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A CROSS-SECTIONAL RESEARCH TO ASSESS THE HEARING LOSS INDUCED BY VARIOUS OCCUPATIONAL NOISE CONDITIONS AMONG INDUSTRIAL WORKERS

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Abstract:
***Objective**: The aim of our study was to check out the hearing limit of industrial workers along with a comparison between noise-exposed as well as unexposed groups.*
***Methodology**: We carried out an observational cross-sectional research at Services Hospital, Lahore (September 2016 to October 2017). We formulate two groups for our cross-sectional study. Group "A" consist of fifty industrial workers who work in consistent huge level noise and correlate with the similar group "B". Subjective test "Pure tone audiometry" was performed to measure hearing limits at different frequencies.*
***Results:** Hearing loss in group "A" was too common, as well as the characteristic dip of the auditory range, was noted at a frequency of 4000 Hz.*
***Conclusion:** The working staff of industries is at greater risk of developing Sensor-neural hearing loss (SNHL) with respect to the common population. These workers can comfortably be picked in the initial stages by audiometry as well as suitable securing steps advised to stop or hamper the silent development of the disease.*
Keywords: *Hearing threshold, Sensor-neural hearing loss (SNHL), Pure tone audiometry, Noise-induced hearing loss (NIHL), spiral ganglion neurons (SGN).*

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INTRODUCTION:

The auditory failure caused by the blaring sound is the main reason for attaining adult SNHL globally. Hearing loss is untreatable but absolutely preventable. In "Guideline for community noise", World Health Organization acknowledged that at a world level noise caused hearing defect is most commonly confronted irreversible occupational, and approximately about one hundred and twenty million people have a denoting as well as significant hearing failure. There are increasing proofs displaying a multiple of additional health issues of bigger size [1].

Noise is defining as all irrelevant sounds which may be not hearing injurious until its intensity exceeded to a definite limit as well as it constantly blaring for some time. Decibel is a unit of sound used for expressing sound intensity and measured as sound pressure level. Commonly a 4 KHz of the audiometric notch was produced by thunderous noise [2, 3]. Moreover, limited studies also presented audiometric notch at 6kHz [4, 6]. The noise of any occupation induces auditory failure (ONIHL) just not irritate the victim but also create problems for their companions along with family members [7]. The first registered case of this complaint (NIHL) was hard to conclude but reactions of noise on human ears were explained by Roman cited (by Ludwig). According to Gaius Plinius Secundus, because of the constant noise of the brimming river, dwellers on the bank of river Nile had lost a lot of their hearing ability (roman statement). Price demonstrated in 1914 regarding a cutting instrument factory in Germany, the blaring noise factory of his period, due to consecutive exposure to loud noise of factory after little duration each worker has lost his hearing capability to some limit. Taylor et al presented in 1965 that curtailment of hearing in workers due to work in the noisiest area for a reasonable time, and find that the huge loss was in the area of 4 kHz frequency. Blaring sounds could damage soft sensory as well as cochlear neuronal components resulting in hearing loss. Such injuries frequently cause the dendrites of the SGN. This study was conducted to discover the occurrence of an auditory failure in workers of industries.

METHODOLOGY:

We carried out an observational cross-sectional research at Services Hospital, Lahore (September 2016 to October 2017). Afterwards taking approval from workers in writing (operators of machines from industries of fertilizer) 50 machine operators from group "A" of below 35 years of age sharing history of working in the noisiest environment were directed to screening for auditory failure. Fifty individuals of group "B" (Matching control group) was also collected from the aforesaid industry coming from different issues without the background of working in the noisiest environment. Affected individuals with a minimum of 7 years, s' experience of working in the noisiest environment were registered for study. Workers giving the background of pre-existing deafness or any additional hearing problem were deleted from the study. Group A & B were directed for an entire clinical checkup of ears along with pure tone audiometry for hearing analysis.

SPSS software was used to get Statistical analysis. Statistical importance of finding was checked by the T-test along with the chi-square test. The value of (P) was determined as well as a value lower than (0.05) was acknowledged as statistically cogent.

RESULTS:

The Audio metrical judgement of the hearing was conducted in our study, however asymptomatic workers exposed to noise as well as were correlate with group "B" (control group). Subjective judgements along with objective computation declare that auditory failure in subjects (self-reporting hearing loss) was extra prevalent in Group A with respect to control group. The average period in the noisiest environment was 6 to 9 years.

Table – I: Hearing Loss Comparison

Hearing Assessment	Group - A (50)		Group - B (50)	
	Number	Percentage	Number	Percentage
Normal Hearing	34.5	17	98	48
Bilateral Hearing Loss	44	22	1	4

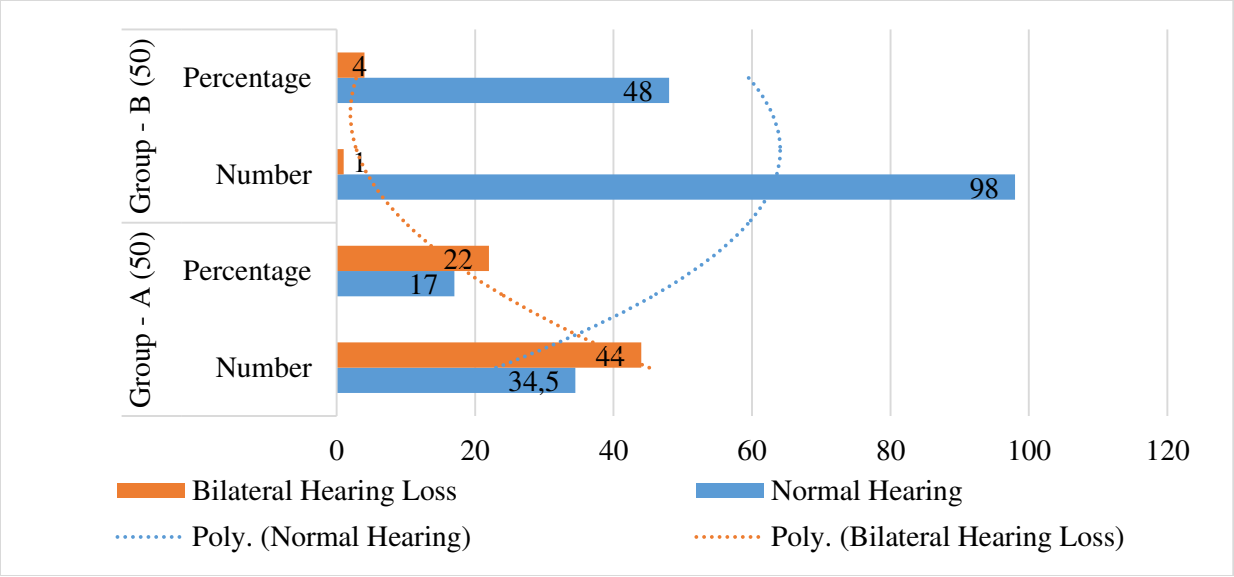
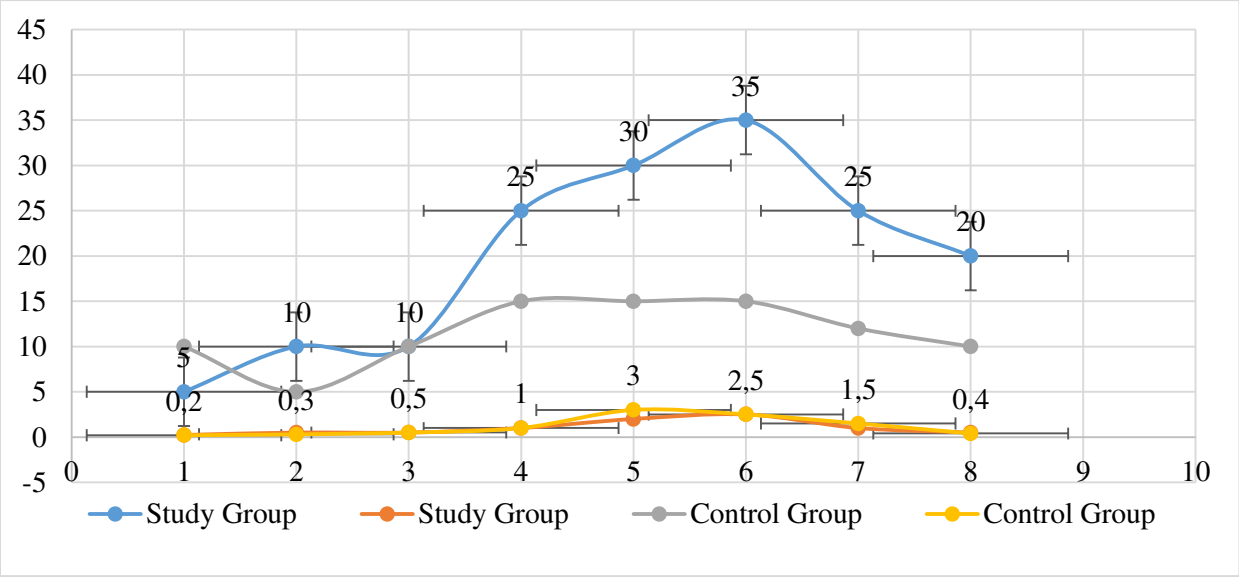


Table – II: Average Hearing Threshold at Various Frequencies

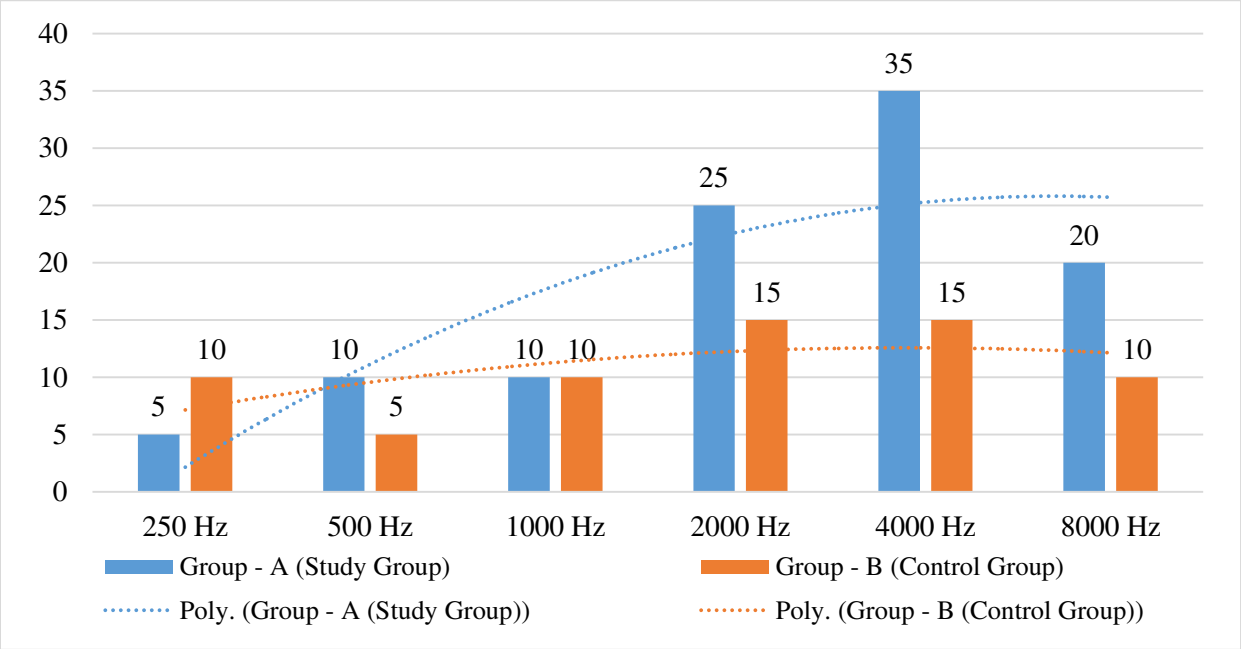
Hearing Threshold	Study Group		Control Group	
	Mean (dB)	SD (dB)	Mean (dB)	SD (dB)
0.25 KHz	5	0.23	10	0.2
0.5 KHz	10	0.5	5	0.3
1 KHz	10	0.5	10	0.5
2 KHz	25	1	15	1
3 KHz	30	2	15	3
4 KHz	35	2.5	15	2.5
6 KHz	25	1	12	1.5
8 KHz	20	0.5	10	0.4



The average hearing limit study in group "A" declare a much greater hearing point in (3000 to 6000) Hz frequency limit. In "B category" no difference in the auditory limit is recorded.

Table – III: Audiograms Comparison

Mean Hearing Threshold Level (dB)	Group - A (Study Group)	Group - B (Control Group)
250 Hz	5	10
500 Hz	10	5
1000 Hz	10	10
2000 Hz	25	15
4000 Hz	35	15
8000 Hz	20	10



In group "A" self-reported hearing loss (subjective) exist in eight workers (16%) meanwhile auditory failure, as conclude audio metrically (objectively), present in twenty-two workers (44%). In group "B" (control group) self-reported hearing loss (subjective) exist in three workers (6%) meanwhile auditory failure, as conclude audio metrically (objectively), present in just one case (4%) of the control group.
A correlation of the average auditory limit of our research as well as in category "B" declare extreme auditory failure in 3 to 6 kHz frequency ranges.

DISCUSSION:

As worldwide considered, noise exposure is related to auditory failure depending on period as well as the aspect of noise. The frequency range of (4 to 6) kHz are the cause of Hearing loss, auditory failure means damage to sensory-neural type. Hair cells inside the ear generally damage simultaneously consequently largely the auditory failure is normally mutually symmetrical [10]. While measure hearing limits at different frequencies the notch have for a long duration been admitted as a scientifically attribute of noise exposure. However, the common relation between constant noise exposure as well as a notch at 4000 Hz, notches have absolutely been detected at 6000 Hz in those people who work in the noisiest environment whereas at 3000 Hz with lower

frequency noise [11]. An audiometric notch was detected in 30 workers 60 % at a frequency of 4000 Hz. According to Hong O study, more than 60% of the workers who work in noisiest environment displayed auditory failure at noise sensitive frequencies of 4000 to 6000 Hz [12]. The prevalence of auditory failure in those workers who works in the noisiest environment of the factory was 42% (where auditory failure was defined as greater than 25 dB) loss at the OSHA -approved 2000,3000 as well as 4kHz of frequencies in each ear [13].

Exposure to noise commonly does not induce a reduction higher to 75 decibels (dB) and 40 dB in higher as well as lower frequencies respectively. Moreover, individuals who are aged with added age-related losses may have an auditory limits failure level beyond these values [14]. Auditory failure of 20 to 40 dB was identified in 64% of individuals having an age range between 25 to 35 years.

Factory worker's exposition to the acoustic effects of blaring sounds alters broadly. Uniformly organic fundamentals for this also keep unclear [15]. If an individual If a person employed in the factory is being exposed to different agents as ototoxic as well as tobacco agents concurrently, he emerges as more sensitive to precarious sequences of noise because of their synergistic activity.

It stresses the significance of PPM. It was also constituted that concluding everyday exposure to occupational noise (within hearing protection cover) along with regular administrative response decrease the hazard of occupational NIHL in workers of industries. Regular and continuous proceeding of individuals will conclude the conducted rate of intervention. Intervention researches which are conducted for the purpose of restraining of NIHL required adding suitable control groups [16].

However, the blaring noise that causes damage to hear is entirely preventable, it despite has a huge expansion rate among the workers of construction companies. Securing instruments for hearing are mostly utilized for decreasing noise exposure among Construction Company's worker. But the use of hearing protection devices is difficult by irregular and fluctuating noise, inadequate departmental intention (in industrial set-ups) for 'hearing protection as well as loose regulatory enforcement [17]. A lengthy study conducted in Austria over a duration of (13) years presented that constant threshold variation was presuming by the regularity of wearing those instruments which are used against noise defense as well as the basic TTS as that worker susceptibility action on a significant role. The temporal threshold shift peak at 4000 Hz appearing free of exposure frequency but particularly after exposure of low-frequency is an indicator of prolonging auditory failure [18].

Two fresh studies were conducted; one is conducted on the workers of Mill in Ghana as well as other is conducted in Zimbabwe on the workers of the mining industry. The period of noise exposure, as well as an audiometric notch in the recently conducted studies, was uniform to our study that is 6 to 9 years and 4000 Hz respectively [19, 20].

Another study which was comparative cross-sectional was conducted freshly on 140 mining industry workers in Ghana (correlate with 150 workers in the control group). The average age of subjects in the recent study was a little bit older as compared to our study i.e. (42.58 ± 7.85) years of stone workers as well as a (42.19 ± 12) year of control group respectively. The subjective auditory failure appeared in (21.5%) of the individuals as well as in (2.8%) of the group B (ratio of an affected individual are in a uniform limit to our research) [21].

CONCLUSION:

The working staff of industries is at the great hazard of developing SNHL with respect to the common population. These workers can comfortably be picked in the initial phase by audiometry as well as suitable securing steps advised to stop or hamper the silent development of the disease.

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