Influence Of The Noise Intensity And Compliance Using Early Equipment On Blood Pressure On Workers In PT. Pindad Turen

Yunda Dewi Nurandika[1], Nia Sari[2], Agusta Dian Ellina[3]
[1]*Students Of Publich Health Science Program STIKes Surya Mitra Husada*
[2]*Lecturer Of Public Health Science Program STIKes Surya Mitra Husada*

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ABSTRACT

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 danger of noise induced, the workers can be using APT like earplug and earmuff. But in the preliminary study at PT. Pindad (Persero) noise generated by one machine reaches 98 dB (A) and almost the majority of workers don't use APT. This research want to knowing influence of the noise intensity and compliance using early equipment (apt) on blood pressure on workers In pt. Pindad (persero) turen.
The research design used analytic observational research using cross-sectional approach. Technique to determine the sample using non random method (non probability) sampling that is using purposive sampling technique. Its population is employees of PT. Pindad (Persero) with respondents of 30 respondents in the tooling.
The result of this research is Signification value of noise variable to systole = 0,036 and 0,024 to blood pressure of diastole. Since the Sig is both <α (0.05) then there is an effect of noise intensity on blood pressure. While Signification the value of compliance variable to systole=0.714 and 0.370 for diastolic blood pressure. So it can be concluded that there is no relationship between adherence APT use with increased blood pressure.
The compliance didn"t influence this blood pressure because the compliance using APT is no reduce the risk are negative from exposure to noise. While the exposure to noise high intensity led to an increase hormone cortisol so that led to increases in the blood pressure on workers after them work. To decrease it, beside the workers are obliged to use APD, better there there are strict sanctions fork the workers who don't use APD

BACKGROUND

Every job has a potential hazard that can cause an accident or work-related illness. One of the potential hazards in the work environment is noise. WHO reported that noise is the third highest pollution in major cities (Zamanian et al., 2013: 1). Every day there are 4 million workers in noise hazard, whereas every year 22 million workers are potentially exposed to noise hazard (NIOSH, 2015). WHO also reported that noise caused health losses of 4 million dollars per day (Zamanian et al., 2013: 1-2).

Noise can cause auditory and non-auditory in humans (Jumali et al., 2013: 545). Auditory disturbances are tinnitus or buzzing ears, difficulty distinguishing high-frequency words (Jumali et al, 2013: 545-546) and the most serious impact is deafness or NIHL (Noise Induced Hearing Loss) in workers exposed to high-level noise (ILO, 2014: 1). While nonauditory disorders that can occur due to noise are sleep disturbances, cardiovascular disease, and decreased cognitive power of 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 on the Threshold Value of Physical Factors and Chemical Factors in the Workplace, noise is all unwanted sounds

sourced from the means of production and / or work tools that at some level may cause hearing loss. In Article 5 paragraph 1 stated that the noise threshold value is set at 85 dB (A) for 8 hours of work per day or 40 hours per week.

Based on a preliminary study on PT Pindad Persero, almost all the machines used in the company generate noise. One of the engines that cause noise is a caliber munition machine used to make bullets. The resulting noise of the machine reaches 98 dB (A) which exceeds the threshold value. Control efforts are done with the use of Ear Protective Tool (APT) is earmuff and earplug. However, exposure to noise that is too long can cause a non audiotory disorder that can occur is a cardiovascular disorder that can be marked by an increase in blood pressure. However, sometimes there are still employees who do not wear earplug or earmuff for uncomfortable reasons.

Blood pressure measurement is an appropriate method for measuring overall cardiovascular response (Chang et al, 2015: 239). Of the 5 samples of workers with no history of Hypertension with work areas at the same intensity of noise, 2 showed increased blood pressure after exposure to noise even though they had used the Ear Protector Tool properly and correctly. While 3 others have increased systole by 10 mmHg. According to the worker's confession, they have been working for about 5 years and the last 2 years their blood pressure is likely to go up. The average increase in their blood from the original 120/80 mmHg to 150/90 mmHg.

Therefore, to prevent the increase in blood pressure from negative impact of noise, prevention is done through the application of a hearing conservation program that includes engineering controls. One of them is using ear protection (OSHA, 2016). Workers are required to adhere to the use of earplugs and earmuffs as a noise-prevention measure to avoid any rise in blood pressure. The purpose of this study is to determine the effect of noise and compliance using the Ear Protective Tool against Blood Pressure at PT. Pindad (Persero).

RESEARCH METHODS

The research design used was analytic observational research using cross-sectional approach. The technique of determining the sample using non-random (non probability) sampling method is using purposive sampling technique. Its population is employees of PT. Pindad (Persero) with respondents of 30 respondents in the tooling.

RESULTS

Characteristics of the Subject

Table 1. Characteristics of respondents in this study include gender, age, duration of work, noise level, obedience using APT and blood pressure.

No	Characteristics	ΣN	Σ%
1	**Gender**		
	Man	29	97
	Female	1	3
2	**Age (years)**		
	20-30	10	33
	31-40	11	37
	41-50	9	30
3	**Duration of work**		
	½ - 1 years	5	17
	1,1-2 years	9	30
	2,1 – 3 years	10	33

	3,1 – 4 years	4	13
	4,1 – 5 years	2	7
4	**Noise level**		
	over NAB	30	100
5	**Obedience using APT**		
	Rarely	28	93
	Often	1	3
	Never	1	4
6	**Blood pressure**		
	Normal	4	13
	High	26	87
	Total	**30**	**100**

Data analysis

Table 2. Multiple linear regression test of systole blood pressure

Variabel Independen	Sig partial test	R Square	sig test simultaneously
Noise	0,023		
obidience	0,714	0,219	0,036

Based on table 2, it can be interpreted as follows :

a. It is known that the value of noise variable Signification = 0,023 (<0.05) means that H1 is received so that there is influence of noise with systole blood pressure level. While the value of Significance of compliance variable = 0.714 (> 0.05) which means there is a relationship of compliance with the increase in blood pressure systole.
b. From result of multiple linear regression test got value of RSquare = 0,219 this mean noise and compliance influence systole blood pressure increase equal to 21,9% while 78,1% influenced by other factor.

Table 3. Multiple linear regression test for diastolic blood pressure

Variabel Independen	Sig partial test	R Square	sig test simultaneously
Noise	0,007		
Obidience	0,370	0,242	0,024

Based on the above table can be interpreted as follows:

a. It is known that the value of noise variable Signification = 0.007 (<0.05) means that H1 is received so that there is an effect of noise with systole blood pressure level. While the value of Significance of compliance variable = 0.370 (> 0.05) which means there is no relationship of adherence with increased diastolic blood pressure.
b. From result of multiple linear regression test got value of RSquare = 0,242 this mean noise and compliance influence increase of diastole blood pressure equal to 24,2% while 75,8% influenced by other factor.

DISCUSSION

Noise of worker of tool parts at PT. Pindad (Persero) Turen

Noise according to Regulation of the Minister of Manpower No.13 / MEN / X / 2011 about the Threshold Limit of Physical Factor and Chemical Factors in the Workplace

are all undesired sounds derived from the means of production process and / or work tools at the level may cause hearing loss.

Noise is measured using decibels (dB) which is one of the logarithmic scales. A small change in the noise intensity in decibels shows a major change in noise levels (OSHA, 2013: 4). Of 30 respondents in the tooling part of PT. Pindad (Persero) almost all receive noise intensity above Threshold Threshold (> 85 dB). On offen machines of 91 dB (A), 93 dB (A) pons and 94 dB (A) cutting machines for 8 hours of working time. 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 Threshold. PERMENAKER NO 13 / MEN / X / 2011 concerning the Threshold Limit of Physical Factor and Chemical Factor in the Workplace, the 4 hour limit per day exposure should not exceed 88 dB.

The main source of noise in the tool parts at PT. Pindad (Persero) exceeding the Threshold Value due to 3 machines. The resulting noise is caused by a collision or friction between the cutting tool and the workpiece surface. So the noise generated by these machines can cause exposure that directly impacts the workers.

Noise in the tool area is a fluctuating noise where the intensity of noise at a time may vary. So in the calculation of noise is calculated the equivalent noise (Leq) to explain the overall noise level within a certain period of time. Leq describes the standard measure of the average of the steady state of noise equal to 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 the 94 dB (A) noise point had a systole blood pressure value of 140 mmHg and 24 respondents with diastole pressure of 90 mmHg, which rarely used APT. If it is left in a long period of time, will cause health problems to the workers.

Worker compliance using APT parts tooling at PT. Pindad (Persero) Turen

Based on the results of research that has been done is known from 30 respondents almost all are not obedient in the use of Ear Protective Equipment (APT). It was found that 28 respondents (93%) rarely use APT. This is evidenced from the observation using a checklist that shows as many as 28 respondents rarely use APT. The average of 28 respondents are using ear protective device that is 4x earplug in 10 days of observation by the researchers. While 1 respondent never used APT. And 1 respondent again use APT as much as 6x. This is very far from the compliance indicator that requires every worker to use APT for 8 hours.

APT provided by PT. Pindad (Persero) is earplug and earmuff. It's just for workers part of the tool more often use the earplug. The function of this APT is used to reduce the level of noise received by workers. The difference is only on the value of NRR (Noise Reduction Rate). Earplug provided by PT. Pindad has a value of NRR of 25 dB (A) while for earmuff has an NRR value of 29 dB (A). The noise levels heard by workers using earplugg will be lower than those that do not use earplugs.

By using the exposure dBA exposure formula, the noise level received by the worker using the earplug is 82 dB (A) and 83 dB (A) for the lowest intensity while the highest intensity is 85 dB (A). The formula used has taken into account the factors of unsuitable hearing device sizing or improper use of the appliance. Based on these calculations the noise level received below the specified threshold value, so the use of the earplug can provide protection from noise interference. Noise is measured using decibels (dB) which is one of the logarithmic scales.

Compliance is defined as loyalty, obedience or loyalty. Compliance is meant here is obedience in use of Ear Protector Tool. According to Smet (1994) in Emaliyawati (2013), obedience is the degree to which a person performs a way or behaves according to what is suggested or charged to it. Compliance is the basic capital a person behaves. According to Kelmen and Emaliyawati (2013) explained that changes in attitudes and behavior of individuals starting with the process of compliance, identification, and the last stage of internalization.

The observer's observations, in addition to experience and years of service that determine the compliance of workers in using APT, observations from superiors and outside guest visits also affect workers' compliance. This is seen when there are safety control activities held every 2 weeks on the first day of work, seen almost most workers use APT. But after the activity is finished, the workers remove the APT with the reason uncomfortable, dizzy and hinder the work process. But in addition to APT in the form of earplug, APD is often used by workers is a safety helmet. This head protector is one of the PPE that must be used when the workers enter the work area of PT. Pindad (Persero).

Blood Pressure worker parts at PT. Pindad (Persero) Turen

Blood pressure is a force generated by blood against the vessel wall that is clinically described as systolic pressure per diastolic pressure (Sherwood, 2013: 373-374). Blood pressure measurement of workers in this study was done 2x by cross shift, ie before the workers exposed to noise which means before work and after work. Blood pressure measurements were performed using a digital tensimeter.

Increased blood pressure is the difference in blood pressure after work and blood pressure before work. The results obtained by researchers showed an increase in blood pressure systole and diastole before and after work. From the results of the research, there was a minimum systole blood pressure value before work of 120 mmHg and a maximum value after work of 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 blood pressure increase of 11.59 mmHg.

According to Joint National Committee (JNC) 7 (2014: 12) systole value of> 140 mmHg including degree 1 hypertension. So the result of blood pressure measurement on workers in the tooling part of PT. Pindad (Perseo) most workers experience Hypertension degree 1. It is known that the Sig value of noise variable to blood pressure systole = 0,023 and diastole = 0,007 <α (0,05) meaning there is significant difference between systole blood pressure and diastole before and after work on noise-exposed workers. This is in line with Syidiq's research which states that there is a significant influence between the noise level on the increase in blood pressure of workers at PT. Pertani (Persero) Surakarta Branch, with significance value of systolic blood pressure and diastolic (p) 0,033 or p = 0,05 <α (0,05).

The results of the study showed that the Sig value of noise to blood pressure systole = 0,023 and diastole = 0,007 <α (0,05). This means that there is a significant influence between noise levels on systole and diastole blood pressure after workers are exposed to noise. The results are also confirmed by research conducted by Kalantary, et al (2015: 218) against automotive industry workers. The results of Kalantary's study, et al showed that there were differences in systolic and diastolic blood pressure in workers exposed to 85-105 dB of noise.

The Effect of Noise and Compliance Using the Ear Protective Tool on Blood Pressure at PT. Pindad (Persero) Turen

The effect of noise and compliance using ear protection against blood pressure can be seen from the significant differences in blood pressure at a time before workers are exposed to noise and after exposure to noise. Both workers are using APT when with workers who do not use APT. At the time the worker is at 94 dB (A), systolic and diastolic blood pressure is higher than that of workers at 91 dB (A) although both points are equally over NAB but workers who do not use APT are not advisable to be around the point of exposure to the noise let alone for 8 hours.

From statistic test result using multiple linear regression to 30 respondents obtained Sig value of noise variable to blood pressure systole = 0,036 and 0,024 to diastole blood pressure. Because the Sig is both <α (0.05) then H1 is accepted, so it can be concluded there is influence of noise intensity and compliance using APT to blood pressure at worker in tooling part of PT. Pindad (Persero) Turen.

Therefore, the use of Ear Protective Tool is required by the company to reduce the negative effect of noise exposure exceeding the Threshold Limit Value. But the reality on the ground, some workers rarely use APT on the grounds of discomfort and disrupt the work process. Because of the frequent exposure time received by workers during their work in the tooling section, this causes the body to adapt so that compliance with the use of APT does not fully affect the increase in blood pressure of workers.

CONCLUSION

1. Based on measurement using Sound Level Meter tool that most of the area in PT. Pindad (Persero) has a noise intensity that exceeds the Threshold Threshold, one of which is the tooling area of which one of the noise points reaches 94 dB (A).
2. A total of 28 (93%) of 30 respondents rarely use the Ear Protective Tool for uncomfortable reasons and slow down the work process.
3. Some workers in the tooling area at PT. Pindad increased blood pressure of systole and diastole after workers exposed to noise during 80 hours of work.
4. From the results of multiple linear regression statistic test obtained Sig value on variable noise = 0,023 to systole blood pressure and 0,007 to diastole blood pressure. Because the value of Sig <α (0,05) hence, there is influence of noise intensity with blood pressure at worker at PT. Pindad (Persero).
5. From the results of multiple linear regression statistical test obtained Sig value on the variable compliance = 0.714 to blood pressure systole and 0.370 to diastole blood pressure. Because the value of Sig> α (0,05) hence, there is no influence of compliance using APT to blood pressure at worker at PT. Pindad (Persero).

SUGGESTION

1. For Research Sites
   Expected PT. Pindad (Persero) seeks the availability of Sound Level Meter to measure noise. As well as manage various schedules such as noise level measurement schedule, safety control schedule and medical check up schedule for the workers. It is also hoped that there will be strict sanctions from safety control officers for non-compliant workers using Personal Protective Equipment. Besides also implementing Health Promotion on Work Disease (PAK).
2. For Educational Institutions

It is expected that the results of the research can be used as reference materials or research literature related to the effect of noise intensity and compliance using APT on blood pressure.

3. For Further Researchers
   It is expected to conduct further research on the analysis of factors affecting the compliance of workers to compliance using APT.

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