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RESEARCH ARTICLE

The study of hearing threshold of workers in an industrial company: A comparison of those who wear earplugs correctly and those who do not

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Abstract

The aim of this study was to compare the outcome between workers who wore earplugs correctly compared to those who do not. Our objective was to observe whether the company's worker is wearing earplugs correctly or not, and to obtain the audiometrical data concerning those who wore an earplug correctly compared to those who do not. The study was conducted in a company held in Bahrain at summer 2016. The type of study which was conducted was cross-sectional study which is a type of observational study that involves the analysis of data collected from the company workers who wear earplugs correctly and the experimental group who wear them incorrectly. The method which was used was an assessment sheet and an audiometrical device which is a machine that evaluates hearing acuity and determines the degree and type of hearing activity. The assessment sheet included the worker's personal data (name, badge number and department), information regarding the use of earplugs correctly or not, and the audiometrical results. The major findings that we found from our results is that there's a signification association between wearing earplugs and department only. However, there is no correlation between wearing ear plugs correctly and age, position and occupation. In conclusion, the workers that wore the ear plugs correctly had a better hearing threshold then those who did not. With the majority of worker who had hearing loss were from the oil and processing department, which is known to be the noisiest department.

Keywords: Hearing, earplug, hearing loss

1 | INTRODUCTION

Do you often ask people to repeat their question or frequently get complaints from people that the TV is too loud, well you might be suffering from a hearing problem? It's no surprise that you might find yourself having symptoms of hearing loss since we live in a developing world, with noisy vehicles and buzzing machines everywhere. Especially in factories where the workers are surrounded by big machines that exert great noises which result in such a great occupational hazard.

Occupational hazard is the maintenance and promotion of health workers from risk factors arising from physical and chemical exposures in their work. By this definition one might say that having noise in the work place might be one of the greatest occupational hazards a worker might face. According to The Bureau of Labor Statistics which is the main fact-finding agency for the Federal Government in the broad field of labor economics and statistics, nearly 125,000 workers that are occupationally exposed to hazardous noise have suffered permanent hearing loss. They also have stated that in 2009 alone there were more than 21,000 hearing loss cases. In addition, "The National Institute for Occupational Safety and Health (NIOSH) has recommended that all worker exposures to noise should be controlled below a level equivalent to 85 dBA for eight hours to minimize occupational noise-induced hearing loss"[1].

The Bahraini company that we are working with is known for being an important contributor to modern Bahrain, accounting for a significant portion of the region's energy-related activities. It is also known for having a loud environment in its working place which makes workers more likely to be exposed to various noises, making them more prone to having hearing problems. By that it is very significant to conduct such a research in order to identify the effect of this issue. It should be noted that all workers have been instructed on the use of earplugs briefly, and correct fitting instructions have been displayed around the company through poster campaigns. However, the aim of this study is to compare between workers who wear earplugs correctly and those who do not, in order to emphasize the importance of wearing earplugs. Our approach will be directed by using an audiometer.

For the past two decades, several studies were conducted regarding occupational hazards, especially in facilities where extremely loud noises have significant and direct effects that result in hearing loss.

A study was conducted by Al-Otaibi, in Saudi Arabia in 2000, which was about occupational hearing loss issues. He concluded that chemicals hazards have a negative effect on the anatomy and physiology of the ears[2].

Another study was conducted by G.W Hughson and others in the United Kingdom, 2002. It was about the behavioral studies of people's attitudes to wearing hearing protection and how these might be changed. This study showed that although the companies apply hearing protection programs, these are not always effective and successful[3].

In addition, in Nigeria, a study about Occupational exposure to noise and patterns of hearing threshold among factory workers was conducted in 2014 by Osisanya and others. The study showed that there is a positive correlation between noise and hearing loss[4].

Moreover, as an outcome of the World Health Organization program for Prevention of Deafness and Hearing impairment (WHO-PDH), which was in Eastern Mediterranean in 1997, about Noise-Induced Hearing Loss (NIHL). The meeting had emphasized that there is a need to increase awareness about the harmful effects of noise on hearing and also showed that occupational noise is still a major problem in developing countries5.

The aim of this study to compare the outcome between workers who wore earplugs correctly compared to those who don't.

Supplementary information The online version of this article (https://doi.org/10.15520/mcrr.v4i07.174) contains supplementary material, which is available to authorized users.

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2 | MATERIALS AND METHODS

The type of this study was a cross-sectional study which involved the analysis of data collected from the Bahraini oil company workers who wear earplugs correctly and the experimental group who wear them incorrectly. As for the data sources, The Bahraini oil company workers were chosen randomly from different departments. The sample size was 448. The data was obtained via an assessment sheet and audiometric device. The assessment sheet included the worker's personal data (name, badge number and department), information regarding the use of the earplugs correctly or not, and the audiometrical results. Our hypothesis is that those who do not wear ear plugs properly will suffer from hearing problems and the ones who do wear it correctly will not be affected. The Bahraini oil company and Arabian Gulf University gave us the approve to conduct this study and collect data from the Bahraini oil company workers. Data was analysed with Statistical package of social sciences (SPSS version 23.0) program.

3 | RESULTS

The results were taken from the study which was conducted on Bahraini oil company's workers. The sample size was 448 (83.3%). The results we found divided in to several conclusions. Our conclusions were divided based on different variables which are occupation, department, position and age. The occupation variable was divided into employee and contractors having the majority of them which are employee. In addition, the others category had the majority of the workers in the department variable with 175 (32.5%). Also, in the position variable, the others category wears the most amongst them. They were 355 (66%) workers. The workers having ages which range between 31-40 years old were the majority with 210 (39%) workers. (Table 1). Oil processing department has the most number of workers that wore the ear plugs correctly, 93 workers (33.1%), while in Oil storage and export has 48 workers (18.7%) do not wore it correctly. The P value was <0.001. (Table 2). The number of employee that wore ear plugs correctly is 234 (43.4%) and while 214 (40.0%) did not. The P value is 0.999. (Table 3). In Area outside operator 25 (8.9%) wore it correctly which was the dominant and in Trainee 12 (7.0%) did not. The P value is 0.007. (Table 4). The dominant category was between 31 to 40 years old group 119 (22.2%) wore it correctly and 91 (17.0%) did not. The P value was 0.266. (Table 5). In our results, we saw that approximately 47.8% did not wore ear plugs correctly and about 52.2% wore ear plugs correctly. (Figure 1). When we looked in to the audiometerical data of the employees, which shows that the majority of the employees had a better hearing threshold (59.8%). However, there was a significant number of employees who had the lowest threshold (22.3%).

Demographic data:

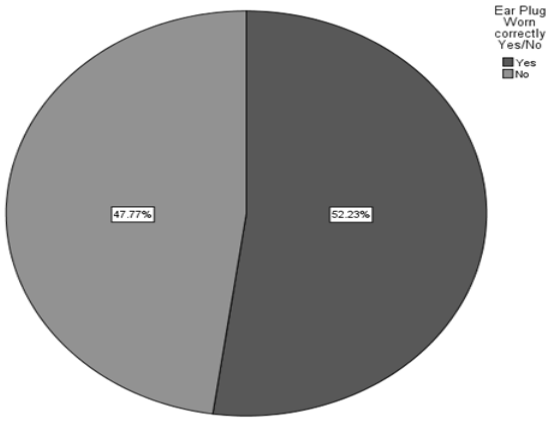

FIGURE 1: Represents the total of workers that wore wear plug correctly compared to those who did not

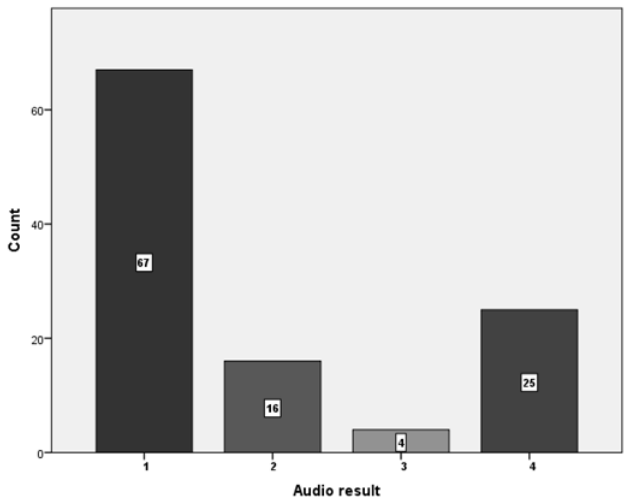

FIGURE 2: Represents the audiometerical data of the employees

TABLE 1: Frequency of all the workers in specific variables in a company in the kingdom of Bahrain in the year 2016

	Number	%
Occupation:		
• Employee	448	83.3
• Contractors	90	16.7
Department		
• Oil processing	140	26.1
• Maintenance services	72	13.4
• Oil Storage & Export	69	12.8
• Corporate services	21	3.9
• Plant maintenance	39	7.2
• Technical services	22	4.1
• Others	175	32.5
Position		
• Area Outside Operator	31	5.8
• Head Operator	35	6.5
• Trainee	34	6.3
• Control Operator	15	2.8
• On Developmental Assignment	22	4.1
• Recorder/Field Operator	11	2.0
• Technician	18	3.3
• Senior Technician	17	3.2
• Others	355	66.0
Age		
• Less than 20 years	2	0.4
• 21-30 years	65	12.1
• 31-40 years	210	39
• 41-50 years	141	26.2
• 51 years and above	119	22.1

TABLE 2: The table represents the comparison Departments and Earplug use(worn correctly or not).

Department	Ear plug worn correctly		Total	P value
	Yes No. (%)	No No. (%)		
Oil processing	93 (33.1)	47 (18.3)	140	
Maintains services	34 (12.1)	38 (14.8)	72	
Oil storage and export	21(7.5)	48 (18.7)	69	<0.002
Corporate services	16 (5.7)	5 (1.9)	21	
Plant maintenance	18 (6.4)	21 (8.2)	39	
Technical services	17 (6.0)	5 (1.9)	22	
Others	82 (29.2)	93 (36.2)	175	
Total	281	257	538	

TABLE 3: The table represents the comparison Occupation and Earplug

Occupation	Ear plug worn correctly		Total	P value
	Yes No. (%)	No No. (%)		0.999
Employee	234(43.4)	214(40.0)	448	
Constructors	47(8.7)	43(7.9)	90	
Total	281	257	538	

TABLE 4: The table represents the comparison between the Position and Ear plug use

Position	Ear plug one correctly		Total	P value
	Yes No. (%)	No No. (%)		
Area Outside Operator	25 (8.9)	6(2.3)	31	
Head Operator	23(8.2)	12(4.7))	35	
Trainee	16(5.7)	18(7.0)	34	0.007
Control Operator	8(2.9)	7(2.7)	15	
On Developmental Assignment	11(3.9)	11(4.3)	22	
Recorder/Field Operator	2(0.7)	9(3.5)	11	
Technician	11(3.9)	7(2.7)	18	
Senior Technician	11(3.9)	6(2.3)	17	
Others	174(61.9)	181(70.5)	355	
Total	281	257	538	

TABLE 5: The table represents the comparison of different group ages and Ear plug use

Age (Years)	Ear plug one correctly		Total	P value
	Yes No. (%)	No No. (%)		
Less than 20	0 (0.0)	2(0.4)	2	0.266
21-30	30(5.4)	35(6.5)	65	
31-40	119(22.2)	91(17.0)	210	
41-50	72(13.4)	69(12.9)	141	
51 and above	59(11.0)	60(11.2)	119	
Total	280	257	537	

4 | DISCUSSION

Our study's main focus is to compare the hearing threshold between workers who wear earplugs correctly and those who do not in a Bahraini company. In addition to that, obtaining the audiometerical data to confirm the importance of wearing earplugs to prevent hearing loss. What we obtained from most of the literature review is that being exposed to an occupationally hazardous noise could lead to a permanent hearing loss. So our research aim was to emphasize the importance of using the preventive methods offered by the company and to encourage the workers in following them. This includes wearing ear plugs and the company has put instructions concerning wearing earplugs correctly in a poster form.

Our study's hypothesis is that those who do not wear ear plugs correctly will suffer from hearing problems and the ones who do wear it correctly will not be affected; this was evident in our research and the literature review we provided in this report.

A study which was conducted by G.W Hughson and others in the United Kingdom, 2002. Showed that although the companies apply hearing protection programs, these are not always effective and successful. This was evident from the results since the company has an awareness campaign to encourage the workers to wear earplugs to prevent hearing loss, there are still some worker who do not. About 47.77% of the workers did not wear earplugs correctly, even in the presence of effective awareness. And about 52.23% wore them correctly. The audiometerical data of the employees showed that the majority of the employees had a better hearing threshold (59.82%) because of the wearing the earplugs. However, there was a significant number of employees who had the lowest threshold (22.32%) due non-compliance of wearing the ear plugs.

In another research which was conducted in Nigeria, where Occupational exposure to noise and patterns of hearing threshold among factory workers was studied. Showed a positive correlation between noise and hearing loss[4]. This was evident too in our research, where significant number of worker who are suffering from hearing issues due to the loud noises that are present in the work field.

In addition, WHO-PDH showed that occupational noise is still a major problem in developing countries and there is need to increase awareness about the harmful effect of noise on hearing[5]. And this is proven by the hearing loss amongst workers who work in noisy environment.

However, there is some variables which did not correlate with our hypothesis. Variables that we considered were occupation, department, position and age. We did cross tabulation (Tool that allows you to compare the relationship between two variables) in order to correlate these variables with the worker's compliance in wearing ear plugs correctly or not, and to observe the frequency of each.

First of all, the department variable is divided into seven departments, which are Oil processing, Maintenance services, Oil storage and export, Corporate services, Plant maintenance, Technical services and others. Our department's total sample size was 538. Amongst them, 281 wore earplugs correctly and 257 did not. Oil processing contain a sample size of worker which is 140 (26.1%) and hold the highest percentage of workers who wore it correctly.

We included the "Others" departments together because each individually will have a small number of workers which is not that significant to be included alone. With them having the highest number of worker which is 175 and hold the highest percentage of workers who did not wear them correctly which is 29.2% and those who did not 36.2%.

Maintains service department is of a total of 72. Only 12.1% wore earplugs correctly and 14.8% did not. Oil storage and export department is of a total of 69. Only 7.5% wore earplugs correctly and 18.7% did not wear earplugs correctly. Corporate services are of a total of 21, having 5.7% of worker wearing them correctly and 1.9% not wearing them correctly. Plant maintenance is of a total of 39, having 6.4 wearing ear plugs correctly and 8.2% not wearing them correctly. Technical services are of a total of 22, having 6% wearing them correctly and 1.9% not wearing them correctly.

The P value as seen in the result was <0.002 and that is <0.05 so it is enough to reject the null hypothesis. The null hypothesis is the hypothesis that there is no difference between the experimental groups at the population level. So this low P value will determine that the null hypothesis is unlikely to be true. So this shows that there is a correlation between departments and wearing earplugs.

The occupation was divided into employee and constructors. The total of employee's in the sample is 448 and constructors being 90, out of the total of 538. Out of the total sample, 281 wore it correctly and 257 did not. By this we can tell that the Employee's had the highest value who did not wear the ear plug correctly. The P value as seen in the result was 0.999 and that is high enough to determine that the results are not significant. Therefore, there is no correlation between occupation and wearing earplugs.

Looking at the position which was divided into Area Outside Operator, Head Operator, Traine, Con-

trol Operator, Developmental Assignment, recorder/ Field Operator, Technician, Senior Technician and Others (a sum of many positions). The total of people that wore the ear plugs correctly 281 and 257 did not. This indicates that the positions in Others had the highest frequency of people that did not wear the ear plugs correctly. The P value was high enough to determine that the results are insignificant. Therefore, there is no correlation between position and wearing earplugs.

The last variable is age which has a sample size of 537. Amongst them, 280 wore earplugs correctly and 257 did not wear earplugs correctly. From the results, we can see that the majority of people who did not wear earplugs correctly was aged amongst 31-40. The P value is high so it's not significant indicating that there is no correlation between wearing earplugs correctly and age.

5 | CONCLUSION

In conclusion, the workers that wore the ear plugs correctly had a better hearing threshold than those who did not. So that stresses upon the importance of wearing the ear plugs. We concluded that the hearing loss is related to the department variable only, since the majority of worker who had hearing loss were from the Oil and Processing department, which is known to be the noisiest department.

When we compared the data according to the department variable, the Oil processing department was the most significant regarding not wearing earplugs correctly and the p value was significant. Also, the results were not significant concerning the relationship between occupation and wearing earplugs correctly. Besides, the position variable was also studied regarding wearing earplugs and not. It also was not significant. However, the last variable which is age was not significant when we compared it with wearing earplugs having a p value > 0.05.

Our research results were limited due to insufficient data regarding the audiometerical levels. So, we recommend the Bahraini company to transfer the manually taken data into the company's systems, in case there are any future researches concerning this topic.

A copy of this research study will be given to the company so that they stress upon wearing earplugs correctly among workers since the results were significant. Also, continuing their annual hearing activity assessment is very important as a part of the preventive measures.

References:

1- Balanay JA, Kearney GD, Mannarino AJ. Assessment of occupational noise exposure among groundskeepers in North Carolina public universities. Environmental health insights. 2016 Jan;10:EHI-S39682

2- Al-Otaibi ST. Occupational hearing loss. Saudi Med J. 2000 Jun;21(6):523-30. PMID: 11500698.

3- Hughson GW, Mulholland RE, Cowie HA. Behavioural studies of people's attitudes to wearing hearing protection and how these might be changed. HSE Books; 2002.

4- Osisanya A, Oyewumi A, Sunmonu M. Occupational exposure to noise and patterns of hearing threshold among factory workers in Ibadan Nigeria.

5- World Health Organization. Prevention of hearing impairment from chronic otitis media: report of a WHO. World Health Organization; 1998.

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