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ORIGINAL RESEARCH

INFLUENCE OF INDIVIDUAL CHARACTERISTICS, BEHAVIOR AND NOISE INTENSITY ON BLOOD PRESSURE IN PONOROGO PLASTIC INDUSTRY'S WORKERS

Pengaruh Karakateristik Individu, Perilaku dan Intensitas Kebisingan Terhadap Tekanan Darah pada Pekerja Industri Plastik Ponorogo

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ABSTRACT

Background: Noise is an unwanted sound that can be caused by any human activity. Continuous use of machines that produce noise in the work environment will have a negative impact on workers, for example is increasing blood pressure. **Purpose:** This study aimed to analyze the influence of individual characteristics, behavior and noise intensity on increasing blood pressure in workers in the Ponorogo's plastic industry. **Methods:** The study used prospective cohort design. The sample of the study was 32 respondents who received continuous noise exposure from injection machine for 8 hours/ day. The variables include individual characteristics, behavior, noise intensity, and increased blood pressure. The data were analyzed using SPSS with paired sample t-test and multiple linear regression. **Results:** The result showed that the average increase in systolic and diastolic blood pressure before and after working is 5.75 mmHg and 5.31 mmHg. If analyzed by statistical paired t-test, the significance value of $p = 0.00 < \alpha = 0.05$ is obtained. Furthermore, multiple linear regression test is used for variables of individual characteristics, behavior and noise intensity on increasing blood pressure showing a significance value of 0.00 <0.05 and F count (6.79 and 6.32) > F table (2.49). **Conclusion:** Individual characteristics, behavior and noise intensity have an effect on increasing blood pressure in workers in the Ponorogo's plastic industry. Medical checkup and ear protection equipment are needed for workers.

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ABSTRAK

Latar Belakang: *Kebisingan merupakan suara yang tidak diinginkan keberadaannya yang ditimbulkan oleh setiap aktivitas manusia. Penggunaan mesin secara terus menerus di lingkungan kerja akan menyebabkan dampak negatif pada pekerja, salah satunya gangguan organ jantung dengan terjadinya peningkatan tekanan darah.* ***Tujuan:*** *Penelitian ini bertujuan untuk menganalisis pengaruh karakteristik individu, perilaku dan intensitas kebisingan terhadap peningkatan tekanan darah pada pekerja di industri plastik Ponorogo.* ***Metode:*** *Penelitian ini menggunakan desain kohort prospektif. Sampel penelitian adalah pekerja pada bagian produksi ceting yang menerima paparan kebisingan kontinyu dari mesin injeksi selama 8 jam/hari sebanyak 32 responden. Variabel penelitian meliputi karakteristik individu, perilaku, intensitas kebisingan, dan peningkatan tekanan darah. Data dianalisis menggunakan uji paired sample t-test dan uji regresi linier berganda.* ***Hasil:*** *Hasil analisis didapatkan bahwa rata-rata peningkatan tekanan darah sistole dan diastole pada pekerja bagian ceting sebelum dan sesudah bekerja adalah 5,75 mmHg dan 5,31 mmHg. Jika dianalisis dengan uji statistic paired t-test diperoleh nilai signifikansi $p = 0,00 < \alpha = 0,05$. Selanjutnya dilakukan uji regresi linier berganda dari variabel karakteristik individu, perilaku dan intensitas kebisingan terhadap peningkatan tekanan darah (sistole dan diastole) menunjukkan nilai signifikasi 0,00<0,05 dan F hitung (6,79 dan 6,32) > F tabel (2,49).* ***Kesimpulan:*** *Karakteristik individu, perilaku dan intensitas kebisingan berpengaruh terhadap peningkatan tekanan darah pada pekerja di industri plastik Ponorogo. Cek kesehatan rutin dan alat pelindung telinga diperlukan untuk para pekerja.*

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INTRODUCTION

The work environment is all aspects of hygiene in the workplace which include physical, chemical, biological, ergonomic, and psychological factors whose presence can affect the safety and health of workers in the workplace (1). One of the physical factors in the work environment is noise. Noise is unwanted sounds that can be caused by every human activity (2). High levels of noise are still a problem in many areas of the world. For example in the United States, there are more than 30 million workers who are exposed to acute noise exposure (3). In Germany, there are also 4-5 million people, or about 12–15% of the workforce, exposed to harmful levels of noise. Then, in some developing countries, not all industries provide protection to reduce noise (4).

Continuous use of machines in the work environment will have a negative impact on workers, such as heart problems with an increased blood pressure (hypertension), decreased hearing function, mental disorders, and work accidents due to lack of hearing instructions given by coworkers (5).The continuous use of machines in the work environment will cause a negative impact on workers, for example, heart problems with an increased blood pressure, both systolic and diastolic (6). Indonesia is one of the countries that have an industry that uses large machines with high noise levels. The noise threshold value set at work is 85 dBA with eight hours worked per day (1). In fact, there are still many industries that do not manage the noise well; their workers are still exposed as long as they work. This condition can occur due to a lack of understanding of occupational safety and health.

The protection closest to the worker can be by giving the worker an ear plug or ear muff that can reduce noise. However, workers can also not obey instructions with the use of ear protection equipment. One of the factors that cause an increased blood pressure is the noise that can come from the workplace (7). The increase in blood pressure is caused by the build-up of collagen substances in the muscle layer and causes blood vessels to narrow and stiffen (8). Based on the results of Basic Health Research (Riskesdas) 2018, the prevalence of hypertension in East Java Province at the age ≥ 18 years increased from 2013 to 2018 with the prevalence in Ponorogo Regency amounting to 7.8 (9).

Ponorogo's plastics industry is engaged in the production of rice sacks and plastic bags. It is one of the industries that generate noise in the workplace. The industry has injection machines that become a source of noise in the workplace. The machine is turned on continuously, causing workers to be exposed for eight hours per day. Furthermore, no ear protection equipment is provided in this industry, so workers will be exposed to existing noise directly, increasing the intensity of the noise. In addition, the results of interviews with several workers in the production department mentioned that they had complaints, such as headaches, fatigue, dizziness, and little nausea when they worked and after working in the noisy area. These are some of the characteristics that indicate a person has high blood pressure.

Based on these problems, the study aimed to analyze the influence of individual characteristics, behavior, and noise intensity on the blood pressure of workers in Ponorogo's plastics industry.

METHODS

The design of this study was an observational analytical study with a prospective cohort design (longitudinal) to examine groups exposed to noise. This study's location was an industry-producing rice sack made from plastic in Ponorogo Regency, East Java. The sample used was all workers in the plastics industry's *ceting* (plastic bowl) production who were willing to be the research subject and were exposed to noise during eight hours of work, which is as many as 32 respondents. Non-probability sampling with total sampling was used in the technique for determining large samples. The sample studied was measured twice, before and after work. In addition, the study was conducted in March-April 2021.

The study was limited to measuring noise intensity and analyzing its effect on the workers' increased blood pressure. In addition, it also analyzes the characteristics of respondents, namely age, gender, history of hypertension, and worker behavior. The data used in this study were primary data obtained through measurements, interviews, and questionnaires filled out directly by respondents. A digital sphygmomanometer was used to measure the workers' blood pressure 15 minutes before and after they worked. Then, to collect data on noise levels, a device called a sound level meter (SLM) was used. In addition, the questionnaires used have been tested for validity and reliability. The independent variables in the study were individual characteristics, individual behavior, and noise intensity, while the dependent variable was increased blood pressure.

The analysis is used to determine the relationship between individual characteristics, behavior and noise intensity with increased blood pressure, namely the paired sample t test and regression test. The paired sample t test is used to compare the difference of two means of two paired samples assuming normally distributed data. In addition, this test is used because the measurement was taken on workers twice, before and after working with level of significance 5%; if the value of $p < 0.05$ it means there is a difference (increase) in blood pressure before and after having worked. Otherwise, if the value of $p > 0.05$ it means that there is no difference (increase) in blood pressure before and after having worked. Multiple linear regression tests are used to determine the effect of independent variables on dependent variables. If the significance value < 0.05 and the value F count > F of the table then there is an influence between the independent variables on dependent variables.

This research has passed the ethics test at the Faculty of Dentistry, Universitas Airlangga, Surabaya with certificate number 070/HRECC.FODM/II/2021.

RESULTS

Individual Characteristics

In Table 1, we can see the distribution of individual characteristics has the most male sex, which is 24 respondents (75%), with the most ages ranging from 26 - 45 years as many as 23 respondents (71.90%). Furthermore, for as many as 24 respondents (75%), the working period was less than five years, and many respondents did not have a history of hypertension, which is the case for 29 respondents (90.60%).

Respondent's Behavior

In Table 2, we can see the distribution of respondents' behavior based on smoking habits. Many respondents did not have a smoking habit, which is 19 or 59.40%. The number of respondents who have a habit of smoking is 13 respondents or 40.60%. Based on the observations of the use of ear protection equipment, all respondents in this study did not use ear protection equipment while working.

Table 1
Distribution of Individual Characteristics of Respondents by Gender, Age, Working Period, and History of Hypertension in Ponorogo's Plastic Industry Workers in 2021

Variable	n	%
Sex		
Man	24	75.00
Woman	8	25.00
Age (years)		
12 – 25	9	28.10
26 – 45	23	71.90
Working Period		
< 5 years	24	75.00
≥ 5 years	8	25.00
History of Hypertension		
Yes	3	9.40
No	29	90.60
Total	32	100.00

Noise Measurement in Workers

In Table 3, the results of noise measurements in 32 workers in the production section when compared to the Minister of Labour Regulation No. 5 of 2018 on Occupational Environmental Safety and Health are higher than the predetermined threshold value of 85 dBA. The average noise intensity received by workers in Ponorogo's plastics industry is 86.40 dBA.

Blood Pressure Measurement

Based on Table 4, it can be seen that the average increase in systolic blood pressure in workers before and after work is 5.75 mmHg. Furthermore, the results of the measurement were analyzed with the paired t-test statistical test and obtained a significance value of $p = 0.00 < \alpha = 0.05$. This shows that there is a significant difference in the blood pressure of the systole before and after working in the production section for workers who are exposed to noise in excess of the specified NAB.

Table 2
Distribution of Respondents' Behavior Categories by Smoking Habits and Use of Ear Protection Equipment in 2021

Variable	n	%
Smoking Habits		
Yes	13	40.60
No	19	59.40
Use of Ear Protection Equipment		
Yes	0	00.00
No	32	100.00
Total	32	100.00

Table 3
The Results of Work Noise Measurement in Ponorogo's Plastic Industry Workers in 2021

Variable	n	%
Noise Intensity (dBA)		
≤ 85 dBA	0	00.00
> 85 dBA	32	100.00
Total	32	100.00

Table 4
The Results of Systolic Blood Pressure Measurements Before and After Working in Workers in the Ponorogo's Plastics Industry in 2021

Systole Blood Pressure	Min (mmHg)	Max (mmHg)	Avg (mmHg)
Before Working	100	138	115.63
After Working	108	140	121.38
The result of the statistical paired t-test obtained that $p = 0.000 < \alpha = 0.05$			

Based on Table 5, the average increase in diastolic blood pressure in *ceting* production workers is 5.31 mmHg. The results of diastolic blood pressure measurements before and after work were analyzed with a statistical paired t-test and obtained a significance value of $p = 0.00 < \alpha = 0.05$. It means that there is a significant difference between diastolic blood pressure before and after work in workers who are exposed to noise over the specified NAB.

Analysis of Influence between Variables

In Table 6, the results of individual characteristic variables, behavior and noise intensity to increased blood pressure (systolic and diastolic) show significance values < 0.05 and F counts > F tables. It can be concluded that variable

individual characteristics, behavior and noise intensity significantly affect the increase in blood pressure (systolic and diastolic).

Table 5
The Results of Diastolic Blood Pressure Measurements Before and After Working in Workers in the Ponorogo's Plastics Industry in 2021

Diastole Blood Pressure	Min (mmHg)	Max (mmHg)	Avg (mmHg)
Before Working	62	101	79.16
After Working	70	107	84.47
The result of the statistical paired t-test obtained that $p = 0.00 < \alpha = 0.05$			

DISCUSSION

The Influence of Individual Characteristics on Increasing Blood Pressure

Males have a 2–3 times greater risk of an increase in systolic blood pressure because they are suspected of having a lifestyle that tends to be unfavorable, which can increase blood pressure (10). Women who have not reached menopause will be protected by estrogen hormones that play a role in increasing high-density lipoprotein (HDL) levels. But when entering menopause, women tend to have an increase in blood pressure (11). In addition, the risk of developing disease will be greater, and blood pressure will also increase.

According to Regulation of the Minister of Manpower and Transmigration of the Republic of Indonesia, Number 25 of 2008, workers aged 40 and above typically have a 0.5 dB decrease in hearing ability per year. Human organs' abilities, including hearing, deteriorate with age (12). Then, workers who have a long working period will be more accustomed to their workplace, but they do not understand what occupational hazards exist in their work environment (13).

The longer workers work in environments with exposure to noise, the greater the possibility of impaired hearing function (14). The longer a worker is exposed to noise, the more it will cause an increase in hormones in the body that cause an increase in blood pressure (15). This finding contradicts the findings of Andjani and Mediana (16), who discovered that the length of working life has no meaningful relationship with increased blood pressure. Furthermore, the noise will be a risk factor for increased blood pressure in workers with a history of hypertension (10).

The Influence of Behavior on Increasing Blood Pressure

Smoking can cause an increase in heart rate and blood pressure. The number of cigarettes consumed by workers can influence blood pressure (17). This condition can happen because cigarettes have chemicals that can enter the bloodstream and damage the lining of arterial blood vessels, causing high blood pressure (18). The longer workers smoke, the higher the risk of increased blood pressure (19).

The use of ear protection equipment is related to reducing potential noise risks up to 5–10 dB (16). Without ear protection equipment, workers will be at risk of occupational diseases. Ear protection equipment can be used in the form of ear plugs or ear muffs. According to previous research, using earplugs can reduce noise while not significantly increasing blood pressure (20). The use of ear muffs can reduce noise by 40–50 dB(A) when compared to ear plugs, which can only reduce noise by 30 dB(A) (21).

Table 6
Multiple Linear Regression Test Results of The Influence of Individual Characteristics, Behavior and Noise Intensity on Increased Blood Pressure in Workers in the Ponorogo's Plastics Industry in 2021

Variable	Significance (p value)	F counts	F tables
Individual characteristics, behavior and noise intensity on increasing systolic blood pressure	0.00	6.79	2.49
Individual characteristics, behavior and noise intensity on increasing diastolic blood pressure	0.00	6.32	2.49

The Influence of Noise Intensity on Increasing Blood Pressure

The intensity received by workers varies depending on their position and work environment. Workers in this production section are exposed to noise for eight hours per day, a type of continuous noise caused by the injection machine. At noise intensity above 85 dBA, there will be an increase in systolic and diastolic blood pressure. In Table 4 and Table 5, we can see that blood pressure is increasing after working. It is concluded that noise intensity is increasing blood pressure (22). This can be happen because the brain will respond to the noise as a threat, which is related to oxidative stress and affects the rate and changes in blood pressure (20). Noise triggers the emergence of work stress which is that they have an impact on increasing systolic and diastolic blood pressure (23). This study is in line with research conducted by (13) where the blood pressure of workers, both systolic and diastolic, had a significant difference between before and after work. It also revealed that there was a significant increase in blood pressure (systolic and diastolic) in workers before and after work who were exposed to acute noise (5).

Exposure to noise can activate the sympathetic nervous system and cause the hormones epinephrine and norepinephrine to become high, thus affecting some organs such as the heart. It is also supported by research conducted by Septianingsih et al (14) that high levels of noise exposure will be a risk factor for hearing loss due to damage to the inner ear structure. Initially, there will be a decrease in hearing, but if the exposure occurs continuously without prevention, it will cause permanent hearing loss such as deafness. Therefore, it is necessary to control to prevent the effects of noise by using ear protection equipment in the form of ear plug/ear muff, engine maintenance (maintenance), or workplace rotation (16).

Analysis of Influence between Variables

Based on the results, it can be concluded that variable individual characteristics, behavior and noise intensity significantly affect the increase in blood pressure (systolic and diastolic). Age will be related to the performance of the body's organs, if the workers get older then the function of the body's organs will also decrease, so it can cause an increase in blood pressure, especially systolic. Women have a 0.256 times greater risk of increasing in systolic blood pressure than men (24). This condition is due to the presence of different hormonal factors between men and women. Blood pressure also influenced by lifestyle factor, for example, smoking habit. It will produce stress hormone and contribute to increasing blood pressure (25).

There was a relationship between noise and blood pressure which can increase to 20 mmHg (7). This is in line with research conducted by Indriyanti et al (26) which states that noise intensity that exceeds the threshold value will increase the risk of increased blood pressure. The limitation of this study was not to examine the workload on workers.

CONCLUSION

Based on the results of this study and its discussion, it can be concluded that variables of individual characteristics, behavior, and noise intensity affect the increase in blood pressure. The results of the increase in blood pressure in workers are originally normal in the pre-hypertensive category after work. So, it is recommended that workers get a medical checkup and take precautions against the occurrence of occupational diseases. In addition, Ponorogo's plastic industry should provide ear protection equipment for its workers because the intensity of noise in the work area has exceeded the threshold value that has been set.

CONFLICT OF INTEREST

The author declares that they do not have conflict of interest.

AUTHOR CONTRIBUTIONS

All authors have actively participated in this study. AF: conceptualization, methodology, software, and data curation. ARP: writing the original draft, preparation, and editing. SK: Reviewing and study supervision.

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REFERENCES

1. Permenaker. Peraturan menteri ketenagakerjaan Republik Indonesia nomor 5 tahun 2018 tentang keselamatan dan kesehatan kerja lingkungan Kerja. Peraturan Menteri tenaga Kerja dan Transmigrasi. 2018.
2. International Labour Organization. Physical hazards noise. ILO; 2019. 1 p.
3. Themann CL, Masterson EA. Occupational noise exposure: A review of its effects, epidemiology, and impact with recommendations for reducing its burden. J Acoust Soc Am. 2019;146(5):3879–905.
4. World Health Organization. Occupational noise: assessing the burden of disease from work-related hearing impairment at national and local levels. Geneva: WHO; 2004. 1 p.
5. Diningsih SEE, Zulfian. Pengaruh intensitas kebisingan di tempat kerja terhadap tekanan darah. J Ilmu Kedokt dan Kesehat. 2018;5(1):1–9.
6. Afriyanto DF, Widajati N. Analysis of work climate and the increase of blood pressure of construction workers in Pamekasan regency. Indian J Forensic Med Toxicol. 2020;14(3).
7. Nurshafa EA, Widajati N. Association of noise exposure and physical workload on systolic blood pressure of ceramic industry workers. Indian J Forensic Med Toxicol. 2020;14(2):1229–34.
8. Amanda D, Martini S. The relationship between demographical characteristic and central obesity with hypertension. J Berk Epidemiol. 2018;6(1):43–50.
9. Kemenkes R.I. Riset Kesehatan Dasar 2018. Badan Penelitian dan Pengembangan Kesehatan. 2019. p. 198.
10. Supriyono. Analisis Faktor-Faktor yang Berhubungan Tekanan Darah Sistole pada Peserta Pelatihan Manajemen Puskesmas. J Inspirasi. 2019;10(1):32–48.
11. Tikhonoff V, Casiglia E, Gasparotti F, Spinella P. The uncertain effect of menopause on blood pressure. J Hum Hypertens. 2019;33(6):421–8.
12. Aristoteles. Korelasi umur dan jenis kelamin dengan penyakit hipertensi di emergency center unit Rumah Sakit Islam Siti Khadijah Palembang 2017. Indones J Perawat. 2018;3(1):9–16.
13. Luthfiyah F 'Izza, Widajati N. Analisis peningkatan tekanan darah pada pekerja yang terpapar kebisingan. J Heal Sci Prev. 2019;3(1):1–9.
14. Septianingsih CP, Palandeng OELI, Pelealu OCP. Pengaruh kebisingan terhadap ambang pendengaran karyawan arena bermain. Med Scope J. 2020;1(2):50–5.
15. Anisah F. Pengaruh Kebisingan Terhadap Tekanan Darah Tinggi (Hipertensi) pada Pekerja Penggilingan Daging di Pasar Induk Minasamaupa Kab. Gowa. Makassar; 2021.
16. Andjani NDS, Mediana D. Hubungan paparan bising dengan hipertensi pada karyawan pabrik industri kabel. J Biomedika dan Kesehat. 2021;4(2):57–64.
17. Widyatama HG, Kusumaningrum D, Parwanto ME, Widyasyifa SA, Rahmayanti D, Gondoyuwono H. Usia dan jumlah rokok meningkatkan tekanan Darah. J Ilm Kesehat IQRA. 2020;8(2):69–76.
18. Umbas IM, Tuda J, Numansyah M. Hubungan Antara Merokok Dengan Hipertensi di Puskesmas Kawangkoan. J Keperawatan. 2019;7(1):1–8.
19. Santos UP, Braga ALF, Garcia MLB, Pereira LAA, Lin CA, Chiarelli PS, et al. Exposure to fine particles increases blood pressure of hypertensive outdoor workers: A panel study. Environ Res. 2019;174:88–94.
20. Bagheri Hosseinabadi M, Khanjani N, Münzel T, Daiber A, Yaghmorloo M. Chronic occupational noise exposure: Effects on DNA damage, blood pressure, and serum biochemistry. Mutat Res - Genet Toxicol Environ Mutagen. 2019;841:17–22.
21. Mukhlish WIN, Sudarmanto Y, Hasan M. Pengaruh Kebisingan Terhadap Tekanan Darah dan Nadi pada Pekerja Pabrik Kayu PT. Muroco Jember. J Kesehat Lingkung Indones. 2018;17(2):112–8.
22. Chen F, Fu W, Shi O, Li D, Jiang Q, Wang T, et al. Impact of exposure to noise on the risk of hypertension: A systematic

review and meta-analysis of cohort studies. Environ Res. 2021;195:110813.
23. Sumardiyono, Wijayanti R, Hartono H, Sri Budiastuti MT. Pengaruh kebisingan terhadap tekanan darah, dengan stres kerja sebagai variabel mediator. J Kesehat Vokasional. 2020;5(2):124–31.
24. Supriyono S. Analysis of factors relating to sistole blood pressure at participants in Puskesmas management train. J Inspirasi. 2019;10(1):32–48.
25. Nadzifah YN, Hidajah AC. The relationship of diabetes mellitus and hypertension with mortality in COVID-19 patients. J Berk Epidemiol. 2022;10(2):219–26.
26. Indriyanti LH, Wangi PK, Simanjuntak K. Hubungan paparan kebisingan terhadap peningkatan tekanan darah pada pekerja. J Kedokt dan Kesehat. 2019;15(1):36.