



Relationship between Respondent Characteristics and Noise Intensity with Increased Blood Pressure in Production Unit Workers of PT Japfa Comfeed Indonesia, Tbk. Plant Margomulyo

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A B S T R A C T

The most common physical risk at work is noise, which may cause several health issues. These include diseases of the auditory system and non-auditory impacts including poor communication, tension, anxiety, high blood pressure, and decreased productivity. At the production unit of PT Japfa Comfeed Indonesia, Tbk. Plant Margomulyo, this research aimed to examine the association between respondent characteristics and noise intensity in the workplace and changes in workers' blood pressure before and after work. 51 respondents participated in the cross-sectional study using an analytical and observational methodology. The results showed that elevated blood pressure was significantly correlated with age ($p = 0.000$), duration of service ($p = 0.007$), usage of personal protective equipment (PPE) ($p = 0.011$), and noise intensity ($p = 0.000$). Nonetheless, no statistically significant correlation was seen between elevated blood pressure and dietary state ($p = 0.467$), smoking behaviors ($p = 0.763$), or history of hypertension ($p = 0.170$). These findings suggest that while lifestyle factors like smoking and nutritional status have less impact in this context, occupational factors—particularly noise exposure—as well as certain personal characteristics like age and length of service are linked to elevated blood pressure in workers.

INTRODUCTION

Occupational health and safety (OHS) is one aspect that is very important in the sustainability of an institution or company. The Indonesian government has specifically regulated Law No. 13 of 2003 concerning Manpower Article 86, which states that all workers have the right to obtain occupational safety and health protection. This right needs to be upheld to protect the safety and health of workers to create optimal productivity (Fahlevi, 2020). The regulation explicitly states that implementing OSH aspects must be carried out in every company that involves many workers and hazardous activities. OHS in an institution or company includes safety risks regarding safe conditions from damage, loss, or suffering and workers' health in the work environment. Every institution or company must enforce OSH aspects to avoid suffering or losses for companies or workers, especially institutions or companies that have physical, ergonomic, chemical, and biological hazards in the work environment (Hamali, 2018).

The work environment cannot be separated from the presence of physical hazards such as noise, lighting, vibration, temperature, lighting, ergonomics, or psychology. The most dominant physical hazard factor found is noise hazard. Noise hazards can be caused by machinery, equipment, production processes, and other work activities (Ulfa, 2022). The threshold value or TLV regarding noise in the work environment has been regulated in the Minister of Manpower Regulation No. 5 of 2018 based on the duration of noise exposure per day. According to Sumardiyono (2019), noise intensity in the work environment that exceeds

the established safe limit or TLV can cause safety and health problems in workers, such as the onset of work stress and increase the risk of accidents, injuries, and diseases or hearing loss. Workers who are exposed to high and continuous noise can cause disorders or health problems such as auditory system disorders and non-auditory system disorders in the form of communication disorders, stress, anxiety, sleep disturbances, discomfort, increased risk of accidents, difficulty concentrating, decreased quality of life of workers, affecting social interactions, reducing self-confidence, increased blood pressure to decreased work productivity (Purnawan, 2019).

PT Japfa Comfeed Indonesia Plant Margomulyo is a manufacturer engaged in the production of animal feed (Asmoko, 2020). The existence of this phenomenon encouraged researchers to analyze the relationship between the characteristics of respondents and the intensity of noise in the work environment with the increase in blood pressure of workers in the production unit before and after work.

METHOD

This study is included in the type of analytic observational research. This study uses a cross sectional approach design. The object of this research is 51 respondents who are workers in the production unit of PT Japfa Comfeed Indonesia Plant Margomulyo. The data analysis used was the Chi-Square statistical test accompanied by a table explaining the test results.

RESULT

Table 1. Distribution of Respondent Characteristics

Characteristics of Respondents	Number (n)	Percentage (%)
Age		
15 – 24	7	13,7
25 – 34	15	29,4
35 – 44	19	37,3
45 – 54	9	17,6
55 – 64	1	2
Nutrition Status		
Skinny	3	5,9
Normal	22	43,1
Fat	26	51,0
Working Period		
< 5 Years	14	27,5
≥ 5 Years	37	72,5
Smoking Habit		
Yes	30	58,8
No	21	41,2
History of Hypertension		
Yes	4	7,8
No	47	92,2
PPE Usage		
Yes	20	39,2
No	31	60,8

Table 1 is a description of the distribution of respondent characteristics, including age, nutritional status, tenure, smoking habits, history of hypertension, and use of PPE. The table shows that the majority of respondents were in the age range of 35 - 44 years, namely 19 people (37.3%). In addition, most respondents had a fat nutritional status, namely 26 people (51%). Respondents who worked for more than 5 years were 37 people (72.5%). The majority of respondents were smokers, as many as 30 people (58.8%). A total of 47 people (92.2%) did not have a history of hypertension. Respondents who worked without using PPE were 31 people (60.8%).

Table 2. Distribution of Noise Intensity

Noise Intensity	Number (n)	Percentage (%)
Below TLV	26	51,0
Above TLV	25	49,0

*sumber data: data primer

Table 2 shows the distribution of respondents who work in the environment based on noise intensity values. A total of 26 people (51%) of respondents work with noise in an environment that does not exceed the TLV. While the other 25 people (49%) work with noise in an environment that exceeds the TLV.

Table 3. Distribution of Blood Pressure Increase

Blood Pressure Increase	Number (n)	Percentage (%)
Yes	34	66,7
No	17	33,3

*source of data: primary data

Table 3 shows the distribution of respondents who experienced increased blood pressure. A total of 34 people (66.7%) experienced an increase in blood pressure. Meanwhile, 17 people (33.3%) did not experience an increase in blood pressure.

Table 4. Distribution of Bivariate Analysis

Variable	Blood Pressure Increase		p-value
	Yes	No	
Age			
15 – 24 Years	0	7	
25 – 34 Years	9	6	
35 – 44 Years	18	1	0,000
45 – 54 Years	6	3	
55 – 64 Years	1	0	
Nutritional Status			
Skinny	2	1	
Normal	12	9	0,467
Fat	20	7	
Working Period			
<5 Years	5	9	
≥5 Years	29	8	0,007
Smoking Habit			
Yes	19	11	
No	15	6	0,763
History of Hypertension			
Yes	9	1	0,170

No	25	16	
PPE Usage			
Yes	18	2	
No	16	15	0,011
Noise Intensity			
Below TLV	9	17	
Above TLV	25	0	0,000

Table 4 is a description of the distribution of the relationship analysis between the independent variables and the dependent variable in this study using the chi square test. It was found that there was a relationship between age ($p = 0.000$), tenure ($p = 0.007$), PPE use ($p = 0.011$) and kebi intensity ($p = 0.007$).

DISCUSSION

Relationship Between Age and Increased Blood Pressure

This study shows there is a relationship between age and increased blood pressure ($p = 0.000$) in PT Japfa Comfeed Indonesia Plant Margomulyo production unit workers. The influence of the age of the respondent can cause an increase in blood pressure between before work and after work. The older an individual's age, the weaker the arterial elasticity. In line with Arini's research (2021) there is a correlation between age and changes in blood pressure. Decreased arterial elasticity due to aging can cause an increase in systolic blood pressure. Meanwhile, individuals aged 55 tend to experience an increase in diastolic blood pressure due to stiff arteries due to atherosclerosis.

However, this is not supported by Indriyanti's research (2019) which states that there is no relationship between age and increased blood pressure ($p = 0.384$). Indrayani (2020) also stated that age and non-auditory complaints, such as increased blood pressure, had no correlation ($p = 0.301$). This is due to a decrease in the physiological function of the worker's body which is decreasing accompanied by a decrease in sound stimuli or noise in the work environment.

Relationship between Nutritional Status and Increased Blood Pressure

This study shows no relationship between nutritional status and increased blood pressure ($p = 0.467$) in PT Japfa Comfeed Indonesia Plant Margomulyo production unit workers. Many workers who have normal nutritional status experience an increase in blood pressure, which indicates that not only workers with more nutritional status have a risk of increasing blood, but workers with normal nutritional status also have the same risk of experiencing increased blood pressure.

In contrast, Indriyanti (2019) suggested that nutritional status is another factor affecting the blood pressure increase ($p = 0.006$). Increasing an individual's nutritional status will be accompanied by an increase in fat in the visceral layer and blood pressure. This can be caused by the consumption of fat or carbohydrates, which can cause an increase in sympathetic activity, which affects blood pressure.

Relationship Between Working Period and Increased Blood Pressure

This study shows that there is a significant relationship between working periods and increased blood pressure ($p = 0.007$) in PT Japfa Comfeed Indonesia Plant Margomulyo production unit workers. The working period can be interpreted as the accumulation of years of exposure received by workers. A long period of work in a noisy work environment can cause health problems. This is in line with Maulana's research (2022), which suggests that noise-induced disorders in the work environment are likely to be experienced by workers with long working periods.

Contrary to Indriyanti's research (2019), which found no significant relationship between tenure and increased blood pressure ($p = 0.174$). The same thing was stated by Indrayani (2020), in which the working period with non-auditory complaints such as increased blood pressure did not have a significant relationship ($p = 0.305$). Widya (2018) also supports that the working period with systolic blood pressure ($p = 0.972$) and diastolic blood pressure ($p = 0.252$) has no relationship.

Relationship Between Smoking Habits and Increased Blood Pressure

This study shows there is no significant relationship between smoking habits and increased blood pressure ($p = 0.763$) in PT Japfa Comfeed Indonesia Plant Margomulyo production unit workers. Smoking habits are not a factor that directly affects the increase in blood pressure. Increased blood pressure can be influenced by the frequency of cigarettes smoked per day.

This is contrary to Indriyanti's research (2019), which states that there is a significant effect of smoking habits on increasing blood pressure ($p = 0.017$). The presence of nicotine in cigarettes can activate free radicals and affect the blood pressure of consumers. Lestari (2019), in her research, found that there were 77.3% of respondents who experienced increased blood pressure were smokers compared to respondents who did not smoke, namely 30.0%. The statistical test also obtained a p -value = 0.018, which shows that increased blood pressure has a significant relationship with smoking habits.

Relationship Between History of Hypertension with Increased Blood Pressure

This study shows no significant relationship between the history of disease and increased blood pressure ($p = 0.170$) in PT Japfa Comfeed Indonesia Plant Margomulyo production unit workers. A family's genetic history of disease has the potential to be passed on to their children. However, the history of the disease is only a risk and sometimes does not decrease for their children due to a healthy lifestyle that can reduce the risk of the disease. The existence of a noisy work environment is also a factor in increasing blood pressure because all workers with a history of disease or no history of disease get noise exposure and have the same risk of increasing blood pressure. This was supported by Indrayani (2020), who found that a history of

illness and non-auditory complaints, such as increased blood pressure, did not have a significant relationship ($p = 0.909$). Suryani (2018), in her research, added that a hereditary history of hypertension and increased blood pressure also had no significant relationship ($p = 0.545$).

Relationship Between PPE Use and Increased Blood Pressure

This study shows there is a significant relationship between the use of PPE and increased blood pressure ($p = 0.011$) in PT Japfa Comfeed Indonesia Plant Margomulyo production unit workers. The use of PPE during work can reduce noise exposure in the work environment, which can affect workers' blood pressure. This is reinforced by Indriyanti's research (2019), which found that the use of PPE can prevent the impact of high noise intensity.

Contrary to Indrayani's research (2020) which found that the use of PPE and non-auditory complaints such as increased blood pressure had no relationship ($p = 0.233$). This can be influenced by the inconsistent use of PPE or sometimes workers remove the PPE when working, PPE that does not function properly, to the size of PPE that does not fit the worker.

Relationship between Noise Intensity and Increased Blood Pressure

This study shows that there is a significant relationship between noise intensity and increased blood pressure ($p = 0.000$) in production unit workers of PT Japfa Comfeed Indonesia Plant Margomulyo. Maulana (2022) stated that noise intensity affects blood pressure due to the heart rate released through the release of stress hormones. In addition, Maulina (2022) also emphasized that sympathetic nerves aroused by noise can cause an increase in blood pressure. The presence of noise in the work environment will be responded by the brain as stress or threat. This triggers the release of hormones such as cortisol and epinephrine to norepinephrine by the adrenal glands which cause an increase in blood pressure. Supported by Sumardiyono (2020) that high noise intensity will increase cortisol levels in the blood and affect blood pressure.

This is supported by Kelirey's research (2023) which found that noise exposure and increased blood pressure had a significant relationship ($p = 0.023$). Zainudin's research, et al (2020) found that 32 respondents (46.7%) who worked in a work environment with high noise intensity, of whom 23 respondents (38.3%) had increased blood pressure. Arini (2021) also confirmed that the increase in blood pressure before or after work with noise intensity had a significant relationship ($p = 0.001$). Indriyanti (2019) also states that workers who work with noise intensity exceeding the TLV have a risk of 19.8 times experiencing an increase in blood pressure.

CONCLUSION

The study's results indicate that there is a significant correlation between the use of personal protective equipment (PPE) ($p = 0.011$), age ($p = 0.000$), length of service ($p = 0.007$), and other respondent characteristic factors and higher blood pressure in employees at the PT Japfa Comfeed Indonesia Plant Margomulyo production unit. Other respondent characteristics, including smoking behaviors ($p = 0.763$), dietary state ($p = 0.467$), and history of hypertension ($p = 0.170$), do not, however, significantly correlate with elevated blood pressure. Furthermore, the research discovered a strong correlation ($p = 0.000$) between the production unit workers' elevated blood pressure and noise levels. These results indicate that although lifestyle variables like smoking and nutritional status may have less influence in this particular environment, occupational factors—such as noise exposure and personal protective equipment (PPE)—play a significant role in determining workers' blood pressure.

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