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The **2nd Joint International Conferences** | <http://proceeding.tenjic.org/jic2> | ISBN: 978-602-5842-03-0 552 The Increased Blood Pressure Due to Effect of the Intensity of Noise on Workers in PT. Pindad (Persero) Turen Nia Saria,^{1,*}, Agusta Dian Ellinaa, Yunda Dewi Nurandikaa a STIKES Surya Mitra Husada, Kediri, Indonesia 1 nia1980tirtoudan@gmail.com* * Corresponding author A B S T R A C T Keywords: Intensity of noise Compliance Blood pressure Each job has a potential hazard that can cause work accidents or diseases, one of which is the noise hazard that can cause **an increase in blood** pressure.

To reduce the hazards caused by noise, workers can use ear protector (Alat Pelindung Telinga / APT) such as earplug and earmuff. In the preliminary study at PT. Pindad (Persero) noise generated by one machine reaches 98 dB(A) and most workers do not use APT. This study aims to determine the effect of noise intensity and compliance using Ear Protective Tool (APT) at PT. Pindad (Persero).

The research design used was analytic observational research using cross-sectional approach. The sample technique used purposive sampling. Samples are employees of PT. Pindad (Persero) a number of 30 respondents in the tooling. The result of the research shows that noise variable significance for systole = the effect of noise intensity on blood pressure.

While the systol significance value of compliance variable = 0.714 and 0.370 for diastole. So **there is no relationship between** adherence to **the use of Ear** Protective Equipment (APT) with **an increase in blood** pressure. Exposure to high- intensity **noise causes an increase in** the hormone cortisol which causes a rise in blood pressure in workers after they are exposed to noise.

To reduce this, other than the workers are required to use the Ear Protective Tool, there should be a schedule of safety control and medical check up as well as strict sanctions against workers who do not use Personal Protective Equipment. Copyright © 2018 Joint International Conference All rights reserved I. BACKGROUND Every job has a potential hazard that can cause work-related accidents or illness. One potential danger in the work environment is noise.

WHO reports noise is the third highest pollution in big cities (Zamanian et al., 2013: 1). Every day there are 4 million workers in danger of noise, while every year 22 million workers are potentially exposed to noise hazards (NIOSH, 2015). WHO also reports that noise causes health losses of 4 million dollars every day (Zamanian dkk, 2013:1-2).

Noise can cause hearing (auditory) disturbances and non-auditory (non-auditory) disturbances in humans (Jumali et al., 2013: 545). Auditory disorders are tinnitus or buzzing ears, difficulty differentiating high frequency words (Jumali et al. 2013: 545-546) and the most serious impact is deafness or NIHL (Noise Induced Hearing Loss) on workers exposed to high levels of noise (ILO, 2014: 1).

While non- auditory disorders that can occur due to noise are sleep disturbances, cardiovascular disease, and cognitive decline in children (Basner et al, 2014: 7-9). Based on the Regulation of the Minister of Manpower and Transmigration of the Republic of Indonesia Number 13 PER.13 / MEN / X / 2011 concerning Physics Factor and Chemical Factor Threshold Value at Work, noise is all unwanted noise originating from production process equipment and / or work tools that can at some level cause hearing loss.

Article 5 paragraph 1 states that the noise threshold value is set at 85 dB (A) for 8 working hours per day or 40 hours per week. The 2nd Joint International Conferences | <http://proceeding.tenjic.org/jic2> | ISBN: 978-602-5842-03-0 Vol. 2, No. 2, July 2018, pp. 552-558 553 Based on preliminary studies at PT Pindad Persero, almost all machines used in the company cause noise.

One engine that causes noise is a caliber munition engine that is used to make bullets. The noise produced by the engine reaches 98 dB (A) which exceeds the threshold value. Control efforts are carried out with the use of Ear Protectors (APT) namely earmuffs and earplugs.

However, noise exposure that can take too long to cause non-audiotory disorders that can occur is cardiovascular disorders which can be characterized by an increase in blood pressure. Even so, sometimes there are still employees who do not wear earplugs or

earmuffs for reasons of discomfort. Blood pressure measurement is the right method for measuring the overall cardiovascular response (Chang et al, 2015: 239).

Of the 5 samples of workers who did not have a history of hypertension with work areas that were at the same noise intensity, 2 of them showed an increase in blood pressure after exposure to noise even though they had used Ear Protector properly and correctly. While 3 other people experienced a systole increase of 10 mmHg. According to workers' testimony, they have worked for about 5 years and in the past two years their blood pressure tends to rise.

The average increase in their blood is from 120/80 mmHg to 150/90 mmHg. Therefore, to prevent the increase of blood pressure from the negative effects of noise, prevention is carried out by implementing a conservation conservation program that includes engineering controls. One of them is using ear protectors (OSHA, 2016).

Workers are required to comply with wearing earplugs or earmuffs as a precautionary measure to prevent blood pressure from rising. The purpose of this study was to determine the effect of noise on blood pressure at PT. Pindad (Persero). II. MATERIALS AND METHODS The research design used was analytic observational with a cross-sectional approach. The sampling technique uses purposive sampling method.

The population is employees of PT. Pindad (Persero) with respondents of 30 respondents in the tooling section. III. RESEARCH RESULT Characteristics of Respondents Tabel 1. Characteristics of Respondents No Characteristics N % 1 Sex Man Woman 29 1 97 3 2 Ages 20-30 31-40 41-50 10 11 9 33 37 30 3 Length of work ½ - 1 tahun 1,1-2 tahun 2,1 Noises exceeded threshold value 30 100 5 Blood Pressure Normal Higher 4 26 13 87 Total 30 100 The 2nd Joint International Conferences | <http://proceeding.tenjic.org/jic2> | ISBN: 978-602-5842-03-0 Vol. 2, No. 2, July 2018, pp. 552-558 554 IV. STATISTIC RESULT Tabel 2.

Multiple Regression Linier for Systole Independen variable Sig for partial test R Square Sig for simultan test Noises 0,023 0,219 0,036 Based on table 2, it can be interpreted as follows: a. Significance value of noise variable = 0.023 (<0.05) means that H1 is accepted so that there is an effect of noise with the level of systole blood pressure. b. RSquare value = 0.219 shows that noise affects the increase in systole blood pressure by 21.9% while 78.1% is influenced by other factors. Tabel 3.

Multiple Regression Linier for Diastole Independen variable Sig for partial test R Square Sig for simultan test Noises 0,023 0,219 0,036 Based on the table above can be interpreted as follows: a. Significance of noise variable = 0.007 (<0.05) means that H1 is

accepted so that there is an effect of noise with diastole blood pressure level. b. RSquare value = 0.242 means that noise affects the increase in diastolic blood pressure by 24.2% while 75.8% is influenced by other factors. V.

DISCUSSION Noise workers at tool parts at PT. Pindad (Persero) Turen Noise according to the Minister of Manpower Regulation No.13 / MEN / X / 2011 concerning Physics Factor Threshold Value and Chemical Factors in the Workplace are all unwanted sounds sourced from production process tools and / or work tools at a level certain can cause hearing loss. Noise is measured using decibels (dB) which is one of the logarithmic scales.

Small changes in noise intensity in decibels indicate a large change in noise level (OSHA, 2013: 4). Of the 30 respondents in the tooling section of PT. Pindad (Persero) almost all receive noise intensity above the Threshold Value (> 85 dB). The often engine is 91 dB (A), 93 dB (A) punch machine and 94 dB (A) cutting machine for 8 hours working days.

While the average worker has worked for 2-3 years at PT. Pindad (Persero). The measurement results indicate that the noise level in the tool area exceeds the specified Threshold Value. PERMENAKER NO. 13 / MEN / X / 2011 concerning Physics Factor Threshold Value and Chemical Factors in the Workplace, the exposure limit of 4 hours per day must not exceed 88 dB.

The main source of noise in the tooling section at PT. Pindad (Persero) which exceeds the Threshold Value is caused by 3 machines. The resulting noise is caused by a collision or friction between cutting tools and the surface of the workpiece. So that the noise generated by these machines can cause exposure that directly affects the workers.

Noise in the tool area is fluctuating noise where the intensity of noise at one time can vary. So that in noise calculation is used equivalent noise calculation (Leq) to explain the overall noise level in a certain period of time. Leq describes the standard size of the average intensity of continuous noise The 2nd Joint International Conferences | <http://proceeding.tenjic.org/jic2> | ISBN: 978-602-5842-03-0 Vol. 2, No. 2, July 2018, pp.

552-558 555 (steady state) which is the same as the fluctuating noise in a period or time interval of measurement (Green et al, 2015: 9955). The results showed that as many as 4 out of 10 workers at 94 dB (A) noise point had a value of 140 mmHg systole blood pressure and 24 respondents with diastole pressure of 90 mmHg, most of which rarely used APT. If it is left for a long period of time, it will cause health problems for its workers.

Blood pressure workers at the tooling section at PT. Pindad (Persero) Turen. Blood pressure is the force generated by blood against the vessel wall which is clinically described as systolic pressure per diastolic pressure (Sherwood, 2013: 373-374).

The blood pressure measurement of the workers in this study was carried out 2x by cross shift, that is, before the worker was exposed to noise which means before work and after work. Blood pressure measurement is done using digital tensimeter. Increased blood pressure is the difference in blood pressure after work and blood pressure before work.

The results obtained by the researchers showed an increase in systole and diastolic blood pressure before and after work. The results showed that the minimum systole blood pressure before working was 120 mmHg and the maximum value after work was 150 mmHg with an average increase of 11.7 mmHg. This is in line with research conducted by Siswati, et al, 2017 with an average value of an increase in blood pressure of 11.59 mmHg.

According to the Joint National Committee (JNC) 7 (2014: 12) the value of systole is > 140 mmHg including hypertension degree 1. Then the results of blood pressure measurements on workers in the tooling section of PT. Pindad (Perseo) most of the workers experienced grade 1 hypertension. It is known that the value of the variable noise Sig on blood pressure systole = 0.023 and diastole = 0.007 (0.05) whimeatia gnif ant difference between systole and diastole blood pressure before and after working on workers exposed to noise.

This is in line with Syidiq's research which states that there is a significant influence between the level of noise on the rise in blood pressure of workers at PT. Pertani (Persero) Surakarta Branch, with a significance value of systolic and astiblprure $p)0.033 = < \alpha 0.05$ The results showed that the value of Sig noise on blood pressure systole = 0.023 and diastole = 0.007 (.

himeat here s significant effect between the level of noise on systole and diastole blood pressure after workers are exposed to noise. The results of the study were also confirmed by research conducted by Kalantary, et al (2015: 218) of automotive industry workers. The results of the Kalantary study, et al. Showed that there were differences in systolic and diastolic blood pressure in workers exposed to 85-105 dB noise.

Effect of Noise Using Ear Protector Against Blood Pressure at PT. Pindad (Persero) Turen. The results showed significant differences in blood pressure at the time before workers were exposed to noise and after exposure to noise. Both workers who use APT when

they are with workers who do not use APT.

When workers are at 94 dB (A), **systolic and diastolic blood pressure** is higher than workers who are at 91 dB (A) although both points are above the NAB, workers who do not use APT are not recommended to be around the noise exposure point especially for 8 hours. From the results of statistical tests using multiple linear regression to 30 respondents obtained the value of the variable Sig noise to systole blood pressure = 0.036 and 0.024 to diastole blood pressure.

BectsecSig (, is cepted, i be uded hat here s eff noise intensity on blood pressure on workers in the tooling section of PT. Pindad (Persero) Turen. Therefore, **the use of Ear Protector** is highly required by the company to reduce the negative **effects of noise exposure** that exceeds the Threshold Value. But on the ground, some workers rarely use APT for reasons of inconvenience and disrupt the work process.

Because of the frequent exposure times that workers receive as long as they work in the tooling section, this causes the body to adapt so that compliance with APT usage does not fully affect the **increase in blood pressure** of workers. **The 2nd Joint International Conferences** | <http://proceeding.tenjic.org/jic2> | ISBN: 978-602-5842-03-0 Vol. 2, No. 2, July 2018, pp. 552-558 556 VI. CONCLUSIONS AND RECOMMENDATIONS Conclusion 1.

Based on measurements using a Sound Level Meter tool that most of the areas in PT. Pindad (Persero) has a noise intensity that exceeds the Threshold Value, one of which is a tooling area where one of the noise points reaches 94 dB (A). 2. Some workers in the tooling area at PT.

Pindad experienced an increase in systole and diastole blood pressure after workers were exposed to noise for 80 working hours. 3. From the results of multiple linear regression tests, there is the effect of noise intensity with blood pressure on workers at PT. Pindad (Persero). Suggestion 1. For Research Sites. It is expected that PT. Pindad (Persero) strives to provide Sound Level Meter tools to measure noise.

As well as managing various schedules such as noise level measurement schedule, safety control schedule and medical check up schedule for the workers. It is also expected that there are strict sanctions from safety control officers for workers who are not compliant using Personal Protective Equipment. In addition, he also carried out a Health Promotion on Occupational Disease (PAK). 2.

For Educational Institutions it is expected that the study can be used as reference material or research literature related to the influence of noise intensity and compliance

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