

NOISE INDUCED HEARING LOSS AMONG ARTILLERY SOLDIERS

Zeeshan Ayub, Azeema Ahmed

Abstract

Objectives: To determine whether there is a significant difference in hearing threshold of artillery soldiers and non artillery soldiers.

Study Design: A cross sectional comparative study.

Place and Duration: This study was done at Khyber Rifles Hospital Landikotal over four months time from 10th September 2009 to 31st December 2009.

Patients and Methods: Study group comprised sixty males thirty of whom were engaged in firing of artillery guns and thirty with sedentary jobs. Pure tone Audiometry (PTA) was done for all sixty individuals.

Results: Average hearing loss in speech frequencies was statistically more in individuals who were actively involved in firing of artillery guns. ($P < 0.001$)

Conclusions: Adequate protection and training should be imparted to individuals involved in firing of artillery guns.

Keywords : Hearing impairment, Pure tone audiometry, Sound pressure level.

Article

INTRODUCTION

The leading cause of hearing impairment is excessive exposure to noise¹. Noise is defined as any sound that gives an unpleasant feeling. In terms of audiology it has come to mean any excessively loud sound that has the potential to harm the hearing mechanism².

Different pattern of environmental noise can be described as continuous, fluctuating, intermittent, or impulsive³. Continuous noise remains relatively constant, whereas in fluctuating noise intensity rises and falls in level over time, and intermittent sounds are interrupted for varying time periods.

Impulsive or impact noises are those that are caused by explosion or metal-on-metal contact and have rapidly changing pressure levels with a intense, short-lasting (i.e., in terms of milliseconds) wave fronts, followed by a smaller reverberation that occur over many seconds⁴.

The amount of sound, usually referred to as the sound pressure level (SPL), is conventionally measured by a sound-level meter (SLM) in decibel (dB) units. Typically firing of a gun gives a SPL of 120 dB or more. Current permissible noise level for a continuous noise of 85 dB or less SPL is 8 hours. Noise or acoustic trauma causes two types of hearing impairments i.e. temporary threshold shift (TTS) or permanent threshold shift (PTS). Artillery or gun fire is more commonly associated with PTS. As with type of sound duration is also an important consideration. More the duration of exposure greater is the chance of impairment being permanent^{1,4,5}.

Noise induced hearing loss among artillery soldiers though a recognized fact has yet to be studied in our setup. Further more the artillery guns' being studied date to pre partition era and it is generally thought that they produce less acoustic trauma.

PATIENTS AND METHODS

The study was carried out, as a Comparative Cross Sectional Study at Khyber Rifles Hospital Landikotal in four months time. The study comprised sixty male patients of ages between 26 and 40 years. They were divided into two groups with 30 patients in each group. Group A consisted of 30 males who were actively involved in firing of the artillery guns for more than 8 years. Group B consisted of 30 males who were housed in the same living condition as group A but were not involved in firing of artillery guns like clerks. The study was completed in four months time.

Informed consent was obtained from all patients. All the 60 patients were tested for hearing level by

Pure Tone Audiometry. All the 60 patients were tested by the same observer using the same machine. An average of hearing threshold between 5 to 30 deci Bell (dB) in three consecutive speech frequencies (i.e 500,1000,2000,or 4000 Hertz) was taken as normal. An average of hearing threshold between 31 to 50 dB was taken as moderate impairment and an average of hearing threshold between 51 to 90 db was taken as severe impairment. A patient with hearing threshold of more than 90 dB in any one speech frequency was excluded from the study. Significance of difference in hearing level in both groups was checked with Chi square test.

Data had been analyzed using SPSS version 16. Descriptive statistics were used to describe the data. Difference in hearing level of both the groups was assessed through chi-square test. P-value <0.05 was considered significant.

RESULTS

A total of sixty individuals were included in this study over a period of four months. Individuals were all males and their ages varied from 26 to 40 years (S.D= 5.9). Mean age for group A was 32.5 years (S.D= 4.25). Mean age for group B was 34.4 years (S.D= 4.8). Mean service of the individuals in group A was 13.27 years (S.D= 3.6) and in group B was 14.7 years (S.D= 4.53). Both the groups were compareable with respect to age (P>0.05) and duration of service (P>0.05). All the individuals were of good physical health and had no previous history of otological diseases or unexplained hearing loss.

Table: Chi Square Test for Hearing Impairment. (n=60)

Patients	Hearing loss			Total
	Normal	Moderate	Severe	
Group A	6 (20%)	20(66.6%)	4(13.3%)	30
Group B	25(83.3%)	5(16.4%)	0	30

P value less than 0.05

Group A had 6 individuals with normal whereas 20 with moderate and 4 with severe hearing loss. In Group B 25 individuals had normal and 5 had moderate hearing loss. Hearing standard in Group B were statistically better than in Group A (P<0.001).

DISCUSSION

The hearing loss seen among this group is usually due to continuous exposure of the noxious stimulus over a protracted time period. Such an impairment is usually detected by an individual once it is severe enough to hamper daily activity and as such a stage it is irreversible^{6,7,8}. Sound pressure level comfortable to a human ear are not more than 50 db. At a distance of 3 meters the sound pressure level from an artillery fire reaches up to 130 db called a deafening sound^{9,10}. Artillery fire or metal-on-metal are mechanical events known as impulsive or impact noises characterized by rapidly changing pressure dynamics which consist of intense, short-lasting (i.e., in terms of milliseconds) wave fronts, followed by smaller reverberations. Impact noises have a sound pressure level (SPL) of more than 120 dB^{11,12}.

Continuous exposure to deafening noise over the years cause damage to the outer hair cells followed by inner hair cells if acoustic trauma continues. Initially the damage is temporary but latter on becomes permanent. Late changes include degeneration of auditory fibers and rupture of reissners membrane¹³. This is manifested in its earliest in an audiometric recordings showing the characteristic dip at 4 Kilo Hertz and latter on involving other frequencies¹⁴⁻¹⁶.

Hearing loss due to professions involving exposure to loud sounds for a long duration over years can be avoided by using adequate protection of hearing and regular checkups¹⁷⁻¹⁹. Need of the hour is to study the problem of acoustic trauma at length in Pak Army and determine the SPL of different guns and to devise a system of hearing protection with training and teaching of artillery staff to better understand this problem.

CONCLUSION

Adequate training in safeguard against acoustic trauma is must for each and every artillery soldier for protection against noise induced hearing loss due to artillery fire which is a constant and real danger to many.

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