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Auditory Variation Among Sound Workers In Independent Power Plant Okpai, Delta State

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ABSTRACT
The obnoxious effect of loud sound on the auditory efficiency of sound workers was under investigation. The study was carried out in Okpai Delta State, where a large power plant is situated. The study was an experimental design to elicit the through impact of noise on hearing loss of sound workers. 20 participants were selected via stratified random sampling technique to accommodate all departments and to avoid bias as well as limit sample errors. The study unveiled that loud sound affects auditory efficiency, that age is equally an indicator of hearing loss among sound workers. The study revealed that most workers hears better with their left ears than the right side. The study compared auditory efficiency of sound workers against non sound workers. It was discovered that those who work in low noise environments hears better than those in noisy environments. The study shows a significant relationship between age and hearing loss. It was discovered that people within the age bracket of 45-60 were the most affected group irrespective of workplace variance. The study concluded with recommendations, on the possible means of ameliorating this ugly trend. It was recommended that more effective legislations on noise reduction be put in place and enforcement of stiff conditions for the use of earmuff be adhered to. The study closed the gap and cleared doubts on the direct effects of loud sound on auditory efficiency among sound workers.
Keywords: Independent power plant, Noise, Auditory, Efficiency, Hearing loss, Turbine, Audiometer, Age, Decibel, Impairment, Okpai, Sound, Exposure, Induce, Hz.

INTRODUCTION
Independent power plant is an industrial outfit owned by individuals, organizations as well as governments, targeted at generating electricity power from kilowatts to the tune of megawatts and above. The generators are mostly gas turbines and steam turbines combined with electric motors and other components to produce the desired power. However, this outfit and its equipments have negative impact on the environment and human health through noise pollution. According to physics explanations, sound emanates from vibration that typically regenerates as an audible wave of pressure transmitted via gaseous, liquid or solid matters.

Human physiology as well as psychology perceives sound as the reception of waves as professed by the brain. Therefore, it is the belief of the human psychologist that humans are limited to hearing of sound waves specifically at pitches when the frequency is within 20HZ and 20KHZ, referring sound waves above the later as ultrasound and those below 20HZ as infrasound.

Collins (2018), defined sound as Vacillation in stress, constituent parts disarticulation, particle swiftness within a space perceived as a stimuli through the auditory organ.

Effective hearing is conceived when an individual decodes sound at high frequency of 20HZ to 20KHZ or 0-40 db when measured with audiometer. Therefore, hearing loss is a decrease in the knack to hear and

understand speech and other sounds at a high frequency. Hearing loss happens when there is deformity in the ear drum or nerves transmitting sounds to the brain is damaged. Sound beyond tolerate level of 90 db is considered as noise pollution, and such sound is dangerous and harmful to the inner ear (cochlea).

An exposure to excessive loud sound for a long period can cause hearing loss. Loud sound can damage cells and membranes in the cochlea. Exposure to loud sound for a long period can equally overburden hair cells in the ear, which can cause these cells to die or mutate. The loss in hearing progresses so long the exposure continues. Long time exposure leaves deteriorating effects even after the exposure period sometimes leading to permanent damage of the auditory neural system.

Should there be any form of permanent damage to the auditory system; neither surgery nor auditory aid can correct the hearing loss. Although, it is equally believed that short time exposure to loud sound above 90db could lead to temporary loss of effective hearing, such situation may return to normalcy after a short while but repeated short time exposure may equally cause tinnitus or permanent hearing loss.

Research has proven that loud sound can generate physical and psychological edginess, lessen efficiency, hamper effective communication and assimilation, as well as contribute to workplace accidents and injuries through barrier to hearing of warning alarms and signals. The effects of loud sound provoked hearing loss can be reflective, limiting workers ability to hear high frequency sounds, comprehend verbal communication, and critically blighting workers ability to communicate with one and the other.

How this loud sound affects the hearing efficiency of sound workers in IPP Okpai, is the major interest of this study.

Statement of the Problem

The harmful effect of loud sound otherwise referred as noise cannot be over emphasized; ranging from deafness, stress, increase in high blood pressure, headache, bridge in communication as well as accidents and injuries among sound workers. Despite several efforts put in place to reduce the adverse effects of noise on sound workers, the revolting impacts of sound still persist.

Therefore, the problem of this study is to assess the auditory variation among sound workers in IPP Okpai, Delta State.

Purpose of the Study

The purpose of this study is to ascertain the following:

1. Verify the auditory variation among individual workers in IPP Okpai
2. Ascertain if the workers losses hearing efficiency progressively
3. If the use of earmuff helps in reducing noise effect among the workforce
4. Analyze the auditory efficiency difference between sound and non sound workers in IPP Okpai

Research Question

The following research questions will guide this study:

1. Is there any auditory variation among individual workers in IPP Okpai?
2. Do the workers loss hearing efficiency over a long period of exposure to sound in IPP Okpai?
3. Do the sound workers in IPP Okpai use ear protection PPE?
4. Is there any significant difference in the hearing efficiency among sound and non sound workers in IPP Okpai?

Literature Review

Literatures relevant to this study were reviewed under Auditory health Effects, Noise induced auditory impairment, industrial noise induced hearing loss, age induced hearing impairment and therapy induced hearing impairment.

Auditory Health Effects

Loud sound is the predominant avoidable cause of hearing loss. Noise induced auditory impairment can be induced on a onetime exposure to an extreme whim sound e.g canon explosion or longtime exposure to loud sound level higher than 90db in an industrial plants.

The genetic facet of auditory induced hearing loss is the loss of auditory sensory cells in the cochlea. Because it is difficult for ear hair and cells to rejuvenate in humans, no diminution can arise; deterrence of

noise-induced hearing impairment is the solitary alternative to conserve hearing. Auditory impairment leading to hearing loss, can equally lead to lack of ability to comprehend verbal communication within work environment. Such hearing loss; can have adverse effect on the societal, cognitive concert and dwindling concentration to responsibilities. These situations can cause accidents of various magnitudes.

Industrial Noise Induced Hearing Loss

In spite of safety precautions put in place to ameliorate the adverse effects of loud sound within work environment, industrial induced auditory loss remains a quandary and a challenge to safety professionals globally.

In most advanced countries, there are legislations on health and safety regulations specifying maximum exposure levels to sound, quality assessment, audiometric test, noise reduction designs, auditory hardware and noise level monitoring device in every sound industry to protect the personnel from sound injuries.

Age Induced Hearing Impairment

Evidence shows that there is relationship between aging and hearing loss. Clinical research shows that people within the age of 40 years and above losses hearing efficiency. Ear and throat doctors asserts that children between the age of 0-20 decodes sound of +10 to -10db while adults of 40 years and above losses hearing efficiency. This implies that adults from 40 years exposed to loud sound lose hearing capacity rapidly than their counterparts not exposed to industrial noise.

Therapy Induced Hearing Impairment

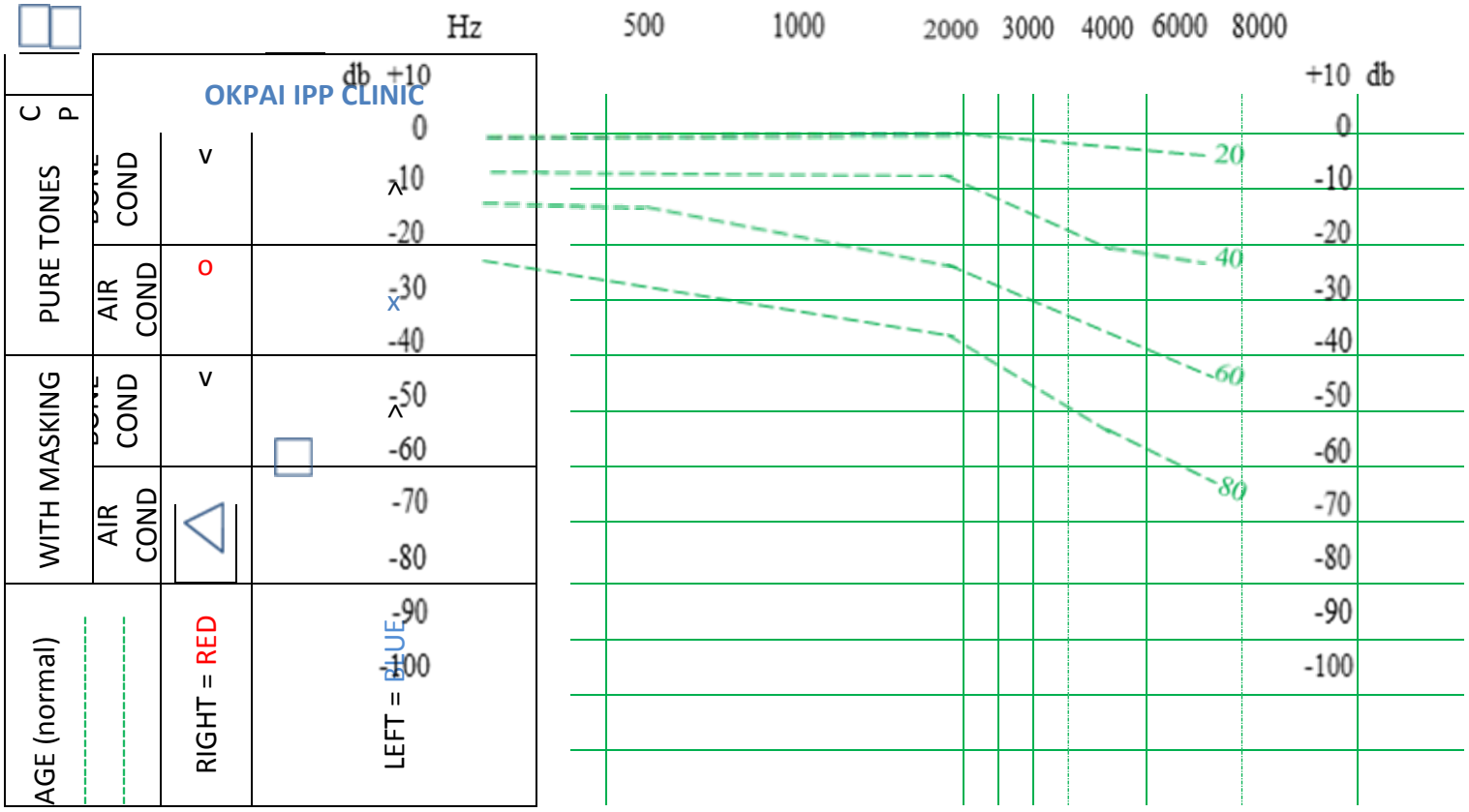
Therapy is drugs used for treatments of adverse illnesses from mere illness to complex illnesses. Medical report indicates that patients of meningitis and pneumonia who are treated with strong antibiotics that emit toxins are most likely to be victims of temporary loss of auditory efficiency. However, radiotherapist equally postulate that hearing loss occur during treatment of carcinoma. This kind of loss may be due to radio-emissions that kill most of the nerves and cells that transmit auditory information to the brain. Repeated use of such therapies could lead to permanent loss in hearing capacity. There is also a link to rhinitis where those with nose blockage hears at a very low frequency sometimes decodes information via sign language.

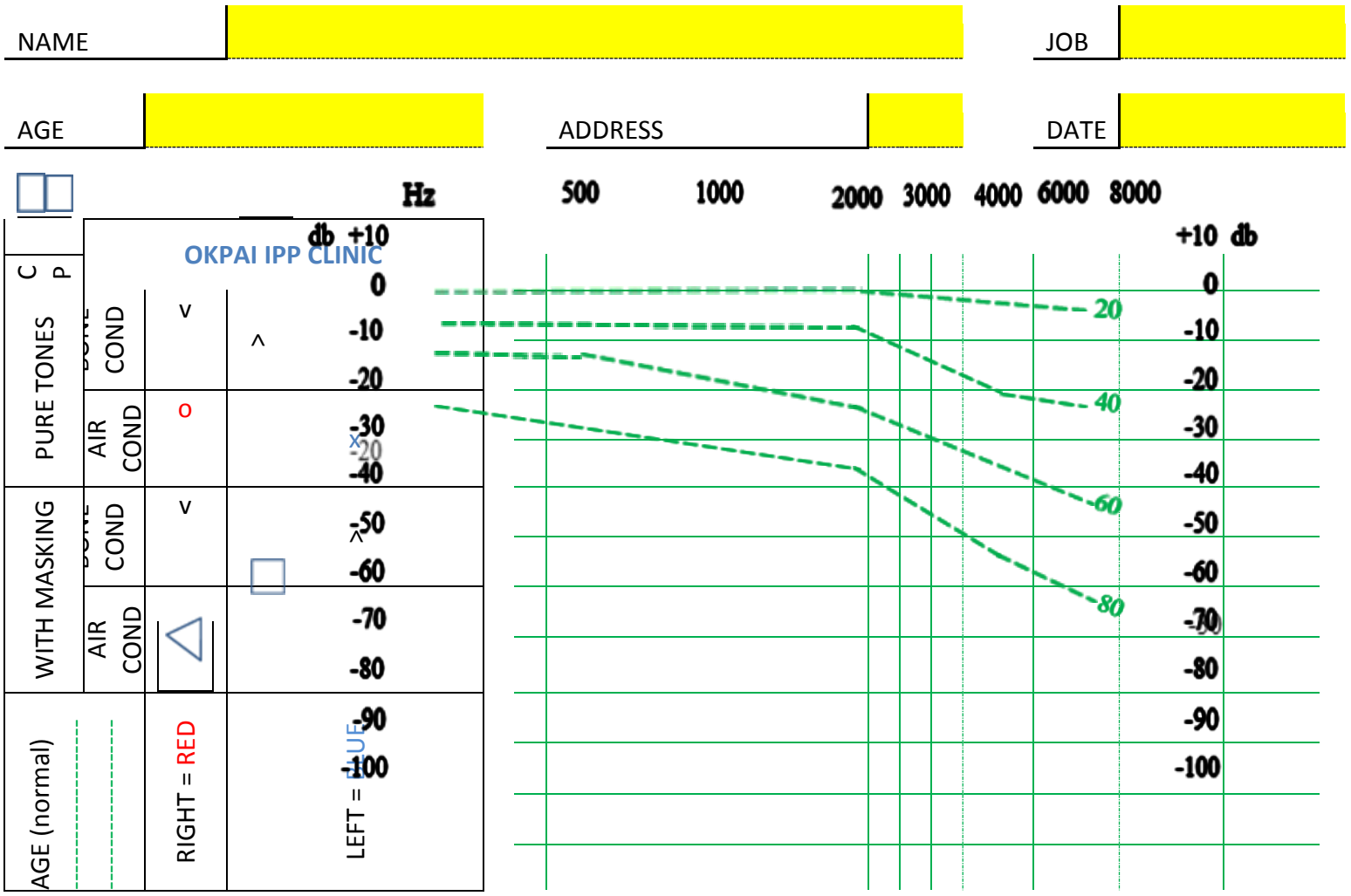
Despite therapeutic inducement, high level of noise is indomitable by noise exposure and longtime activities. Although no age is exempted, early childhood exposure to loud sound repeatedly could sum-up to cause hearing impairment through adulthood. However, there is evidence of biological deformity that could emanate during youthful age and worsen at old age.

Clinical Audiometric Result sheet

NAME | JOB

AGE | ADDRESS | DATE





The spreadsheet above indicates sound workers clinical biometric chat. The chat displayed sound frequency of 500 – 8000 Hz, +10 to -100db, age 20-80 years as well as left versus right ear audiometric efficacy.

RESEARCH METHODS

Area for the study

The study was carried out in IPP Okpai. IPP Okpai is located in Ndokwa East Local Government Area of Delta State, Nigeria. The site is an electricity generating plant with steam and gas turbines generating over 560 megawatts. The machines are heavy duty producing excessive noise level up to 90db. The plant accommodates over 120 sound and non sound workers.

Research Design

Experimental design was adopted in this work to elicit the audiometric efficacies of IPP Sound workers in Okpai.

Population of the Study

Population of this study comprised of all workers in independent power plant Okpai Delta State of Nigeria.

Sample and Sampling Technique

Stratified random sampling technique was used in selecting the sample size for this study. Stratified sampling technique was adopted to accommodate all departments as well as sound and non sound workers. Sound workers are here referred to: as those who work directly at areas where the noise level is above 90db. A total of 20 sound and non sound workers were selected for the study.

Instrument for Data Collection

The instrument used for data collection in this study is audiometer. Audiometer is an instrument that induces sound in varying frequency calibrated in decibel. Other instruments include the resource persons and data sheets.

Method of Data Collection

The sampled groups were subdivided into two. The experimental and the control group; both groups were subjected to the same audiometric test. The experimental group is those who work directly on loud sound areas while control group are those who work in offices and low sound prone areas. Each person in all the groups was subjected to consecutive three days test to avoid bias and to limit test errors.

Experimentation

An audiometer with headphone was used. The subjects wore headphone producing sound as a transmitter via the machine. The sound was induced from high to very low sound to determine the ultrasound to infrasound dictate audibility.

RESULTS

Table 1: Data Presentation for Experimental group

XY	Age 20-25	25-30	30-35	35-40	40-45	45-50	55-60	Day 1 A 0-15db B 15-25db C 25-45db A B C			Day 2 A 0-15db B 15-25db C 25-45db A B C			Day 3 A 0-15db B 15-25db C 25-45db A B C		
1	√	×	×	×	×	×	×	√	√	√	√	√	√	√	√	√
2	×	×	×	√	×	×	×	×	√	√	×	√	√	×	√	√
3	×	×	×	×	×	×	√	×	×	√	×	√	√	×	×	√

4	×	×	×	×	×	√	×	×	√	√	×	×	√	×	√	√
5	×	×	√	×	×	×	×	×	√	√	√	√	√	×	√	√
6	×	×	×	×	√	×	×	×	√	√	×	√	√	×	√	√
7	×	√	×	×	×	×	×	√	√	√	√	√	√	×	√	√
8	√	×	×	×	×	×	×	√	√	√	√	√	√	√	√	√
9	×	×	×	×	×	×	√	×	×	√	×	√	√	×	×	√
10	×	×	×	√	×	×	×	×	√	√	×	√	√	×	√	√

Table 2: Data Presentation for Control group

XY	Age 20-25	25-30	30-35	35-40	40-45	45-50	55-60	Day 1 A 0-15db B 15-25db C 25-45db A B C			Day 2 A 0-15db B 15-25db C 25-45db A B C			Day 3 A 0-15db B 15-25db C 25-45db A B C		
1	√	×	×	×	×	×	×	√	√	√	√	×	√	√	√	√
2	×	×	×	√	×	×	×	×	√	√	√	√	√	√	√	√

3	×	×	×	×	×	×	√	×	×	√	√	√	√	×	√	√
4	×	×	×	×	×	√	×	×	√	√	×	×	√	×	√	√
5	×	×	√	×	×	×	×	√	√	√	√	√	√	√	√	√
6	×	×	×	×	√	×	×	×	√	√	×	√	√	×	√	√
7	×	√	×	×	×	×	×	√	√	√	√	√	√	√	√	√
8	√	×	×	×	×	×	×	√	√	√	√	√	√	√	√	√
9	×	×	×	×	×	×	√	×	√	√	×	√	√	√	×	√
10	×	×	×	√	×	×	×	×	√	√	√	√	√	×	√	√

DISCUSSION OF RESULTS

Participants in table 1 above were 10 persons who were grouped into age groups of 20 to 60 years which is the retirement age for the sampled workforce. This same condition applies to the group in table 2.

In table 1 those within the age of 20-25 years, maintained consistent auditory efficiency of ultrasound to infrasound. The efficiency in this age group may be due to age limit and the fact that they are still fresher in the sound industry.

Those within the age of 25-30 still maintained an appreciable auditory efficacy, this result is due to the fact that age 20-30 falls within the same youthful age bracket and most of them are fresh school leavers who got the job within the last 2 years, as such the long impact of loud sound is yet to surface.

The result of those within 30-35 indicates that hearing loss has begun to ingrate. The result shows that they loss hearing between 0 – 15 db, although they hear very little or intermittent within sound level of 0 - 12 db at variance. The failure to decode sound at 10db may be due to regular phone calls as they tend to hear better through the left ear than the right ear.

The result in table 1 shows that those between age 35-40 years loss hearing of low sound between 0 to -15db totally. This lost indicates that they have worked in the loud sound area for more than 10 years and that age impedes hearing of low sound.

The result in table 1 displayed that auditory efficiency of workers between ages of 40-45 years is synonymous to the result of those between the ages of 35-40 years. This similarity may be due to age bracket and similar or close years of work exposure to loud sound.

The result of those between the age of 45 - 50 years as indicated in table 1 above differed a little, as most of this age loss hearing from 0-25db, only few heard little sound on day one. This claim may be related to the fact that the participants were over careful to listen may be due to anxiety.

The result of those between the ages of 55-60 years indicates that age is a major factor to auditory inefficiency. The result revealed that participants of this age loss hearing from 0-25db. This result maintained that hearing loss is relative to longtime exposure to loud sound.

In table 2, the result indicates that participants between the age of 20-25 had good auditory efficiency, although participant number 1 could not decode sound level between 15-25db on day 2 activity. This failure can be ignored due to the fact that he has already decoded sound level 0-15db on the same day. The loss in hearing in this case may be due to distractions, external noise or machine error. When compared to table 1, the result of both tables showed that those within the age of 20-25 years had very good auditory proficiency. However, this performance is not far from young age factor, less thinking and nascent to industrial loud noise exposure.

Those between ages 25-30 years in table 2 showed the same result as those between ages 20-25. This result is linked to age bracket and the fact that they are rarely exposed to loud sound in the work place. This result is familiar to the same age bracket in table 1. The familiarity could be due to the fact that they are young school leavers whom started work within few years of graduation as such; loud noise effect is still very insignificant to their hearing loss.

The result of participants between age 30-35 in table 2 indicates that those who work in low noise environments hears better than their counterparts that work in high sound environments. Although age affects hearing, but this result indicates that if people work in low noise area, the impact of age factor to hearing loss will be insignificant. When this result was compared to that of table 1, the results displayed that those within this age bracket whether sound or non sound workers still have good auditory efficiency.

The result of age bracket 35-40 as in table 2 shows that those working in low noise area hear well than their counterparts in the noisy area. The result is closely related to that of 30-35 above. The relationship is due to age bracket and years of service in the company's operation. However, when compared to that of the same age bracket in table 1 above, it varies significantly due to sound exposure. This result affirms the fact that those who work in noisy environment are more prone to hearing loss.

For age bracket 40-45 in table 2, the result indicates that none of the participant could hear sound between 0-15db. This result is the same with the result of table 1. The implication of this result is that whether high noise or low noise, from the age of 45 hearing efficiency tends to depreciate gradually due to age factor and longtime use of cell phones.

Age 45-50 as indicated in table 2, varies slightly with that of age 40-45. When compared with the same age bracket in table 1, the result was the same. This consistency with sound workers may be due to the fact that sound workers within this age bracket are more mindful of the negative impact of loud sound to their hearing competency; as such they make use of ear protection wears than those below their age limit. Although the two results still maintained that those within the age 45-50 loss hearing efficiency mostly at low sound of 0-15db and sometimes up to 20db and above as their efficacy is seen between 25db considered high sound audibility.

In the case of participants between ages 50-60 as in table 2, the participants showed good hearing efficiency when compared to their counterparts in table 1. In table 1, those between age 50-60 are efficient in high level of sound between 30-48db. When they were exposed to sound below 20db they were receptive while non sound workers were still efficient in hearing sound within 20db. However, these results showed that old age is an indicator of hearing loss among those above 50 years of age.

The results answered the research questions above that;

1. There is auditory variation among individual workers in IPP Okpai
2. The workers loss hearing efficiency over a long period of exposure to loud sound
3. The sound workers in IPP Okpai do use earmuff which reduces the impact of noise to their ears
4. There is significant difference in the hearing efficiency among sound and non sound workers in IPP Okpai hence sound workers records lower efficiency than their counterparts.

CONCLUSION

The negative effect of loud sound to hearing impairment cannot be overemphasized. Hearing loss has a lot of negative impact on the society at large. Hearing loss impedes effective communication among pairs and work group. It causes accident in workplace and slows down production. High noise leads to so many health challenges like headache, stress, fatigue, raise in blood pressure and provocateur of other illnesses among other ill factors in workplace. Therefore, preventive and control measures are very crucial in any given society. Age is seen very relative to hearing loss, therefore frequent monitoring of workers between ages of 40-60 years is paramount.

RECOMMENDATION

Based on the findings from this study, the following recommendations are made:

1. There should be a strong legislation to limit noisy machines within power plants.
2. Yearly audit of audiometric record for all workers should be encouraged.
3. The HSE department should be very forceful on the use of earmuff within the work environment.
4. Non compliance to the regulatory rules should be a punishable offence
5. Adults should reduce direct ear-phone usage rather phones should be used on loudspeakers.

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