

# An Analysis of a Hearing Conservation Programme (HCP) at a Mining Company in Zimbabwe

Godfrey Mutara<sup>1</sup> Ngonidzashe Mutanana<sup>2\*</sup>

1.Lecturer- Department of Health Sciences: Zimbabwe Open University, Mashonaland West Region P O Box 285, Chinhoyi Zimbabwe

2.Part-time Lecturer: Department of Counselling: Faculty of Applied Sciences, Zimbabwe Open University, Mashonaland West Region P O Box 285, Chinhoyi, Zimbabwe

\*E-mail of corresponding author: [ngonidzashemttn31@gmail.com](mailto:ngonidzashemttn31@gmail.com)

## Abstract

The study sought to carry out an analysis of a hearing conservation programme at a mining company in Zimbabwe. To answer the research problem, researchers used a descriptive survey design in which the target population were underground employees at the company. A sample of 120 employees was selected using the stratified random sampling technique and the researchers used two research instruments; questionnaires and a focus group guide. Findings revealed that the mine under study is providing Hearing Protective Devices (HPD) and the majority of the workers are making use of them. The Hearing Protective Devices being provided by the company are plugs, noise ban customised hearing devices, and the ear muff. The company is also doing well in carrying out audiometry test because they are done annually. In view of the findings and conclusions drawn from the study, the researchers strongly recommended that Line managers and SHERQ practitioners should strictly inspect and enforce the usage of HCP by all employees in their area of control. The researchers also strongly recommended the company to employ a resident audiologist on site so that employees with deviations are assisted promptly.

**Keywords:** Hearing Conservation Programme, Induced Noise Hearing Loss, Hearing Protective Device, Audiometry Test, Mining

## 1.0 Introduction

The sense of hearing is one of the most important senses to a human being. It allows speech development which helps in the complex interaction of the human race. Excessive noise in the workplace can limit worker's ability to communicate and hear warning signals and has an effect on their safety and productivity (Hermanus, 2007). Despite issuance of ear protective devices to employees, cases of noise induced hearing loss continue to appear in occupational reports in Zimbabwe. The research paper therefore explored what Zimplats (Ngezi Mine), a mining company situated in Zimbabwe is doing to prevent and minimize the loss of this delicate sense of their employees.

## 2.0 Background

The Occupational Health Southern Africa (2012) notes that the processes associated with mining generate tremendous noise as a result of activities such as percussion drilling, blasting, crushing ore and machine engines. As this is often exacerbated by confined and reflective spaces, the Occupational Health Southern Africa also observes that this highly exposes the miners to the development of Noise Induced Hearing Loss (NIHL).

Occupational Noise Induced Hearing Loss has been described as acquired hearing deficiency directly attributed to excessive workplace noise exposure and unlike most occupational injuries there is no visible evidence in noise induced hearing loss. It often goes unnoticed when it occurs first and accumulates over time so much that the effects are realized long after the damage has been done. However, the damages are permanent and irreversible.

Chadambuka et al (2013) posit that excessive noise attributes to approximately 37% of all adult cases of hearing loss and remains a significant contributor to employment related morbidity internationally and that globally, over 275 million people are affected and 80% of them are in low and middle income countries. The World Health Organization (1997) strongly believe that Noise Induced Hearing Loss is the most common permanent and preventable occupational illness in the world.

In the United States of America (USA), about 9 million workers are exposed to Time Weight Average (TWA) sound levels of 85dBA and about 10 million have noise induced hearing loss (US POL-OSHA, 2002). The USA National Institute of Occupational Safety and Healthy (NIOSH) also reports that 80% of USA miners work in an environment in which noise levels exceed the legislated permissible exposure limit. The study has shown that noise exposure ranges from 82-103dBA. To this end, it can be noted that noises in workplaces have a heavy impact on health around the world because millions of years of healthy life are lost due to Occupational Noise Induced Hearing Loss (ONIHL).

Noise induced hearing loss represents a much heavier burden in developing countries like Zimbabwe

than in the developed regions of the world. This is mainly due to lack of noise prevention programmes and awareness on the consequences of the excessive noise exposure. Chadambuka et al (2013) have also discovered that social noise exposure has increased over the last 10-15 years due to attendance at discos, night clubs and earphone use.

In a recent study, investigating the profiles of noise exposure in South African Mines, there is an indication that the mean noise exposure levels in South African Mining Industry range from 63.9 – 113dBA and that approximately 73.2 % of mines in the industry are exposed to noise levels above the legislated occupational exposure limit of 85dBA. The study also observed that prevalence rate of NIHL is 3.1 cases per 1000 employees (Occupational Health Southern Africa, 2012)

In Zimbabwe, the Factories and Works Act Chapter 14.08 requires employers to take all the practical steps for the health of employees and persons lawfully on the premises. NIHL is within the top five occupational illnesses in Zimbabwe and among the top three compensable occupational illnesses after backache and pneumoconiosis. Zimbabwe has a law which specifically protects workers exposed to several hazards in industry including mining establishments. In a survey conducted at a nickel mine in Zimbabwe, NIHL prevalence was at 27.4%, 42% being mild loss, 28.8% being moderate and 28.8% being moderate to severe of which 60% of these were 50 years and above (Chadambuka et al, 2013)

Zimplats (Ngezi Mine) is the largest platinum mine in Zimbabwe that engages in underground mining and processing of platinum group metals and it is a member of the Impala Group. Its operations started in December 2001 undertaking opencast mining, which was later changed to underground mining in December 2008. It has four operational mines and a processing plant. Like most mines, large and loud machinery is used in rock drilling, breaking, crushing and transportation of the ore. The machinery includes the Load Haul and Dump (LHD), Dump Trucks, Drill Rigs, Bolters and Rock Breakers, all of which produce noise in excess of 85dBA. In the Impala Group FY13 Occupational Health report, Zimplats reported two cases of NIHL. The average time exposure for underground workers per shift is 10 hours for seven continuous days followed by three-four days break in between shifts. Given that the fact that the minimum age of entry is 21 years and that the retirement age is 60 years, without adequate workplace hearing conservation programme noise induced hearing loss could be inevitable.

Many workers lose their jobs once hearing has been affected. They also cannot be employed in any other industry and this has a direct impact on one's income. NIHL is also associated with psychological problems of stress, anxiety and depression, reduced ability of employee to communicate and hear warning signals and productivity. It also impacts negatively on other workers, results in reduced quality of life, raises blood pressure and causes sleep problems. Employees look forward to working hard when young in preparation to a comfortable good quality life when we retire. Sadly, patients with NIHL are robbed of this comfort and quality of life in their retirement.

Companies also bear the consequences of NIHL because they are forever paying higher and higher amounts of money in compensation fees to individuals and families and there is increased litigation. Companies also loose skilled manpower because the most skilled and productive manpower is often the one affected by NIHL. There also high costs of setting up and maintenance of an effective hearings conservation programme.

### **3.0 About the study**

Zimplats is a fairly new player in the mining industry that once recruited experienced and seasonal miners from other mines. As a result it took over some inherent hearing loss of some degree that are slowly maturing into NIHL, since this is a slow and insidious disease and slowly accumulates over time. Its effects are realized long after damage has been done. There are cases of Induced Noise Hearing Loss being closely monitored and the affected individuals are receiving counselling on the importance of wearing Hearing Protection Devices. There is loss of skilled manpower due to early retirements, costly compensation to those affected by the National Social Security Authority. The quality of life of employees is adversely affected as the hearing loss affect their communication skills and develop other health problems which include raised blood pressure and stress. It was against this background that the researchers were motivated to analyse the Zimplats Ngezi mines hearing conservation programme.

## **4.0 Methodology**

### **4.1 Research Setting**

The study was conducted at the Zimbabwe Platinum Mines, (Zimplats) which is situated along the Zimbabwean Great Dyke 150 kilometres south west of Harare, Zimbabwe's capital. Zimplats currently operates four shallow mechanised underground mines, namely Ngwarati, Rukodzi, Mupfuti and Bimha and a processing plant at Ngezi. The Selous Metallurgical Complex (SMC), is located 77 kilometres north of the mine and comprises of a concentrator and smelter. Zimplats currently employs 5 704 people including contractors (Impala Platinum Limited Report, 2014)

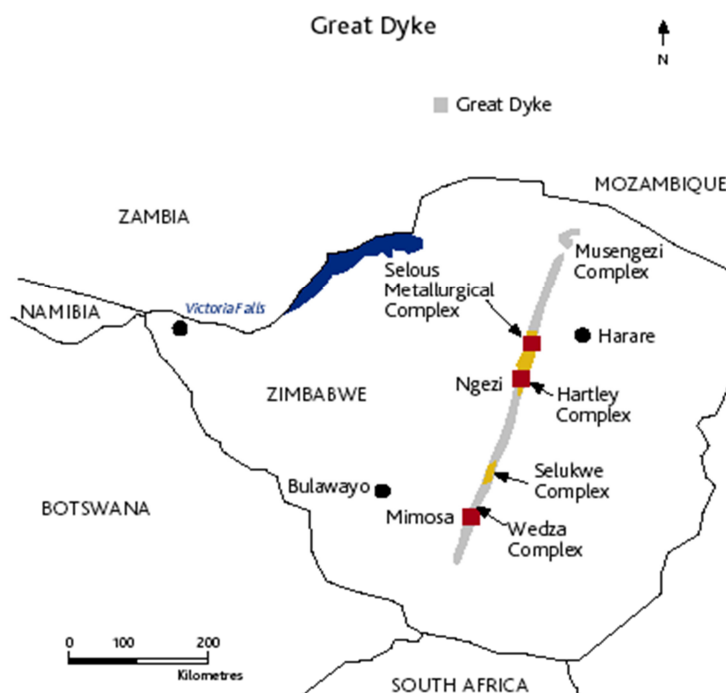


Figure 4.1: The map of study area located 150km from Harare along the Zimbabwean Great Dyke, Impala Platinum Holdings Limited Annual Report (2004)...

#### 4.2 Research Methods, research design and data collection

The study adopts a mixed mode approach in which both qualitative and quantitative paradigms were used. The quantitative aspect entails obtaining quantitative data through questionnaires' and describing, recording, analysing and interpreting results through the use of statistical analysis. The qualitative approach entails data collection using in-depth interviews. This qualitative approach will also assist the researcher to obtain the emic (insiders) view of issue and events.

Leedy (1997) defines a research design as a "detailed plan before work on the project begins". Since the current study is all about analysing the Hearing Conservation Programmes at a mine in Zimbabwe, it also seeks the perceptions of workers towards the programme. To this end, the major research design adopted was the descriptive survey strategy. Leedy (1997) argues that surveys are the best designs to adopt where perceptions, views and beliefs of subject are sought. Best and Khan (1993) perceive that descriptive surveys describe and interpret what it is concerned with, conditions or the relationships that exist, opinions that are held, processes that are going on, effects that are evident or trends that are developing. This form of research design is meant to give a descriptive detail of the problem. The descriptive survey was chosen because data obtained can be presented and analysed using both qualitative and quantitative methods. As such, the study employed two research instruments to collect data for analysis and these are questionnaires and focus group guide.

The target population were Zimplats underground employees from the four underground operations, namely Ngwarati, Rukodzi, Mupfuti, and Bimha mines. Since Zimplats is a large operation 30 employees from each department were randomly selected from each strata (i.e. by occupation) and this ensured a true representative of the population. To this end, a total of 120 employees took part in the survey. To ensure inclusion in the sample, the respondents met the following criteria; male or female respondents aged 20-59 years working underground shift where personal protective hearing devices are used on day and night shift workers. These participants were general hands, artisans and machine operators or team leaders.

#### 4.3 Study Limitations

The study suffered from methodological limitations particularly in the sample size. The study focused on only one mining company, Zimplats (Ngezi Mine). However, the number of respondents for the study was large enough to ensure a representative distribution of the population and to be considered representative of groups of people to whom results will be generalized or transferred.

#### 4.4 Data Analysis

Data was presented and analysed through qualitative thematic analysis, which involves the drawing up of themes from data collected through qualitative means. Pie charts, bar charts, line graphs and tables were also used in

presenting quantitative data.

### 5.0 Results and Findings

The main objective of the study was to carry out an analysis of the Hearing Conservation Programmes at Zimplats (Ngezi Mine) in Zimbabwe. To this end, the researchers explored the various strategies being used at Zimplats Mines in preserving the employees’ sense of hearing and evaluated the effectiveness of these strategies. A total of 110 participants responded to questionnaires with remaining 10 participating at a focus group discussion.

#### 5.1 Strategies being used at Zimplats Mines in preserving the employees’ sense of hearing

The researchers started by exploring the strategies that are used at Zimplats Mines in preserving the employees’ sense of hearing. To this end, the researchers carried out an investigation on the protective devices that are used by employees when they are working, the type of devices that they use, the education that the employees receive in how to use these devices and how often they have had their devices changed.

##### 5.1.1: Do you always use protective devices when you are working?

N:-110

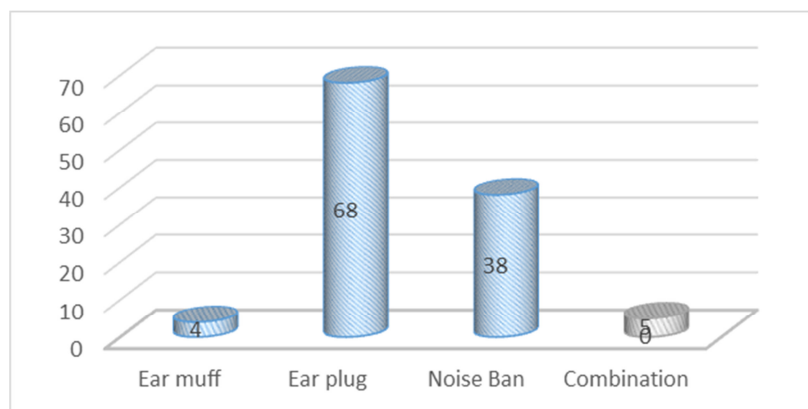
Occupation	Always	Percentage	Sometimes	Percentage	Never	Percentage
General Hand	21	52%	17	43%	2	5%
Operators	32	80%	8	20%	0	0%
Team Leaders	11	55%	7	35%	2	10
Artisan	4	40%	4	40%	2	20%
TOTAL	68	62%	36	33%	6	5%

**Table 5.1: Distribution of Respondents by Personal usage of Hearing Protective Device when working**

Table 5.1 above shows that 68(62%) of the respondents indicated that they have always used Hearing Conservation Programme (HPD) devices when working. Results also show that operators (80%) are the most users of these devices with the Artisans (40%) being the least group. Results show that 36(33%) of the respondents stated that they sometimes use HPD. From this group, it would appear General Hands (43%) are the most exposed as they have the highest number followed by artisans (40%). This may be attributed to the fact that there is low perceived susceptibility severity and benefits (Health Belief Model). They have no experience with noise induced hearing loss due to little exposure in the mining industry. In a focus group discussion, the participants indicated that hearing protective devices are provided by the company and some make use of them, whereas others do not use them. Further probed why they are not using these devices when they have been offered by the company, a participant remarked, “ah zvinobhowa izvi” (they are so boring) implying that some workers have a negative attitude towards the devices. What this shows is that the mining company is providing hearing devices, but it may be suffering a setback from some employees who have an attitude problem.

##### 5.1.2 What type of protective device do you use?

N:- 110



**Fig 5.1 Distribution of respondents by type of hearing protective device used**

Fig 5.1 shows that 68(62%) of the respondents wear ear plugs, 38(36%) use the noise ban customised hearing protective device and 4(4%) use the ear muff as personal protective devices. None of the respondents use the dual protective method contrary to the Centre of Disease Control (2012) belief that there is no single “best” type for individuals or situation. Using a combination of ear plugs and ear muffs is recommended for exposures that

exceed 100 db (A). Findings at a focus group discussion also revealed that the majority use ear plugs and they remarked they have never used the dual protective method.

5.1.3 Where you educated in the use of the Hearing Protective device?

All the participants (100%) agreed that they had received education prior to the usage of HPD. Findings from a focus group discussion also revealed that the workers receive demonstration in how to use these devices, which is critical so that employees learn the right way of wearing their hearing protective device.

5.1.4 How often do you have your devices changed?

N-110

Type of HPD	Total users	3 months	6 months	12 monthly	Servicing
Ear Plugs	68	8	49	11	0
Noise Ban	38	0	0	2	0
Ear Muff	4	0	0	0	0

Table 5.2: Distribution of response by frequency of hearing protective device change

Results on table 5.2 indicate that only 8 of the 68 ear plug users stated that their hearing protective devices are changed every 3 months which is the recommended period. The majority of ear plug users 49 have theirs changed bi-annually. The remaining 11 had their hearing protective device changed yearly. All of 38 noise ban users cited that their HPD have never been serviced since they were issued. Findings from a focus group discussion revealed that there is no specific time frame on changing of hearing protective devices. Some participants remarked that these devices are changed whenever it is necessary. What it shows is that there is no adherence to the stipulated period of device change or service.

5.2 An Evaluation on the effectiveness of the Hearing Conservation Programmes

The researchers also carried out an evaluation on the effectiveness of the Hearing Conservation Programmes. As such, they investigated on the annual medical examination of employees, whether the employees have had their ears examined, the audiometry test performed on each examination and the adequacy of medical intervals.

5.2.1 When was your last annual medical examination?

N-110

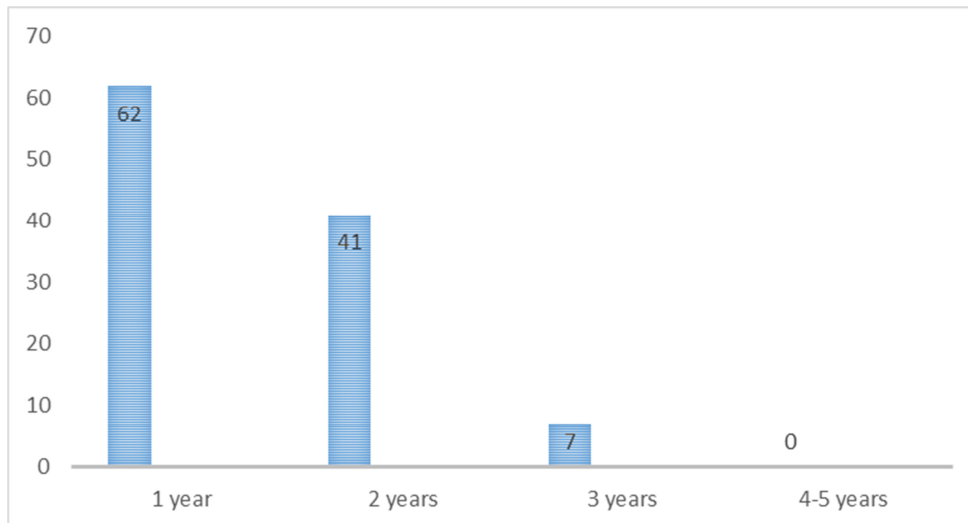
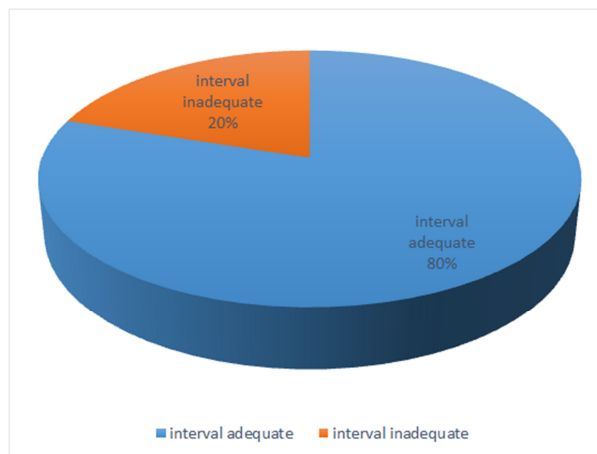


Fig 5.2: Distribution of the responses by annual medical intervals

Results on figure 5.3 above shows that 62 (52%) of the respondents have yearly annual medical examination, 41(37%) had an annual interval of 2 years and 7 (6%) had an intervals of 3 years. Findings from a focus group discussion revealed that there are some employees in underground employment who do not have yearly audiometric tests as indicated in the hearing conservation programme document.

## 5.2.2 Have you ever had your ears examined?

N-110



*Fig 5:4 Distribution of Responses by adequacy of medical intervals*

As shown in fig 5.4 above 22 (20%) of the respondents expressed that the time interval is too long considering the long working shifts in noisy environments. The majority of the respondents 88 (80%) felt that the yearly intervals is adequate. Findings from a focus group discussion also revealed that yearly intervals are adequate.

## 6.0 Discussion

The majority of employees at Zimplats Mine are always using Hearing Conservation Programme (HCP) devices when working as should be the case since the environment is usually noisy. Similarly, the Occupational Safety and Health Administration (2013) claims that the HCP aim is to prevent initial occupational hearing loss, preserve and protect remaining hearing, and equip workers with the knowledge and protective devices necessary to safe guide themselves. Kock (2013) highlighted that according to the regulations HCP devices should be provided free of charge by the employer and they should be supplied new and unused. Fitting should be done by a competent occupational health practitioner and these should be inspected and monitored for quality and effectiveness. However, it would appear the majority of the general hands and artisans at the mining sites are the most exposed to Induced Hearing Noise Loss followed by artisans. This may be attributed to the fact that there is low perceived susceptibility severity and benefits (Health Belief Model). They have no experience with noise induced hearing loss due to little exposure in the mining industry.

Investigations also revealed that workers at the mining sites are using the following hearing devices; ear plugs, the noise ban customised hearing protective device and the ear muff as personal protective devices. None of the respondents use the dual protective method contrary to the Centre of Disease Control (2012) belief that there is no single “best” type for individuals or situation. Several studies have recommended the use of combined ear plugs and ear muffs for exposures that exceed 100 db (A). Byrne (2005) provide the following three types of HPD; insert type – ear plugs that are placed in external auditory meatus and seal against the walls of the meatus, muff-type devices seal against the head around the pinna and Canal Caps sealed protectors – provide an arousal seal right at the enhance of the external ear canal acoustic helmet. According to SANS 1451-1 (2008) as quoted by Kock (2013), the factors that should be considered when choosing HPD are SAZ Certification, sound attenuation requirements, wearer’s comfort, working environmental and activity, medical disorders and compatibility with other head gear. For the WorkerSafeBC (2014) temperature, climate and communication should considered for the wearer as well.

The Washington Audiology Services (2013) strongly believes employers are required to provide a minimum of two types of hearing protectors to noise exposed workers. On the other hand, Steenkemp (2011) highlights that Hearing protective devices are not uniform and not standardised. The National Occupational Exposure Survey conducted by NIOSH (1996) stated that management cannot apply all aspects of a hearing conservation program entirely, workers are not equally exposed to noise, monitoring audiometry and hearing protection. As quoted from the Centre of Disease Control (2012) in a presentation by Hudak, there is no single “best” type for all individuals or situations. Using a combination of ear plugs and ear muffs is thus recommended for exposures that exceed 100dB (A). Examples of such areas include, continuous miners, mine bolters underground auxiliary fans and coal processing equipment.

All the participants agreed that they had received education prior to the usage of HPD. The Canadian Centre for Occupational Health and Safety (2012) clearly states that Hearing Conservation Programs (HCP) include noise assessment, hearing protector selection, employee training and education, audiometry testing,

maintenance, inspection, record keeping and program evaluation. To this end, the mining company is doing well in educating its mining workers in how to use protective devices before they use them.

Zimplats Mine conducts yearly annual medical examination. The medical department is adhering to the hearing conservation program. Audiometric test are also done during their annual medical examinations. Berrymn et al (2009) believe audiometric testing is necessary to confirm a hearing deficit. According to the UM Policy (2002) supervisors should ensure employees receive follow up audiograms within one year of the baseline. For Kock (2013) employees who are exposed to noise above 85dB or are required to enter noise zones should have undergone audiometric examination. Routine audiometric tests and medical examinations are compulsory annually. Azizi (2010) supports this argument when he states that employees with following conditions are more susceptible to NIHL therefore they require close monitoring and screening should be thorough in order to identify new cases like rheumatoid, arthritis, hyperlipidaemia, increased age, smoking, diabetes mellitus and ototoxic drugs.

## 7.0 Conclusion

Following the above findings, the researchers concluded that the mine under study is providing Hearing Protective Devices and the majority of the workers are making use of them. However, it would appear the HPD conservation programme is suffering a setback from some employees who do not want to use them, for instance General Hands and Artisans. The hearing Protective Devices being provided by the company are plugs, noise ban customised hearing devices, and the ear muff. However, none of the workers are using the dual protective method, a standard that is recommended by several researchers. The company is doing well in educating workers how to use these devices as affirmed by all the workers that the company provides a demonstration before they use them. The researchers also concluded that some of these devices are changed occasionally, whereas some are changed when it is necessary. Finally, the researchers observed that the company is doing well in carrying out audiometry tests during annual medical examinations. To this end, the medical interval has been found to be adequate for the employees.

## 8.0 Recommendations

In view of the findings and conclusions drawn from the study, the researchers strongly recommended that Line managers and SHERQ practitioners should strictly inspect and enforce the usage of HCP by all employees in their area of control. Punitive action should be taken against those who do not comply so that incidences of NIHL are reduced. The researchers are also strongly recommending the company to employ a resident audiologist on site so that employees with deviations are assisted promptly. Hearing conservation awareness campaigns should also be conducted half yearly to all employees to raise the perceived severity, benefit and susceptibility amongst undergoing employee.

## References

- Azizi M.H (2010). *Occupational noise-induced hearing loss*. Tehran
- Berrymn, P., Meyer, D., Summey, R.N., Sceessele, D., Atwell, T., Ostendorf, J., Randolph, S., & Buckheit, K. (2009). *What makes a successful hearing conservation programme?* AAOHN Journal Volume 57 no. 8.
- Best, J.W & Khan J (1986) *Research in Education*. Allyn and Bacon, Boston.
- Occupational Health and Safety Environmental Safety Division (2012). *Life can be loud*.
- Bryne. D.C (2005). *A Model Hearing Conservation Programme*. Mining Hearing Workshop June 21-22 2005. Pittsburgh Laboratory.
- Centres for Disease Control and Prevention (2001). DHHS (NIOSH) Publication Number 2001-103: Work Related Hearing Loss. Retrieved from <http://www.cdc.gov/niosh/docs/2001-103/>
- Chadambuka, A., Mususa, F. & Muteti, S. (2013). *Prevalence of noise induced hearing loss among employees at a mining industry in Zimbabwe*. African Health Sciences Volume 13, Issue 4.
- Hermanus M. (2007). *Occupational health and safety in mining-status, new developments, and concerns*. The Journal of the South African Institute of Mining and Metallurgy, Volume 107, 2007
- Kock J.F.W (2013) *Hearing Protection in Mining Evaluating the Noise Clipper Custom made Hearing Protection Device*. Pretoria
- Leedy. P. D (1985) *Practical Research, Planning and Design*. McMillan, London.
- WorkerSafeBC (2014). *Classification rate*. Canada.
- McBride D.I. (2004). *Noise Induced Hearing Loss and Hearing Conservation in Mining*. Occupational Medicine Volume 54 pg 290-296.
- National Institute for Occupational Safety and Health (NIOSH) (1998). Criteria for a Recommended Standard: Occupational Noise Exposure. Revised Criteria 1998. [Http://www.cdc.gov/niosh/98-126.html](http://www.cdc.gov/niosh/98-126.html). National Institute for Occupational Safety and Health. Cincinnati.
- Nelson, D.I. Nelson, R.Y. Concha-Barrientos, M. Fingerhut, M. (2005). *The global burden of occupational*

- noise-induced hearing loss* American Journal. Industrial Med. 2005 December; 48(6): 446-58 PMID: 16299704
- Occupational Safety and Health Administration (2013). OSHA Technical Manual (OTM): Appendix E-Noise Reduction Rating. Retrieved from [https://www.osha.gov/dts/osta/otm/new noise/appendix.pdf](https://www.osha.gov/dts/osta/otm/new%20noise/appendix.pdf)
- NIOSH (1998) *Health hazard evaluations: Noise and Hearing Loss*. 1986 – 1997 <http://www.cdc.gov/niosh/hearloss.html> accessed 22 February 2005
- Steenkamp R.J (2001). *Total quality occupational noise control: combat noise-induced hearing loss and promote quality of work life*: Paper Presented at the 45<sup>th</sup> EO congress, Istanbul Turkey.
- UM Policy (2002). *Hearing Conversation Programme*. University of Maryland.
- US Department of Health and Human Services (1998). *Criteria for a recommended standard, Occupational Noise exposure, Centres for disease control and prevention*. NIOSH Cincinnati, Ohio
- WHO (1997) *Strategies for prevention of deafness and hearing impairment. Prevention of Noise-induced Hearing Loss*. Geneva <http://www.who.int/pbd/deafness/en/noise.pdf> accessed 12 April 2005
- Zimbabwe Government. *Factories and Works Chapter 14.08*. Printers 1996



The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:

<http://www.iiste.org>

### CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

**Prospective authors of journals can find the submission instruction on the following page:** <http://www.iiste.org/journals/> All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

### MORE RESOURCES

Book publication information: <http://www.iiste.org/book/>

Academic conference: <http://www.iiste.org/conference/upcoming-conferences-call-for-paper/>

### IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digital Library , NewJour, Google Scholar

