirds of the hearing impaired population. WHO also estimates that every year about 38,000 deaf children are born in this region [11]. To treat the hearing impaired population correct assessment and diagnosis is a time need. For this purpose pure tone audiometry (PTA) is essential. PTA is the key hearing test used to identify hearing thresholds levels of an individual, enabling determination of degree, type and configuration of a hearing loss [12]. Thus providing the basis for diagnosis and management of a hearing impaired person. Approximately 15% of the American adults (37.5 million) aged 18 and above report some hearing loss [13]. British study shows that the prevalence of hearing impairment is 3.5% in the age group of 18-40 years, 17.4% in the age group of 41-60 years and 45.3% in the age group of 61-80 years [14]. In this study, patients in 21-30 years age group were most commonly affected and it was 32%. Next common age group was 31-40 years and 16% of the total patient were in this age group. The manual worker were 1.3 times more affected in conductive hearing impairment than the non-manual worker according to the result of British study [14]. From this study we got both ears were involved in disease process in 77% of the patients and only right ear was 15%, only left ear was 8%. So bilateral involvement were more common than unilateral. In this study, it was found that CSOM was the commonest cause of hearing loss (45%). In another study, a total of 686 children were interviewed and examined for CSOM with associated hearing loss in Yemen. The prevalence of CSOM of hearing loss was 7.4% [15]. The difference between that study from this one is due to the fact that they included all the people in their study but only the hearing impaired people were included in this study. The results of this study are consistent with that of Zielhuis et al., who studied 23 patients with otitis media with effusion and observed hearing loss in 20% of the patients. Browning GG et al., found that mild hearing loss is the commonest degree of hearing loss [14] which is consistent with this study.

CONCLUSION

From this study it is clear that the commonest type of hearing loss is conductive type, commonest degree of hearing loss is mild degree (26-40 dB) and commonest cause of hearing loss is chronic suppurative otitis media (CSOM) followed by otitis media with effusion (OME). As ear diseases are common in this country and commonest type, degrees are milder form and most of the causes are preventable and PTA helps in early identification of hearing loss, So that we can take appropriate steps to curb down the preventable hearing impairment.

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