



## **ANALYSIS OF RELATIONSHIP BETWEEN WORKPLACE PHYSICAL ENVIRONMENT AND WORKER BEHAVIOR WITH THE INCIDENCE OF HYPERTENSION IN WORKERS IN INDONESIA (LITERATURE REVIEW)**

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### **ABSTRACT**

Basic Health Research in 2013 reported that the prevalence of hypertension in Indonesia based on measurement results reached 26.5%, and experienced a fairly high increase to 34.11% in 2018. Factors that can affect the occurrence of hypertension in workers are noise intensity, environmental temperature, obesity, physical activity, salt consumption, alcohol consumption, coffee consumption, and smoking. The purpose of this study was to analyze the relationship between the physical workplace environment and worker behavior with the incidence of hypertension in workers in Indonesia. This research uses a systematic review method and uses the PubMed and Google Scholar databases with research locations in Indonesia. Of the 30 articles, 8 articles showed the relationship between noise and the incidence of hypertension, 4 articles showed the relationship between salt consumption and the incidence of hypertension, 6 out of 8 articles showed the relationship between obesity and the incidence of hypertension, 5 out of 9 articles showed the relationship between physical activity and the incidence of hypertension, 9 of 17 articles showing the relationship between smoking and the incidence of hypertension. Noise is a physical environmental factor in the workplace that is most often proven to influence the incidence of hypertension in workers in Indonesia. Salt consumption, obesity, physical activity and smoking are worker behavioral factors that are most often proven to influence the incidence of hypertension in workers in Indonesia.

Keywords: Risk Factors, Hypertension, Blood Pressure

### **Introduction**

The 2013 Basic Health Research reported that the prevalence of hypertension in Indonesia based on measurement results reached 26.5% <sup>(1)</sup>, and experienced a fairly high increase to 34.11% in 2018 <sup>(2)</sup>. Hypertension is a condition where blood pressure is higher than normal values, namely above 120 mmHg and 80 mmHg. Hypertension can increase the risk of other diseases such as chest pain, heart attack, stroke and rupture of blood vessels. Therefore, hypertension is a serious medical condition and requires regular monitoring. Several factors that can affect the increase in blood pressure include noise, ambient temperature, physical activity, alcohol consumption, smoking, and nutritional status <sup>(3)</sup>.

Hypertension is influenced by many factors, both risk factors that can be changed and risk factors that cannot be changed. Age, gender, family history, and genetics fall into groups that cannot be controlled <sup>(4)</sup>. A number of study previously put forward Risk factors for hypertension that can be changed include: obesity <sup>(5-8)</sup>, activity physique <sup>(9)</sup>, consumption salt <sup>(8, 10-12)</sup>,

consumption alcohol <sup>( 13 , 14 )</sup> , coffee consumption <sup>( 15 )</sup> And smoking <sup>( 7 , 16-18 )</sup> . From research previously obtained that style life specifically too Lots use salt , consumption of coffee containing caffeine tall And consumption alcohol is influencing factors \_ happening hypertension . As for behavior *sedentary* or lack of activity physique And smoke in a manner significant influence happening hypertension .

Worker behavior and the physical environment of the workplace are conditions of individual worker habits and the workplace environment that must be met to prevent the emergence of health problems for workers and environmental pollution in the workplace. The office physical environment requirements that need to be considered according to the Decree of the Minister of Health of the Republic of Indonesia Number 1405/Menkes/SK/XI/2002 are temperature and humidity, dust, air exchange, pollutant gases, microbes, waste, lighting in the room, noise in the room, vibration in the room, radiation in the room, disease vectors, room and building conditions, toilet conditions, and installations for the benefit of office buildings.

Pattern Eat and worker behavior is the habitual condition of individual workers and the work environment that must be met to prevent health problems for workers. According to previous research <sup>( 8 )</sup> , exposed workers \_ noise exceeding 85 dB can cause happening enhancement pressure blood <sup>( 19-25 )</sup> . Temperature room that exceeds 30 °C will produce pressure hot as a result happen enhancement pressure blood <sup>( 26 , 27 )</sup> .

Primary research that examines the relationship between the physical workplace environment and worker behavior with the incidence of hypertension in previous workers has been carried out by many researchers in various locations using various methods, such as *case control* , *cross sectional* , and *cohorts* . So based on this description, the researcher is interested in researching "Analysis of the Relationship between the Physical Environment of the Workplace and the Behavior of Workers with the Incidence of Hypertension in Workers in Indonesia ( *Literature Review* )".

## Methods

This study used a *literature review method*. In this research, the review that will be examined is the relationship between the physical environment of the workplace and worker behavior with the incidence of hypertension in workers in Indonesia. Secondary data in *the* form of articles will be collected through 2 *databases* , namely Google Scholar and PubMed using the keywords " *Noise* ", Temperature , Heat Pressure, *Obesity* , Smoking , Consumption Salt ( *salt consumption* ), coffee consumption ( *coffee consumption* ), alcohol consumption ( *alcohol consumption* ), physical activity ( *physical activity* ), hypertension ( *hypertension* ), worker hypertension ( *worker hypertension* ), and Indonesia." After all articles have been collected, *a screening is carried out* based on inclusion criteria, checks for duplication and selection of titles and abstracts. Then the

final results of eligible articles were entered into the data extraction table, and data synthesis was carried out using descriptive analysis techniques.

The inclusion criteria that have been set are “Journals published within the last 5 years (2017-2022); a journal that examines the relationship between the physical environmental conditions of the workplace and worker behavior with the incidence of hypertension in workers; journals that can be accessed in full text for free; journals in Indonesian and English; journals where no duplication was detected.”

## Results

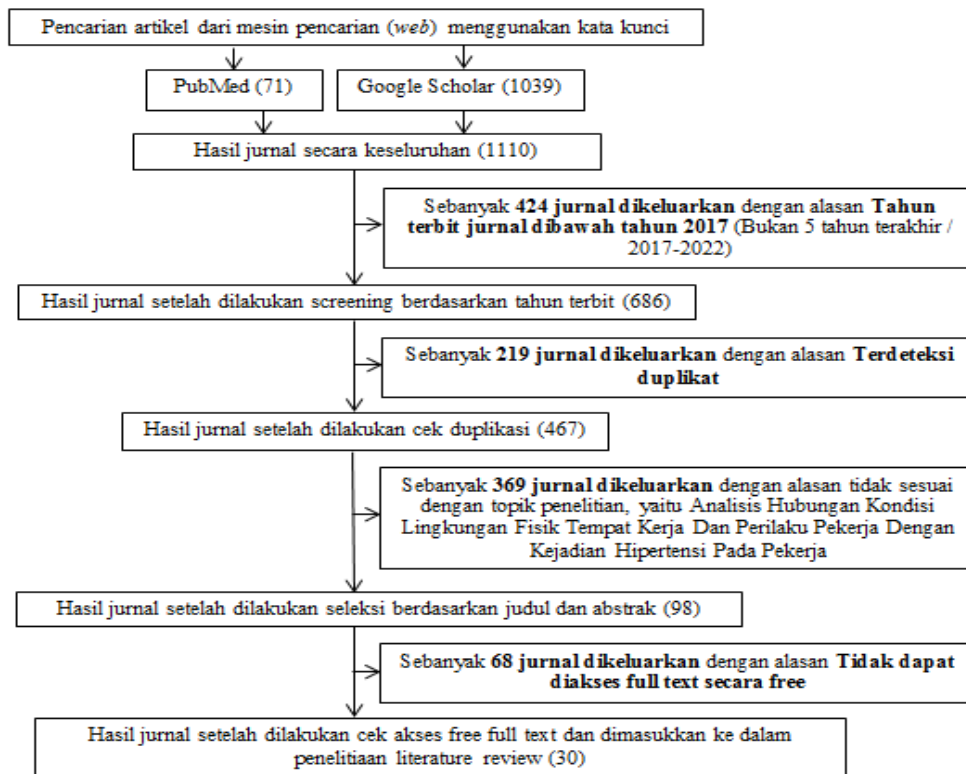
### Search Results and Study Selection

**Table 1. Article Search Results Through Two (2) Databases**

No.	Database used	Number of articles collected
1.	Google Scholar	1039 articles
2.	PubMed	71 articles
<b>Total articles collected</b>		<b>1110 articles</b>

Used two *databases* for collecting research articles, namely *Google Scholar* and *PubMed* . After searching using keywords, search results were obtained with a total of 1110 articles. All articles obtained, then collected and carried out the *screening stage* based on predetermined inclusion criteria.

*screening stage* based on the inclusion criteria was carried out using the Endnote Check stage The results obtained were 219 articles were excluded on the grounds that duplication was detected. So that the remaining 467 articles to be selected based on the title and abstract. Then the results obtained were that 369 articles were excluded on the grounds that the articles did not match the research topic, namely Analysis of the Relationship between Physical Environmental Conditions of the Workplace and Worker Behavior with the Incident of Hypertension in Workers. So that there are 98 articles left to check for *free full text access* . Then the results obtained were 68 articles were excluded on the grounds that *the full text of the article could not be accessed for free* . So that the remaining 30 final articles will be included in this study. The results of the search and selection of this study can be described in the form of a *flow diagram* as follows.



**Chart 1**  
*Flow Diagram of Study Search and Selection*

## Results of a Literature Review of the Relationship between the Physical Environment of the Workplace and Worker Behavior with the Incident of Hypertension in Workers in Indonesia

In this study, researchers took variables from 30 selected articles according to the variables used in this study, namely noise, ambient temperature, obesity, physical activity, salt consumption, alcohol consumption, coffee consumption, and smoking ( Table 2 ).

**Table 2**  
**Results of a Literature Review of the Relationship between the Physical Environment of the Workplace and Worker Behavior with the Incident of Hypertension in Workers in Indonesia**

No.	The variables studied	Number of Researching Articles	Literature Review Results
1.	Noise	8	8 articles (100%) showed that there was a relationship between noise and the incidence of hypertension in workers
2.	Ambient temperature	2	2 articles (100%) showed that there was a relationship between temperature and the incidence of hypertension in workers
3.	Obesity	8	6 articles (75%) showed that there was a relationship between obesity and the incidence of hypertension and 2 articles ( 25%) there was no relationship between obesity and the incidence of hypertension in workers
4.	Physical Activity	9	5 articles (55.5%) showed that there was a relationship between physical activity and the incidence of hypertension and 4 articles (44.4%) showed no relationship between physical activity and the incidence of hypertension in workers.
5.	Salt Consumption	4	4 articles (100%) showed that there was a relationship between salt consumption and the incidence of hypertension in workers
6.	Alcohol consumption	4	2 articles (50%) showed that there was a relationship between alcohol consumption and the incidence of hypertension and 2 articles (50%) showed no association between alcohol consumption and the incidence of hypertension in workers.
7.	Coffee Consumption	4	1 article (25%) showed that there was a relationship between coffee consumption and the incidence of hypertension and 3 articles (75%) showed no relationship between coffee consumption and the incidence of hypertension in workers.
8.	Smoke	17	9 articles (52.9%) showed that there was a relationship between smoking and the incidence of hypertension and 8 articles (47%) showed no association between smoking and the incidence of hypertension in workers.

## Discussion

Based on the results of a literature review , it is known that there are 8 articles (100%) which show statistical results that there is a relationship between noise and the incidence of hypertension in workers. From these 8 articles, it was explained that workers were exposed to noise that exceeded NAB (>85dB) during work. Based on study earlier by Maulina et al in 2019 found that There is connection significant between noise with pressure blood with mark *p-value* 0.000<sup>(23)</sup>. So that noise can affect health, such as increased blood pressure .

The Noise Threshold Limit Value (NAB) for 8 working hours per day according to the Indonesian Minister of Health Regulation Number 70 of 2016 concerning Health Standards and

Requirements for Industrial Work Environments is 85 dBA. Noise intensity can be a risk factor for the occurrence of hypertension in workers if workers are exposed to noise >85 dBA. Noise can cause stress which can increase the release of adrenaline and narrow blood vessels, which can cause hypertension<sup>(28)</sup>. Therefore, workers should pay attention to the noise threshold in the workplace to minimize the occurrence of hypertension in workers.

Based on the results of a literature review, there were 2 articles (100%) which showed statistical results that there was a relationship between ambient temperature and the incidence of hypertension in workers. From the 2 articles, it was explained that the ambient temperature at the worker's place is > 30 °C, so that workers are at risk of health problems such as hypertension. This is in line with research by Lestari et al in 2019 that there is connection temperature with enhancement pressure blood systolic with mark *p-value* 0.000 and diastolic with mark *p-value* 0.001<sup>(29)</sup>. Based on the Decree of the Minister of Health No. 1405/MENKES/SK/XI/2002 concerning Office and Industrial Work Environment Health Requirements, it states that the Threshold Limit Value (NAV) for room temperature is between 18-28 °C.

Elevated temperatures can cause increased blood pressure in workers exposed to heat over long periods of time<sup>(27)</sup>. Moment body exposed hot, heart will pump blood become more hard and fast. Enhancement burden work heart this is what causes it vessels blood become thick and rigid so that potential happening increase pressure blood<sup>(30)</sup>. Apart from that, hot temperatures can also cause workers to become less active focus and agile in finish work, lack of concentration, interfere with brain accuracy, and interfere with the coordination of the sensory and motor nerves. Overheating conditions will increase feelings of tiredness, tiredness, drowsiness, lack of stability and increasing the number of work errors<sup>(31)</sup>. Therefore, it is best for companies and offices to pay attention to temperature levels so that they remain within normal limits to minimize the occurrence of hypertension in workers.

The Body Mass Index Threshold Limit for Indonesia according to the Ministry of Health of the Republic of Indonesia is when not enough from 17.0 including category very skinny, range 17-18.4 incl category thin, stretched 18.5-25.0 including normal category, range 25.1-27 including category fat and more of 27 incl category very fat. Study previously obtained that Body Mass Index (BMI) is an influencing factor incident hypertension<sup>(5)</sup>.

Results literature reviews shows that there are 6 articles (75%) which show statistical results that there are There is a significant relationship between obesity and the incidence of hypertension in workers and 2 articles (25%) show statistical results that there is no relationship between obesity and the incidence of hypertension in workers. Study earlier show that There is connection obesity and hypertension with *p-value* 0.000<sup>(8)</sup>.

Excess workers heavy body own heap lots of fat and narrow down Genre blood as a result No sufficient Genre blood to all body. Work heart more hard pump blood For fulfil need Genre so

that happen enhancement pressure blood <sup>(8)</sup>. Risk happening disease like hypertension, stroke, failure heart, kidney, cancer And rock bile increase along with happening obesity <sup>(5)</sup>.

Excess body weight can cause an increase in cholesterol in the body, which triggers atherosclerosis. Atherosclerosis can cause blood vessels to narrow, thereby increasing the peripheral resistance of blood vessels. In addition, hypertensive patients with obesity will have higher cardiac output and circulating blood volume than hypertensive patients who are not obese <sup>(6)</sup>. Someone who has heavy body excessive 2.2 times more risk big For experience hypertension in the future come <sup>(8)</sup>. Therefore, workers should pay attention to their body mass index so that they remain within normal limits to minimize the occurrence of dangerous diseases that can affect performance, such as hypertension. As for possible efforts \_ done including being diligent exercise, reduce behavior *sedentary* like watch tv And play computer too long, set pattern Eat with consumption fruit And vegetable more of 5 servings a day, reduce food tall sodium, high glucose And tall fat <sup>(8,32)</sup>.

Based on the results of a *literature review*, there were 5 articles (55.5%) which showed statistical results that there was a relationship between physical activity and the incidence of hypertension in workers and there were 4 articles (44.4%) which showed statistical results that there was no relationship between physical activity and the incidence of hypertension in workers. Of the 4 articles which showed no relationship, explaining that the questionnaire filled out by the respondents did not explain the work (length of work, work weight, etc.) related to physical activity and also most respondents had carried out physical activity regularly so the results obtained were statistics is no relationship. Meanwhile, from the 5 articles that show the results there is a relationship, it explains that most respondents do not do physical activity regularly so that the results obtained statistically are there is a relationship. this \_ in line with study Merthayani et al in 2020 that There is connection between activity physique to hypertension with *p-value* 0.001 <sup>(9)</sup>.

Workers who have light physical activity can be at risk of developing hypertension compared to workers who have moderate/severe physical activity <sup>(5,33)</sup>. Physical activity is one of the factors that greatly influences the stability of blood pressure. Worker own trend do activity monotone every day so that causes a feeling of boredom Good in a manner physique nor mental, p the impact on decline fitness physical workers <sup>(9)</sup>. Do activity regular physical \_ will absorb or remove accumulation cholesterol in the vessels blood. Workers who do not do physical activity can cause the heart rate to be high and cause the heart muscle to work more hard pump blood to all body so that pressure on arteries more big And pressure blood the more increased <sup>(34)</sup>. Not enough workers do activity physique risk 1.25 times experiencing hypertension compared to with frequent workers \_ do activity physical <sup>(35)</sup>. Not enough motion can increase risk excess heavy body. Therefore, workers should pay attention to physical activities that are carried out daily to minimize the risk of developing hypertension, especially for office workers who only work by sitting and

staring at laptops for long periods of time. As for WHO recommended activity is 300 minutes \_ per week or 60 minutes per day <sup>(8)</sup>.

Based on the results of *a literature review* , there were 4 articles (100%) that showed statistical results that there was a relationship between salt consumption and the incidence of hypertension in workers. Of the 4 articles that show results that there is a relationship, it explains that respondents who have hypertension often consume foods with high sodium/salt content so that the test results statistically show that there is a relationship.

Based on study previously obtained significant relationship \_ between consumption sodium with hypertension on worker with mark *p-value* 0.000 <sup>(8,10)</sup>. Consumption food tall sodium such as biscuits, fish salty , milk , coffee and flavoring MSG foods are proven in a manner significant influence happening hypertension on workers <sup>(11)</sup>. WHO recommends reducing sodium intake to control blood pressure. Another diet that can control blood pressure is *the DASH (Dietary Approach to Stop Hypertension)* diet. DASH diet with reproduce consumption foods rich in minerals, proteins and fiber <sup>(32)</sup>.

Excessive salt/sodium consumption can make the diameter of the arteries narrow and the heart works to pump harder, which can cause blood pressure to rise <sup>(36)</sup>. Consumption food tall sodium causes sodium bond with H<sub>2</sub>O consequently fluid volume extracellular increase An increase in the volume of extracellular fluid causes an increase blood volume thus having an impact on the emergence of hypertension <sup>(37)</sup>. Therefore, workers should not consume foods that contain sodium/salt in excess to reduce the risk of hypertension.

Based on the results of *a literature review*, there were 2 articles (50%) which showed statistical results that there was a relationship between alcohol consumption and the incidence of hypertension in workers and there were 2 articles (50%) which showed statistical results that there was no relationship between alcohol consumption and the incidence hypertension in workers. Of the 2 articles which showed no relationship, explaining that the respondents did not consume alcohol excessively with frequent consumption times so that the results statistically had no relationship. Meanwhile, from the 2 articles showing the results there is a relationship, it explains that the respondents consumed alcohol for a long time, often, and excessively (> 3 glasses/day) so that the results are statistically related. Based on study before , found that workers who consume alcohol own 3.25 times the risk of experiencing incident hypertension compared to workers who don't consumption alcohol <sup>(14)</sup>.

Alcohol has the effect of increasing blood acidity, so that the blood becomes thick and the heart is forced to work hard to pump <sup>(38)</sup>. The habit of excessive alcohol consumption can cause an increase in the hormones epinephrine and adrenaline, which can cause arteries to narrow and cause water and sodium to accumulate in the body <sup>(39)</sup>. Therefore, workers should not consume



excessive amounts of alcohol frequently, because consuming alcohol can have effects in the future, one of which is causing hypertension.

Based on the results of a *literature review*, there was 1 article (25%) which showed statistical results that there was a relationship between coffee consumption and the incidence of hypertension in workers and there were 3 articles (75%) which showed statistical results that there was no relationship between coffee consumption and the incidence hypertension in workers. Of the 3 articles that showed no relationship, explaining that respondents who had a habit of drinking coffee 1-3 cups/day could tolerate the effects of caffeine from coffee so that it did not have an impact on increasing blood pressure. Meanwhile, 1 article shows that the results have a relationship with p-value of 0.000 (<sup>15</sup>), explaining that 100% of respondents had the habit of drinking coffee frequently and excessively (> 3 cups/day) so that the effects of caffeine from coffee could not be tolerated and had an impact on increasing blood pressure.

Based on study before, found that consume coffee on worker with frequency seldom risk 1.50 times while workers who consume coffee with frequency often risky 2.25 times compared with workers who don't coffee consumption (<sup>14</sup>). Consumption of coffee can be dangerous for people with hypertension because the caffeine content in it can increase blood pressure. Put forward that 1 cup of coffee per day can increase systolic blood pressure by 0.19 mmHg and diastolic blood pressure by 0.27 mmHg (<sup>15</sup>). Adrenaline hormone increases when coffee containing caffeine enter to in body cause stomach acid and muscle activity, as well as stimulating the liver to release sugar compounds into the bloodstream to produce extra energy. it \_ become trigger enhancement pressure blood (<sup>15</sup>). Therefore, workers should not consume excessive coffee (>3 cups/day) to reduce the risk of increasing blood pressure in workers.

Based on the results of a *literature review*, there were 9 articles (52.9%) which showed statistical results that there was a relationship between smoking and the incidence of hypertension in workers and there were 8 articles (47%) which showed statistical results that there was no relationship between smoking and the incidence hypertension in workers. Of the 8 articles that showed no relationship, explaining that respondents who experienced hypertension were respondents who did not smoke, but not many respondents who smoked had hypertension. There is no relationship between smoking and hypertension. It is also explained that respondents who smoke often and regularly carry out physical activities so as to minimize the risk of developing hypertension. While the 9 articles showing the results of a relationship, explained that respondents had excessive smoking habits (> 10-20 cigarettes/day) so that they could trigger hypertension. this \_ in line with study earlier that There is connection smoke to hypertension with *p-value* 0.011 (<sup>40</sup>).

Based on study previously put forward that there is connection smoke with incident hypertension (<sup>16, 40</sup>). Study other by Lee et al 2001 with \_ follow study for 3 years so smoke increase risk hypertension as much as 3.50 times. this \_ in line with study by Rahmayani et al

(2019), namely smoke own risk as much as 14.37 times more big experience hypertension <sup>(16)</sup>. Behavior smoke on employee office increase risk more than 8 times big experience hypertension from employee the office does n't smoking <sup>(17)</sup>.

Cigarette consists from various substance chemistry like carbon monoxide And nicotine . Nicotine and carbon monoxide inhaled through cigarettes will enter the bloodstream thereby damaging the endothelial lining of the arteries . as a result happen narrowing vessels blood Because buildup substance substance nicotine And carbon monoxide . Heart Work more hard pump blood to all body And happen enhancement pressure blood <sup>(15)</sup> . Therefore, workers should not smoke excessively to avoid hypertension.

### **Conclusion**

Workplace physical environmental factors which include noise and environmental temperature, as well as worker behavioral factors which include obesity, physical activity, salt consumption, alcohol consumption, coffee consumption and smoking. From this *literature review research* , a conclusion can be drawn, namely that the physical environmental factor in the workplace that most supports the process of developing hypertension is noise. Meanwhile, the worker behavioral factors that most support the process of developing hypertension are salt consumption, obesity, physical activity and smoking. This can be seen from the proportion of articles that examine the relationship between noise (8 articles), salt consumption (4 articles), obesity (8 articles), physical activity (9 articles), and smoking (17 articles) with the incidence of hypertension in workers and show the results Statistically there is a significant relationship between noise (100%), salt consumption (100%), obesity (75%), physical activity (55.5%), and smoking (52.9%) with the incidence of hypertension in workers.

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The author declared that the author had no conflict of interest.

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