

# Relationship between Noise Intensity and Psychological Disorders among Workers in the Compressor Machine Division

Suzana Indragiri<sup>1\*</sup>, Muslimin,<sup>1</sup> Cucu Herawati,<sup>1</sup> Heni Fa'riatul Aeni,<sup>1</sup> and Dicky Iskandar Putra,<sup>1</sup>

<sup>1</sup>Public Health Department, Sekolah Tinggi Ilmu Kesehatan Cirebon, Cirebon, Indonesia

\*suzanaindragiri@yahoo.co.id

**Abstract.** Workers in the compressor machine division experienced the intensity of noise above the threshold value. The negative impacts of noise include discomfort and lack of concentration. This study aims to determine the relationship between noise intensity and psychological disorders among workers in the compressor machine division. This study used a descriptive analytical approach with a cross sectional study design. Data collection method used interview, the instruments used here were questionnaire and sound level meter. The populations in this study were the workers in compressor machine division as many as 39 workers. The sampling used a total sampling technique. The study was conducted in June 2019. Analysis of data used univariate and bivariate analysis with Chi-square test. Based on the results of the study it was obtained that 74.4% of respondents worked in a noisy place and 38.9%). moderate psychological disorders (Chi-square test results obtained p value = 0.005, meaning that there was a relationship between noise intensity and psychological disorders among workers in the compressor machine division. A recommendation for companies is to conduct a hazard control on the machine by means of machine maintenance, replacing machine equipment that produced a high intensity of noise. Furthermore, companies should conduct administrative control by work rotation and regular monitoring of ear muff usage so that workers are safe from the exposure of high intensity of noise. Companies should also conduct engineering control such as providing noise barrier from material capable of dampening the noise source to minimize the effect on the incidence of psychological disorders among workers.

## 1. Introduction

The use of high technology in the workplace in terms of facilities and infrastructure which produces unwanted noise or sound or noise will cause health problems among workers, namely the occurrence of occupational diseases. Noise is one of the physical hazard factors that are often found in the workplace. Along with the industrialization process that is accompanied by technological advancements and economic growth that develops each year, the threat of disturbance risk due to noise will also increase [1].



Noise in the workplace is often a problem for the workers. Generally, noise comes from working machines, generators and various moving equipment and contact with metals, compressors and so on. Unfortunately, many workers are accustomed to the noise, although they do not complain but health problems still occur, while the impact of noise depends on the level of noise. In addition to hearing loss, the impact of noise on health that occurs among workers can be in the form of psychological disorders such as disorders of comfort, stress, insomnia, easy to get angry and concentration problems that can cause work accidents [1].

Based on the Minister of Manpower and Transmigration Regulation No. PER.13 / MEN / X / 2011 concerning the threshold value of physical factors and chemical factors in the workplace, it is stipulated the noise threshold limit value (TLV) of 85 dBA as the highest intensity and this is a value that can still be tolerated by workers without causing illness or health problems in daily work for a time not exceeding 8 hours a day or 40 hours a week [2].

The health effects of occupational and environmental noise exposure. Even though noise sources at work are quite divergent, the exposure setting is well defined; i.e., exposure during the execution of occupational tasks. In the living environment not only the sources but also the exposure settings are quite diverse. As mentioned above, a common environmental noise source is traffic. In addition, in industrialized regions industrial noise may affect environmental quality [3].

Noise, especially those originating from working equipment or machines, can be controlled, among others, by setting a silencer on the source of vibration or modifying the machine to reduce noise. Noise exceeding the TLV of 85 dB (A) with noisy machine noise and working time 8 hours/continuous days can cause disorders among workers. Noise can cause effects in the form of physiological, psychological and organic pathological disorders.[4] 8-12% of the world population suffer the effects of noise in various forms and it is estimated that the number continues to increase. The impacts of noise on health can occur on the sense of hearing and non sense of hearing [5].

A study conducted by Sundari at the steel smelting plant in Jakarta found that 31.55% of workers suffered from deafness due to noise, with the noise intensity of between 85 - 105 dB, with an average service life of 8.99 years. A study conducted by Lusianawaty showed that 7 out of 22 workers (31.8%) in the West Java plywood company experienced deafness due to noise, with environmental noise intensity of between 84.9 - 108.2 dB.[6]

According to Ryff and Singer, low psychological well-being can lead a person to feel dissatisfied and do not accept self-weakness, lack of trust with others, unable to cooperate, unable to accept evaluations from others, feel unable to change and improve a situation to a better one, do not care about the environment, do not believe that life is meaningful and lack of desire to develop and grow [7].

Based on the results of a study conducted by Nuzulia, the core evaluations had a positive role in supporting the psychological well-being among employees. This indicated the role of interpretation of an individual's position on the reality of the work environment that could psychologically affect an employee's welfare. The interpretation of positive experiences will lead to satisfaction among employees as the foundation of optimizing the psychological welfare function [8].

The results of the Labor Force Survey in 2009 found 182,700 cases of work-related stress in the UK. The cause source of the stress disorders was not only due to the work itself, but could also due to physical, emotional and mental stressors. An example of physical stressor at workplace is noise [4].

## 2. Methods

This study used a descriptive analytical approach with a cross sectional study design. The populations in this study were the workers in compressor machine division of Cold Storage Cirebon as many as 39 workers in the period of April 2019. The sampling used a total sampling technique. The instrument used in the study for the independent variable (noise intensity) was the sound level meter, while the instrument for the dependent variable (psychological disorder) was a questionnaire. Data collection methods used in this study were by conducting measurement and interview with workers in the

compressor machinedivision. Data analysis for noise intensity and psychological disorders variables were analyzed using the chi-square test.

### 3. Results

The results of the data analysis on noise intensity on workers at Cold Storageare presented in the distribution table below:

**Table 1.** Frequency Distribution Based on Noise Intensity among Workers in the Compressor Machine Division

Noise Intensity	Frequency	Percentage
Not Noisy (< 85 dB)	10	25.6%
Noisy ( $\geq 85$ dB)	29	74.4%
Total	39	100%

Based on table 1, it was shown that the majority of noise intensity experienced by workers in the compressor machine division was noisy ( $\geq 85$  dB) for as many as 29 workers (74.4%), while not noise intensity (<85 dB) was experienced by 10 workers (25.6%).

The results of the data analysis on psychological disorders among workers in the compressor machine division are presented in the distribution table below:

**Table 2.** Frequency Distribution Based on Psychological Disorders among Workers in the Compressor Machine Division

Psychological Disorder	Frequency	Percentage
Mild	11	28.2%
Moderate	9	23.1%
Severe	19	48.7%
Total	39	100%

Based on table 2 it was shown that the majority of psychological disordersthat was experienced by the respondents was severe psychological disordersfor as many as 19 workers (48.7%). Meanwhile, there were 9 workers (23.1%) who experienced moderate psychological disordersand there were 11 workers(28.2%) who experienced mild psychological disorders.

The results of data analysis on noise intensity and psychological disorders among 39workers in the compressor machine division are presented in the distribution table below:

**Table 3.** Relationship between Noise Intensity and Psychological Disorders among Workers in the Compressor Machine Division

Noise Intensity	Psychological Disorder						Total		<i>P value</i>
	Mild		Moderate		Severe				
	N	%	n	%	n	%	N	%	
Not Noisy	1	10	3	30	6	60	10	100	0.005
Noisy	10	35.5	6	20.7	13	44.8	29	100	
Total	11	28.2	9	23.1	19	48.7	39	100	

Based on table 3 on the results of the analysis of the relationship between noise intensity and psychological disorders among workers, it was found that there was 1 worker who worked in not noisy place (10%) who experienced mild psychological disorders. Meanwhile, there were 13 workers who worked in noisy place (44.8%) who experienced severe psychological disorders.

Bivariate test results using the chi-square test showed a p value = 0.005 ( $\alpha = 0.05$ ). Then it can be concluded that there was a relationship between noise intensity and psychological disorders among workers in the compressor machine division.

#### 4. Discussion

##### 4.1 Noise Intensity

The results of the study showed that The majority of respondents namely 29 workers (74.4%) in compressor machine division were exposed to high intensity of noise ( $\geq 85$  dB). This was due to the workers were directly working on the compressor machine with a noise intensity of 88 dB. Meanwhile, 10 workers (25.6%) experienced an intensity of  $< 85$  dB because these workers were staff and operators who worked in the room that had been given a noise silencer.

According to Minister of Manpower and Transmigration Regulation No. PER.13/X/2011 in 2011, all unwanted sounds originating from production process equipment or work equipment at some level can cause hearing loss [9]. The noise intensity in the compressor machine experienced by workers was 88 dB with a period of noise exposure of 8 hours of work. According to Minister of Manpower, if the worker is exposed to an intensity of 88 dB, then the maximum period of noise exposure experienced by the worker should only be in 4 hours.

##### 4.2 Psychological Disorder

The results showed that the majority of psychological disorders that was experienced by the respondents was severe psychological disorders for as many as 19 workers (48.7%). This was due to the noise level exceeds the threshold limit value.

Based on observations on the compressor machine it was known that psychological disorder often experienced by workers was difficult to communicate and concentrate. The disorder was caused by the continuous operation of the machine which caused noise.

Psychological disorders are conditions that will make a person behave abnormally or do not like people in general. If the noise is experienced for a long time it can cause symptoms of easy to get angry, stress, fatigue, disturbance and reduce in work performance and others [10].

##### 4.3 Relationship between noise intensity and psychological disorders among workers in the compressor machine division

Based on the results of data analysis on the relationship between noise intensity and psychological disorders among workers in the compressor machine division using the chi-square test, it was obtained a p value = 0.005 ( $\alpha = 0.05$ ). Then it can be concluded that there was a relationship between noise intensity and psychological disorders among workers in the compressor machine division.

Noise is one of the physical factors of the work environment that can have an impact on hearing loss (auditory) and extra auditory such as stress (psychological disorders), hypertension, work fatigue and feelings of discomfort [11]. The type and form of noise sources can be identified. The levels of noise originating from equipment vary between equipment models.[9] Increased mechanization will result in increased noise levels. Development that uses a lot of modern equipment in an industry or company to increase productivity has an impact on labors because the sound produced by the machines in the development process will have a negative impact on labors [10].

The study result is supported by a study conducted which stated that there was a relationship between noise intensity and psychological disorders among workers in the weaving division [1]. Furthermore, the study result is also supported by a study conducted which stated there was a relationship between noise intensity and psychological disorders among workers in laundry washing division [5].

#### 5. Conclusions

The majority of respondents namely 29 workers (74.4%) in compressor machine division were exposed to high intensity of noise ( $\geq 85$  dB). The majority of respondents namely 19 workers (48.7%)

experienced severe psychological disorders. There was a relationship of noise intensity and psychological disorders among workers in the compressor machine division ( $p$  value =  $0.005 < \alpha = 0.05$ ).

## References

- [1] Permatasari Y, "Hubungan Tingkat Kebisingan dengan Gangguan Psikologis Pekerja di Bagian Weaving di PT. X Batang, Jawa Tengah," *J. Kesehat. Masy. FKM UNDIP*, vol. 2, no. 1, 2013.
- [2] Utami Ayi R, "Hubungan antara Beban Kerja dan Intensitas Kebisingan dengan Kelelahan pada Tenaga Kerja Pemeliharaan Jalan Cislak Kotabima CV Serayu Indah Cilacap," 2012.
- [3] Willy Passchier, Vermeer and Wim F. Passchier, "Noise Exposure and Public Health," *Environ. Health Perspect.*, vol. 108, no. 1, p. 124, 2000.
- [4] H. S. Purnamasari A, "Paparan Kebisingan Berhubungan Stress Kerja pada pekerja di Unit Rcu PT. Pertamina (Persero) Ru Vi Balongan Indramayu," 2016.
- [5] W. I. Kristiyanto F, Kurniawan B, "No Title," *J. Kesehat. Masy. FKM UNDIP*, vol. 2, no. 1, 2014.
- [6] Nuruddin M, "Kebisingan dan Pencegahannya." [Online]. Available: <https://nuruddinmh.wordpress.com/2012/11/18/kebisingan-dan-pencegahannya/>.
- [7] Adha H, "Hubungan Dukungan Keluarga dan Kesejahteraan Psikologis pada Ibu Pekerja Penuh Waktu Tahun 2018," 2018.
- [8] Nopiando B, "No Title," *J. Soc. Ind. Psychol.*, vol. 1, no. 2, 2012.
- [9] Wirasastra W, "Hubungan Kebisingan Terhadap Gangguan Pendengaran pada Pekerja di Area Atmospheric Hydrolization Unit (AHU) PT Pertamina (Persero) RU IV Balongan Indramayu Tahun 2015," STIKes Cirebon, 2015.
- [10] Psikologymania, "Penyakit Akibat Kebisingan." [Online]. Available: <https://www.psikologymania.com/2014/08/penyakit-akibat-kebisingan.html>.
- [11] Marisha M, "Hubungan Kebisingan dengan Stress Kerja pada Pekerja di Ruang Produksi Benang dan Ruang Produksi Tambang PT. Arteria Daya Mulia (ARIDA) Kota Cirebon Tahun 2015," STIKes Cirebon, 2015.