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Assessment of Hearing Impairment and Hypertension among workers exposed to occupational noise in Baiji power plants

ABSTRACT

Methods: This was a cross-sectional study. The study sample (population) consisted of 240 healthy male employees from Baiji electric power plants with a history of past and present exposure to noise. The study was conducted during the period from the 15 December of 2012 to the 15 February of 2013. There are four sections in the power plants. Turbine, Boiler, central control room and fuel. All workers who worked in the power stations for 5-7 years or more were included in the study. Data was gathered from the results of available portable audiometric test and the blood pressure was measured in supine position by using mercury sphygmomanometer

Hearing impairment was defined as average hearing threshold for frequencies 0.5kHz, 1kHz, 2kHz and 3kHz equal or more than 25 dB(A) in both ears. Workers are classified according to exposure time in to two groups. The workers are working in turbine and boiler formed continuously exposed group(CEG). While the workers are working in central control room and fuel formed intermittently exposed group(IEG).

Results: The prevalence of hearing impairment in this study was 17.08% among all the exposed workers. The prevalence of hearing impairment was significantly more in (CEG 14.58%) as compared to (IEG 2.5%). The prevalence of hypertension among continuous exposure group to noise was (12.5%) significantly higher than the intermittent exposed group to noise (2.08%). There was a positive association between duration of exposure and prevalence of Hypertension. Both hearing impairment and hypertension showed in the current study increasing frequency in relation to the duration of exposure (employment). 26.6% of hearing impairment cases found among those exposed for less than 15 years while 72.7% among those exposed for 15 years and more. On the other hand, hypertensive were 28% and 45.6% respectively with period of duration of exposure. The results of the present study indicate that hypertension and hearing impairment are commoner in workers continuously exposed more than that in workers intermittent exposed group to high level of occupational noise. The prevalence of hearing impairment and hypertension distributed according to the age of workers, we found that the 12.95% of bilateral neurosensory in age below 40 years, while 30.04% of cases in age above 40 years. While the prevalence of hypertension, we found 10.47% of cases in age below 40 years and 30.6% in age above 40 years. The most common group affected by hearing impairment (permanent bilateral) were present in Turbine and boiler of power plants. The common age group affected is above 40 year old.

The study shows that the longer exposure to noise either during the working day or through the period of employment increased the chance to developing hearing impairment and hypertension. The occupational hearing loss due to work related disease are common and constitute up to (14%) of all occupational hearing diseases.

Conclusions: These findings provide corroborative evidence to further substantiate the notion that exposure to noise is associated with hearing impairment. They also support the proposition that long term occupational exposure to noise appears to be a risk factor for arterial hypertension.

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Introduction:

Noise is unwanted sound. The sound is propagated in the form of wave. Workers are exposed to noise in power plants, textile glass, manufacture of boiler pressures ,ship building, engineering, industries ,Iron steel factories^[1,2,3] Each of which can be described in term of frequency or number of cycle per second measured in hertz. Intensity as expressed in decibel, the human ear ranging in frequency from 20Hz—20000 Hz.

The intensity of very faint sound is around Zero dB and jet normally, engine can produce sound of 130dB,which is painful to the ear the sound we normal hear are complex sound formed from many waves of varying frequencies, intensities, ordinary speech is heard at frequencies at 500Hz—2000Hz.the most important effect of exposure to noise is noise induced hearing loss (NIHL)^[4,5]The hearing impairment is a temporary as exposure to noise about more than (85dB)continuous more than 8h/day or >40h/week and duration of exposure 5-15year to the develop the most hazardous is high

intensity, high frequency, continuous noise susceptibility has definite effect to develop hearing problem.^[6]

Aim of the study:

To identify and evaluate the hearing status of the workers in the Baiji electric power plants and role out percentage of hypertension among those with long term exposure to occupational noise.

Objectives of the study:

- 1.Measurment of hearing impairment (H.I) cases among workers in Baiji electric power plants(gases and thermal).
- 2.Identify the relation of hearing problems according to the daily exposure per hour.

Occupational disease can be defined as a disease occurs or induces or aggravates by work place like noise, probably is the most common occupational environmental hazard and the most common cause of hearing loss. Noise induced hearing loss an irreversible hearing impairment resulting from long term exposure to level of noise beyond 85dB,NIDHL a permanent bilateral sensory neural

deaf, temporary or permanent shift in the hearing threshold, present clinically by in sensitivity to sound frequencies.^[26,27] which occupational exposure can be shown to be major causal or contributory factor.^[28,29] hearing loss effect at a large percentage of population according national center of health statistic 37million adults in USA have trouble hearing. This is making its public issue third in line after heart disease and arthritis.^[13,14] about 2 to 3 of every 1000 children in US are born deaf or hard of hearing. Nine out of every 10 children who born deaf, they are born to parents who can hear.^[14,29]

Subject and Methods

Administration and ethical consideration.

To carry out this study an official permission was obtained from Baiji electric power plants. The context of work declared to the subject to obtain their acceptances and cooperation during the study.

Design of the study and timing:

The current work is an observational cross-sectional study among convenient sample. It was carried out

during the period from 15th December 2012 to the 15th February 2013. only four days per week were list for achieving the interview.

The study group:

The study was conducted among workers attending of the Baiji electric power plant (gas, thermal station) working in work place with source of noise (Turbine, Boiler) the total workers in the study sample was 240 workers exposed to occupational noise.

Results

The total of subjects included in this work 240 workers are working in Baiji electric power plants (gas, thermal station). During the period from 15th December 2012 to the 15th February 2013. The study includes all workers who working in place exposed to noise like turbine, boiler. This work had studied the epidemiology of hearing impairment and hypertension among those with long term occupational exposure to noise in Baiji power plant. All worker is male, age is between two group. The first is below 40 years there are 193 which represent (80.4%) of the total study group, while the second group

more than 40years old which shown in Figure.1 represent(19.6%) from total study. a

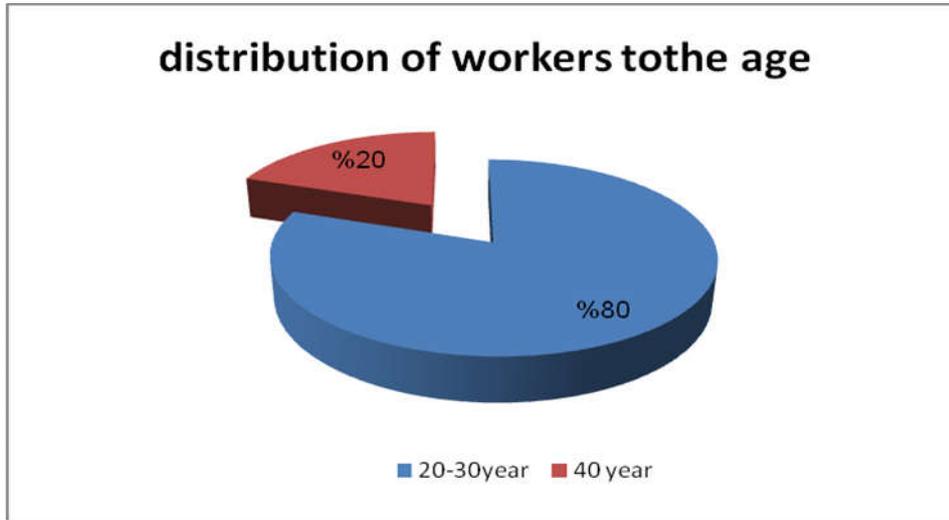


Figure.1.Distribution of workers according to the age. (percentage

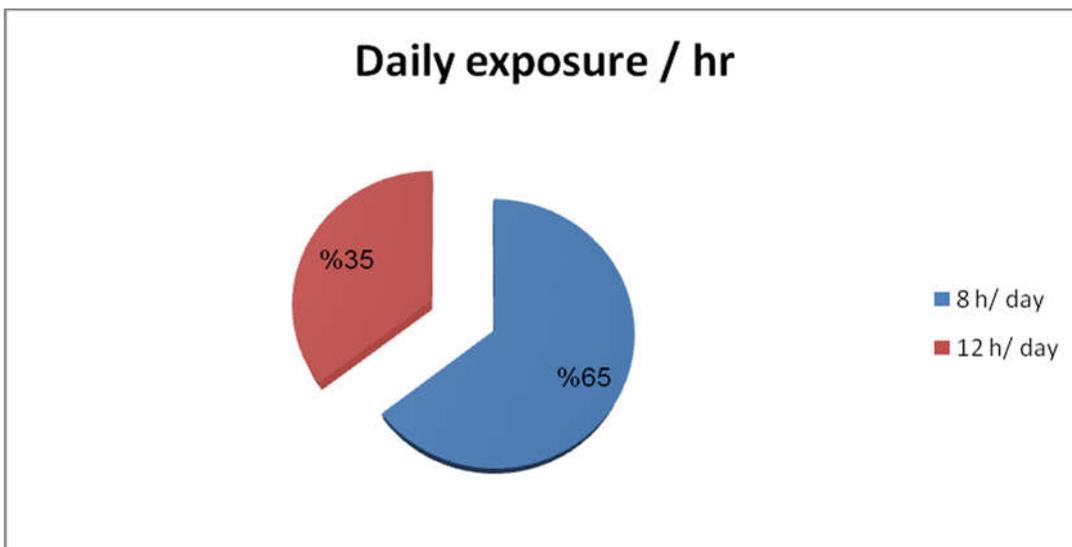


Figure 2.Distirbution of workers according to daily exposure per hour.(percentage).

It was found that the workers who exposed to 8h/day were 155 worker represent about [64.58%] out of total study. On the other hand those who exposed to 12h/day were 85worker represent about [35.4%].

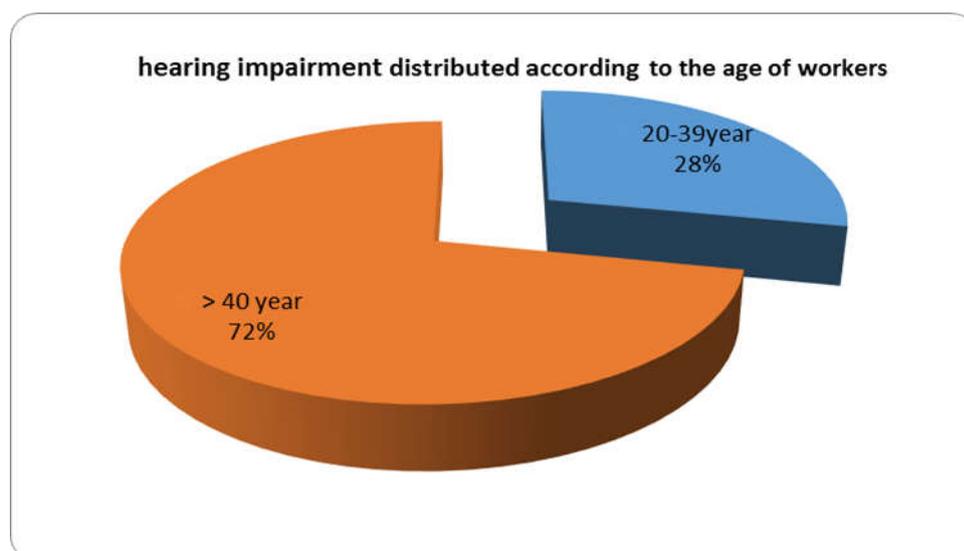


Figure.3.Distribution of hearing impairment according to the age of workers.(percentage).

Regarding the distribution of hearing impairment cases according to the age of workers shown(25case) which is represented about 28% of cases below40 year,out of 193 workerwhile (16case) represent 72% of cases above 40 year old out of 47 worker.

It was found that the workers who exposed to 8h/day were 155 worker represent about [64.58%] out of total study. On the other hand those who exposed to 12h/day were 85worker represent about [35.4%].

Table 1: Distribution of hearing problem of workers according to the daily exposure per hours

Hearing problems	8h/day	%	12h/day	%	Total
Bilateral n. sensory	25	15.6	16	20	41
Non-occupational H. problems	135	84.4	64	80	199
Total	160	100	80	100	240

Chi –square=0.721 ,df=1,p- value more than .05

Regarding the daily exposure per hours and it relationto development hearing impairment. We have 25 cases [15.6%] out of 160worker exposed to 8h/day, while 16cases [20%] bilateral neuroisensory out of 80 worker. The association between hearing impairment and daily exposure per hours is statistically not significant in table 1.(Ch- square=0.721, dF=1, 0.05> p >0.50)

Table 2. Distribution of hearing impairment cases according to duration of exposure(year).

Duration of exposure	No. of workers with occupational- Hearing impairment	%	No. of workers without occupation hearing problems	%	Total	%
5 -9 years	27	15.7	145	84.3	172	100
10-15years	6	10.5	51	89.5	57	100
> 15years	8	72.7	3	27.3	11	100
Total	41		199		240	

Chi- square test($X^2= 26.006$, $df = 2$, $P\text{-value} < 0.001$)

Regarding to the duration of exposure year on development of hearing impairment for the workers whose their duration of exposure between 5 -9 year was 27case[15.7%], while the period between 10-15 year was 6 case [10.5%] and the period more than > 15y was 8 cases [72.7%]The association between hearing impairment and duration of exposure year. It is statistically significant shown in table 2. ($x= 26.006$, $df = 2$, $p < 0.001$)

Table 3: Distribution of hearing problem of workers according to the age of workers.

Hearing problem	20-39years	%	> 40years	%	Total
Bilateral neurosensery h. loss	25	12.95	16	33.04	41
Non-occupat. H. problems	168	87.05	31	65.95	199
Total	193	100	47	100	240

Chi- square= 11.867, $df= 1$, $P\text{-value}$ less than 0.05

Regarding the effect of age on development of hearing problem,we found that 25 cases[12.95%] bilateral neurosensery between 20 -39 year out

of 193 worker, while 16case[33.04%] out of 47worker bilateral neurosensery in age above 40 year.This association between the age of workers and development of hearing impairment is statistically highly significant, as shown in the table 3.[$p < 0.001$] p-value less than 0.05.

Discussion

Result from this cross –sectional study indicates that there is a relationship between blood pressure and noise induced hearing disorder. Prolonged exposure to industrial noise firstly elevation of the systolic blood pressure and to some extent the diastolic blood pressure awell if noise exposure continues, with resulting in sever hearing loss ,the systolic blood pressure tends to return to normal, diastolic blood pressure seems to either rise or fall. The positive correlation of the age and blood pressure among population has been confirmed in many studies(Andriukin,AA,1961; Aroma,A.1974).^[44,80]Percentage of workers experiencing hearing impairment in both ears(bilateral neurosenseory) is (17.08%) in this study. Similar to the study done in

Terengganu by(Inddrus, 2002)^[12].The prevalence of hearing impairment among workers in power station in Terengganu was only (18.1%) therefore HCP conducted in this power station should be reviewed of it effectiveness and employees compliance. In that study the prevalence of hearing impairment is higher than my study.

According to the types of hearing loss we identified the most common work- related noise as compared to the prevalence of bilateral neuroisensory deafness in other study which represent (20.5%) of cases of hearing impairment in workers of Iron and steel industry in Nagpur by(Uday W Narlawer, 2006) ^[48]which is higher than our study. who is describes the relation between the hypertension and hearing impairment in workers of Iron steel industry in India.

In our study, the association between hearing impairment and age of employment ,it is highly significant that Duration of employment appears to the single most important variable that significant association with hearing impairment in this study with

chronic exposure to noise can be hazardous because the effect of noise can accumulate over time.(Chen JD)^[82]

Conclusions& Recommendations

Conclusions

1.Hearing impairment due to which NIHL represented about (14%) of all occupational hearing diseases.

2.Occupational hearing loss(especially bilateral neurosensory) due to long exposure to high level of noise represents one of the most common occupational hazards can occur in work place which is represented about 17.08% from total study group.

3.According to the effect of age on development hearing impairment cases. We found that 12.95% of cases(bilateral neurosensory) in the age below 40year, while 33.04% of cases in the age above 40year

Recommendations:

To the ministry of electrician.

1. Trying to provide a good condition in the work place.
- 2.Advice and teach the workers to use the protective measure mainly PPE.

3.Do programs for the workers about the risk factors of different occupationsand the best way to avoid them.

4.Trying to open medical departmentin the ministry of electric and branches in each company of electric power station to increase the health education around the occupation disease in general and hearing problem special part.

To ministry of higher education and scientific researches.

1. Focusing on already existing researches about occupational hearing disorder.
2. Encourage researchers to have full recent studies about occupational hearing loss.
3. Consider occupational hearing disorder as one of the important subject

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